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COLLABORATIVE MANAGEMENT OF HANDLING WASTE IN DOULU TOURISM AREA OF KARO REGENCY

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Abstract

Located in Doulu Village of Karo Regency of Sumatera Utara, Penatapen tourism area is one of the tourist attractions that have the potential to generate waste. Proper waste generation handling is needed to be implemented to increase the quality of services. The role of visitors, entrepreneurs and government are crucial to improving the waste management system. Based on observations, waste management has not reached optimal conditions. The community is less aware of sorting out waste and does not have adequate bins. This research analyzed waste generation and evaluate the opportunities for collaborative management in handling waste generation in Penatapan tourism area. The analysis results in the determination collaborative management strategies are carried out by SWOT method. Observation is taken within 16 days during the national holiday. The waste generation reached 1046,7 kg of waste. SWOT analysis obtained the right strategy of processing waste from its source by making a bins with the appropriate volume referring to SNI 19-2454-2002. The proposed collaborative waste management strategy is government to educate the community to sort out waste independently and be aware of environmental issues as well as pilot village programs with the main activities of processing organic waste into fertilizer in Doulu Village.

Key words: *Waste management, Waste Generation, Penatapan Tourism area, Pilot Village, Collaborative Management*

INTRODUCTION

In the era of globalization, the development of tourism in Indonesia is increasing along with the standard of living of the community. The need for entertainment and fun thus increases the number of tourist visits to tourist attractions. One of the keys to visitor satisfaction is the quality of service. Sakarji (2020) has identified that service quality such as reliability, assurance, responsiveness, Tangible and Empathy has a significant relationship to customer satisfaction.

According to Indonesian Law No. 10 of 2009 Article 4 (Republic of Indonesia, 2009), the tourism sector aims to increase national income to improve community's welfare and prosperity, expand and promote opportunities to employment, encourage regional development, introduce and utilize tourist attractions, foster love of the homeland and strengthen friendship in Indonesia.

According to Karo Regency Tourism Department, visitors in 2019 reached 727.526 people and decreased to 250,076 people in 2020. The decrease of visitors is considered reasonable due to restrictions on social activities in all regions during Covid-19 pandemic. Karo Regency in Regional Work Plan of 2021 targets the number of tourist visits by 1.000.000 people. The high number of visitors contributes to the increase in waste that requires the procurement of facilities and infrastructure including waste management.

Data of Karo Regency Environment Department stated the percentage of waste handled is 83.12% in 2020, and still below the target of 90,66%. This is caused by the topography of Karo Regency includes hilly areas and the vast coverage. Waste management systems are not general and differs in each region caused by the difference of community characteristics, topography, and sociodemographic of an area (Akinci, Guven, & Gok, 2012).

Proper waste management must be implemented to not cause environmental pollution impacts and keep the cleanliness and comfort of tourism areas. Waste management is often defined as control of waste collection, starting from the process of waste, collection, removal, transportation, processing, and transformation of waste to the final disposal process. This system is carried out with the application of the best principles for health, economics, engineering, conservation, aesthetics, environment, and also to society (Berg, Sebestyen, Bendix, le Blevennec, & Vrancken, 2020). Collaboration between the public, the private sector, and the government is needed to optimize. Synergy and good communication between parties are necessary to achieve a goal that cannot be solved individually (Sabaruddin, 2017). North Sumatra has several tourist options that can attract tourists. This research takes the tourism area of Penatapan Doulu, Karo Regency as one of the choices of tourism areas in North Sumatra where the number of visitors increases significantly every year. The objectives of this paper are therefore to obtain data on waste generation and evaluate the opportunities for collaborative management in dealing with waste generation in Penatapan tourism area. Collaborative management is a multi-organizational synergy that has a common goal and planning to solve complex problems together in one unit (Nalbandian, 2005). Maryanti (2017), report on the importance of collaborative management approach in waste management through counseling and mentoring conducted by the government and environmental practitioners to local communities in 3R waste processing (reduce, recycle, reuse) in Bogor City.

RESEARCH METHODS

This research used qualitative descriptive method which describes social facts of society and also explains the role and efforts of stakeholder in collaborative management in handling tourism waste. The location study was taken in Panatapan Doulu area in Karo Regency of North Sumatra Province.

Figure 1. Showing the location of Doulu Village bordering Deli Serdang Regency in the north, Naman Teran District on the west, Dolat Rayat District on the east, and Sempajaya Village on the south.

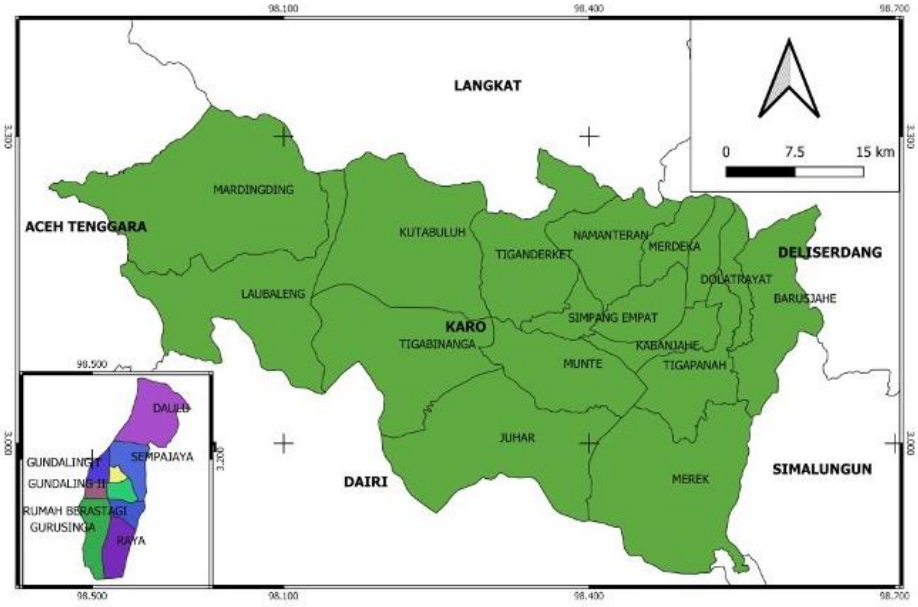

Fig. 1 Karo Regency Administrative Map

This research is conducted by focusing on the problems as well as obtaining information data in the research field. The questionnaire was distributed about waste handling and respondents' assessment of waste handling (Role and performance of The Office of Cleanliness and Sanitation, Facilities and Infrastructure, Financing, Legal Products, Community Participation, and Tourists / Visitors) as has been carried out.

To collect appropriate data, it is best to involve the right data sources and respondents. The average number of tourists reached 193 people/day thus total sampling of 33 people using Issac and Michael method (1.1) is obtained.

$$S = \frac{\lambda^2.N.P.Q}{d^2.(N-1)+\lambda^2.P.Q} \qquad (1.1)$$

$$S = \frac{1,642.193.0,5.0,5}{0,10^2.(193-1)+1,642.0,5.0,5}$$

S = 33,01, set to 33 people

Remarks:

S = number of samples
λ^2 = chi^2 at error 20% = 1,642
N = average number of visitors
P = correct odds (0,5)
Q = wrong odds (0,5)
d = bias 0,1

Respondents consisted of key and main informants including (a) key informant: (1) Bappeda Karo; (2) Karo District Environment Office; (3) Attraction Manager, and (4) Karo District Tourism Office and (2) Main Informant: (1) Regent / Vice Regent Karo; (2) Doulu Village of Karo Regency, and (3) Visitors or tourists visiting.

This research aims to analyze the amount of waste and composition of waste generated from tourist activities in the Doulu Determination area. In addition, this research aims to evaluate the waste management management system in the Doulu Determination tourist area. Evaluation includes the existing condition of waste management management, the potential of the region, as well as mapping on interested parties. The results of the evaluation will be analyzed through SWOT methods to obtain proposed waste management strategies through the concept of collaboration management.

RESULTS AND DISCUSSION

Overview of Research Locations

Penatapan tourism area is located in Doulu Village, Berastagi District, Karo

Regency, North Sumatra Province which is consisting 9 villages. Doulu village has an area of 10,690 km2 with a ratio to sub-district area reaching 11.48%. Doulu village can have a distance of about 10 km from the capital of Berastagi Subdistrict and about 80 km from the center of Medan City. Located on the main Medan-Berastagi pathway makes Doulu Village has advantages in terms of accessibility.

Located on the path to Medan City, Penatapan tourism area has the potential because it provides views of Medan City and hills (Lubis, Sinulingga, Sufika, & Bangun, 2014). Panetapan tourism area has about 30 restaurants, 1 prayer building, 3 public toilets, and parking area.

Characteristics and Volume of Waste

The accumulation of waste is the result of community waste in a certain area. The design base of Temporary Landfills (TPS) and landfills (TPA) is determined by the data of waste accumulated within a certain period time. Measurement of waste in tourism areas is carried out based on the SNI method 19-3964-1994. Data measurements were taken over 16 days (16-31 of August 2021) including national holidays. The days are selected to obtain data on days that produce maximum waste such as national holidays as the basis for waste management analysis. The amount of waste produced on holidays is more due to the increase in visitors in the Penatapan tourism area. 30 samples were taken throughout the area and restaurants.

Measurements used three stages: (1) waste collection process; (2) waste sorting process and (3) waste weighing process based on composition.

Fig.2 indicates the rate of waste generation on 17th of August, 2021 had the most waste compared to other days with 1046,7 kg of waste/1590 people. This is due to the increase in visitors on national holidays. Total waste during the 16 days of the research reached 2,204 kg of garbage/3092 people. Each person on average produces about 0.72 kg of waste.

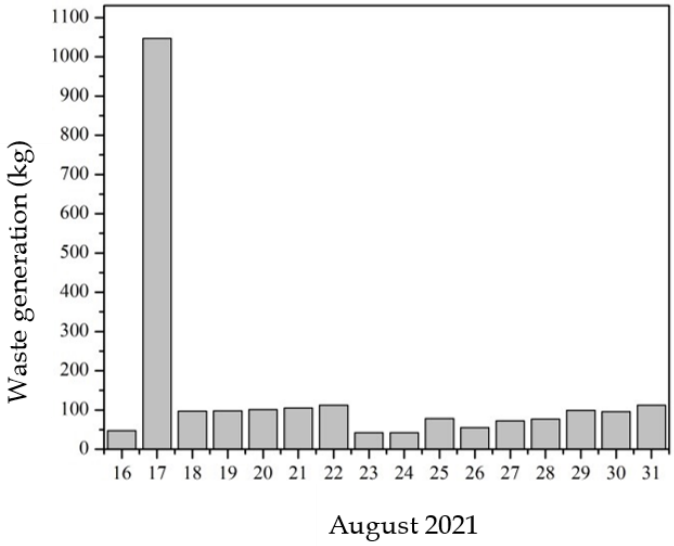

Fig. 2 Waste generation rate in Penatapan tourism area

Waste Generation based on Composition

Based on SNI 19-3964-1994 the composition of waste includes paper, organic, wood, fabric, rubber, metal, and glass/ glass. Table 1. informs the composition and percentage of generated waste at Penatapan tourism area.

Table 1. Waste generation composition at Penatapan tourism area

No	Type of Waste	Composition	Percentage
1	Organic Waste	Food Waste	13,46
2	Organic Waste	Leaves	2,58
3	Organic Waste	Woods	1,88
4	Organic Waste	Fruit Peels	28,07
		Total	**46,01**
1	Inorganic Waste	Plastic	42,02
2	Inorganic Waste	Rubber	0,57
3	Inorganic Waste	Metal	6,41
4	Inorganic Waste	Glass	4,94
		Total	**53,94**

The composition of waste in Penatapan tourism area is dominated by inorganic waste by 53,94% while organic waste by 46,01%. Plastic contributes the most in inorganic waste by 42,02% and fruit peels have the largest role in organic waste by 28,07%.

This study examined the calculation of waste generation in Penatapan tourism area which produces an average of 0.83 kg/person/ day or in volume of 0.25 liters/person/day. A previous study reported in Parangtritis Bantul beach tourism area reached 0,8 liters/person/day (Masjhoer, 2017)

According to Minister of Environment and Forestry Regulation No. 70 of 2016, waste processing methods by combustion are not permitted. The type of garbage that has been sorted produces a group of waste that can be burned with the highest percentage of 75.15% but is not allowed to be burned so that further waste handling must be carried out. Table 2. shows the type and percentage of sortated waste at Penatapan tourism area.

Table 2. Types of waste generation Penatapan tourism area

Sortation	Types	Percentage
Rotten material	Food waste	13,46
Organic	Food waste, leaves, moods, fruit peels	46,01
Biodegradable	Rubber, food waste, leaves, moods, fruit peels	46,58
Combustive material	Rubber, leaves, woods, fruit peels, plastic	75,15
Recyclable	Plastic, rubber, metal	49,00

Characteristics of Tourists, Governments and Entrepreneurs

The questionnaire data was taken from 33 respondents including visitors, Representatives of Bappeda Karo, Environmental Office of Karo Regency, Manager of Attractions, Tourism Office of Karo Regency, Regent / Vice Regent of Karo, Doulu Village of Karo Regency, and entrepreneurs. Table 3. inform the data collected regarding knowledge about waste management and the characteristics of visitors, governments, and entrepreneurs.

Table 3. percentage of respondents' knowledge about waste management

No	Question	Respondents' Answer		Percentage (%)	
		Yes	No	Yes	No
1	Trash is all remaining objects produced from human activites that are no longer used	30	3	90,9	9,1
2	Do you know the difference between organic and inorganic waste types?	28	5	84,8	15,1
3	Do you know the impact of waste?	29	4	87,8	12,1
4	Have you ever gotten socialization related to waste management?	26	7	78,7	21,1
5	Do you know the types of waste	26	7	78,7	21,

No	Question	Respondents' Answer		Percentage (%)	
		Yes	No	Yes	No
	included				1
6	Do you know the types of waste in the hazardous and toxic materials category?	23	10	69,6	30,3
7	Do you think it is necessary to sort waste based on its type?	21	12	63,6	36,3
8	Do you know the processing of organic waste into compost?	29	4	87,8	12,1
9	Do you know what kind of recyclable waste?	27	6	81,8	18,1
10	Do you think the tourism area is already in a clean state?	29	4	87,8	12,1

Table 3 shows that visitors, governments, and entrepreneurs know and aware about waste type, waste impact, and waste management. About 87,8% testified that Penatapen tourism area is in clean state.

Evaluation of Waste Management Conditions in Management Tourism Areas

Research observations resulting each restaurant using open trash bins without sorting the waste. Fig. 3 shows the conditions of over-capacity waste at the temporary landfills.

Fig. 3 Over-capacity Public Waste Bins

The waste generated by visitors and restaurants exceeding the capacity of trash bins, therefore the trash bins cannot hold the over-capacity waste. The transportation of garbage with a period of 4 days is also a cause of the accumulation of waste in temporary landfills.

Evaluation to the existing conditions of waste management is carried out by five aspects according to SNI 19-2454-2002 based on data and research observations.

1) Operational Technical Aspect

This aspect includes sorting, revelry, collection, transportation, and waste treatment. Only a few businesses sort out the trash. Due to the limited availability of garbage containers by following per under Law No. 18 of 2008 and also the lack of public knowledge of the importance of doing waste sorting so that visitors have difficulty sorting out the waste. Observations resulting trash bins at the temporary landfills (TPS) have a lower volume than the waste itself. waste at the temporary landfill (TPS) is transported every 4 days by UPTD LH Karo Regency to landfill which is 30 km from the Penatapan tourism area.

Fig. 4 Kabanjahe Open Dump

Fig. 4 shows conditions of landfills (TPA) with an dumping system. Open dump landfill has the potential to cause environmental issues.

1) Institutional/Organizational Aspects

Management organizations deploy government-run institutions and communities that have a role in waste management including the provision of necessary facilities and infrastructure. Institutions in waste management systems are required as holders of important roles in organizational structure, function, responsibility, and authority and coordination both vertically and horizontally (Kurnia & Khikmah, 2015).

2) Financing Aspects

According to SNI 12-1991-03 regarding operational cost and maintenance and equipment replacement, waste management cost is obtained from the community (80%) and local government (20%), and the

allocation fund amounted to 10% of the total APBD (Regional Spending Budget). The operational costs of waste processing are determined from the levy from the community which refers to Regional Regulation of Karo Regency No. 4 of 2012 article 14 concerning The Levy of the Ministry of Transportation by Rp. 2000,-/day for restaurant category.

3) Regulation Aspects

Implementation of regulations in Karo Regency that have not been running by following the legal basis of law No. 18 of 2008 due to lack of public awareness of the importance of waste sorting and waste management independently even though the government has provided counceling to entrepreneurs. The government has not given strict sanctions for perpetrators who throw waste carelessly so that the relationship between the government and entrepreneurs has not been well established in the waste processing system.

4) Community Role Aspects

The community has a big role in waste management systems. Communities with good care in waste management and waste processing are beneficial to the government. Public concern in minimizing waste generation, good waste sorting, and final waste processing such as reusing, reducing, recycling, and composting is key in the waste management system (Singer et al., 2019

SWOT Analysis

The SWOT analysis method is used to determine, evaluate, clarify and validate proposed planning that has been prepared to achieve the goals. The concept of strategic management emphasizes the importance of internal and external assessments that consider future developments before a strategy is established. This analysis method maximized Strong, Weaknesses, Opportunities, and Threats in systems. Fig 5. present analysis and consideration as a reference to obtain appropriate strategies for waste management.

Internal Factor / External Factor	Strength (S)	Weakness (W)
	1. Bussinessmen and visitors already aware of waste management well	1. Research location does not have an institution that manages the community in self-processing waste
	2. Location has regional regulation regarding waste management	2. Final landfill located far from research location
	3. Waste management system afford jobs for community	3. Waste sorting according to waste types has not been implemented
	4. Great support by bussinessmen to provide waste revelations.	4. Temporary landfills are unable to accommodate the amount of generated waste
	5. The government actively provides written and counseling advice to the community regarding the waste management system	5. The role of the community has not been optimal in waste management independently
	6. The research location is in a strategic location and easily accessible	6. There is no retribution in wate management
		7. Lack of government firmness in sanctioning violators
Opportunities (O)	**S-O Strategy**	**W-O Strategy**
1. Organic waste utilization as compost	1. Increase cooperation between parties related to the usage of waste from tourism area	1. Conduct cooperation attemps between communities, businessmen, governments and other parties for waste management collaboration
2. Plastic waste utilization to increase community income to plastic craftmen	2. Increase community skills to manage the waste of tourism area	2. Conduct collaborative attemps between communities, businessmen, governments and other parties to provide facilities and infrastructures
3. Collaborative strategy between government and related parties to provide facilities and infrastructures	3. Conducted waste management campaign through electronic media or posters	3. Conduct collaborative attempts in determining economic research and retribution cost in wast management
4. Becomes research study material on the potential and management of waste		
Threats (T)	**S-T Strategy**	**W-T Strategy**
1. Visitors bring outside food and drinks	1. maximize government programs and regulations related to vision and mission in increasing public awareness in waste management	1. Conduct a research to determine the waste levy withdrawal system
2. Waste revelation without cover as source of disease	2. Conduct counselling sessions regarding waste hazard to environment and health	2. Optimalize regulation implementation regarding firm sanction to violators
3. Waste collection to landfill every 4 days	3. Add periode of waste collection to landfill	3. Charge a waste management levy rate for visitors
4. Lack of visitors awareness in self-managent waste	4. increase temporary landfills volume at reseach location	
5. High rain intensity at research location		

Fig. 5 SWOT Analysis

According to SWOT analysis in Fig. 5, suggestions to waste management strategy starting by supplying waste bins according to waste types. Waste bins differ in two types,

dry and wet waste. Waste sorting is conducted individually by the community. The average waste generation reached 1,39 m^3/restaurant/day. Total waste is split into dry and wet waste therefore waste bins need a volume of 0,69 m^3 and a retention time of about 2 days. Each bin has to provide at least 1,39 m^3 of trash bins volume. Around 49% of total waste can be recycled. Waste types include plastics, rubbers, and metals. Recycled waste has the potential as a source of employment that allows the improvement of the economic level of the community. Previous research conducted by Dokhikah and Trihadiningrum (2012), waste sorting that concludes informal sector such scavengers managed to reduce solid waste by 10% in Indonesia.

Pilot Village Program as a real synergy among parties which has a purpose to support waste management system. Activities in Pilot Village Program include: (1) perform organic compost and fertilizer making training which carried out by collaboration between Doulu Village and university academics in Medan City; (2) Counceling sessions program regarding waste management and effect of waste by the government as facilitator; (3) Doulu Bersih Program, this program conducted by village community who joined to institutions or non-government organizations (NGO). These institutions/organizations performed communal works, waste awareness campaigns, and education. The counceling is expected to increase public awareness and mindset of waste management.

Previous research performed by Krisnani dkk (2017), Reported that the implementation of counseling on socio-economic impacts in the utilization of self-sorting has changed the mindset of the Genteng Village community. The results of the research obtained the potential of waste that can be recycled reached 49% of the total waste generated.

CONCLUSION

According to research observation at Penatapan tourism area from 16-31 of August, 2021 during the national holiday, visitors hitted 1.590 persons on 17th of August 2021 with an average of 193 persons/day. Waste generation reached 0,83 kg/person/day.

Community and entrepreneurs have not been performing waste sorting with the 3R (reuse, reduce and recycle) concept. Open and inadequate bins are still widely used despite causing environmental and health problems. Over-capacity temporary landfills and landfills located 30 km from temporary landfills causing waste collection is conducted every 4 days.

SWOT analysis result suggests the collaborative strategy of waste management. Procurement of facilities and infrastructures by the community according to SNI 19-2454-2002. Government and academics conduct counceling sessions concerning the benefits of waste sorting and management. Implementing the Pilot Village including several activities such as compost and organic fertilizers making training program to achieve Doulu Bersih.

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