

Development of Sustainable Solid Waste Management System of Air Manis Tourism Area for Supporting Sustainable Tourism in Padang City, West Sumatra, Indonesia

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Abstract

This study aims to study the current practice of solid waste management system and the potency of development of a sustainable system for solid waste management to support the implementation of sustainable tourism program in Air Manis Tourism Area in Padang City, West Sumatra, Indonesia. Measurement of solid waste generation, composition, and recycling potency was conducted as well as observation and interviews to complete the study. It revealed that the area generated solid waste as 6.501 m³/day which mainly consist of 76.513% food waste, 6.257% plastic, 2.709% paper, and 9.336% yard waste, while materials that have potency for recycling were plastic, non-ferrous metal, food waste, paper, and glass. It is recommended that sustainable solid waste management system should be applied in the tourism area by providing storage, collection, and treatment in the recycling center that located on tourism area applying composting and recycling method, and also transportation into the nearest transfer station.

Keywords: *solid waste management, sustainable system, tourism area, sustainable tourism, recycling center.*

1. Introduction

Problems that often faced by big cities is solid waste that generated by the population. Therefore, the Padang City Government issued a regulation concerning waste management to realize a healthy and clean waste environment in a comprehensive and integrated manner, to achieve this goal the city government also issued regulation concerning waste free areas (Walikota Padang, 2012). Some of the coastal tourism areas are included in the waste-free area that was determined by the decision, including Air Manis Beach which is the flagship of coastal tourism in Padang City. The number of visitors and traders around the beach can be a source of generation in the tourist area.

Air Manis Beach is located in the Air Manis area which has an area of 1.19 km² with a population of 1,719 in December 2017 (BPS, 2016). The waste produced by this area comes from two sources, namely coastal tourism areas and stalls in the coastal area. This area previously isolated from the municipal solid waste management service area, thus, improperly solid waste management easily found.

Cultural and Tourism Agency of Padang City has provided cleaning staff for the beach area, but these cleaning workers only have to collect garbage and disposed it at one area without prior processing or treatment, so that in the coastal area there are many piles of garbage that interfere with comfort a visitor. Waste from residential areas is traditionally managed by the community by burning and piling up in an open area. Therefore, it is necessary to study the existing data and solid waste management practice in the Air Manis area as an effort to prevent environmental pollution, ensure public health as well as for the sustainability of tourism.

Tourism has consequences positive and negative influences. Tourism has a significant impact on the environment, such as the presence of air pollution, water pollution, and a decrease in environmental quality due to garbage around tourist areas (Suzanna, 2013). In recent years some studies of solid waste management on the tourism area have done on several countries such as Kashmir (Bhat et al., 2014), Cyprus (Zorpas et al., 2015), Spain (Arbulu et al., 2016), Vietnam (Hoang et al., 2017), Romania and Italy (Giurea et al., 2018), an also Indonesia (Naltaru et al., 2014; Wijaya and Trihadiningrum, 2014; Dewi, 2017; Jefri and Aziz, 2018; Aziz and Mira, 2019).

The purpose of this study is to analyze the solid waste generation, composition, and recycle potential of Air Manis Area, and promote the sustainable solid waste management system for the Air Manis area.

2. Material And Methods

The study divides into several stages, firstly, the literature review that aims to collect and study theories that support the study from textbooks and journals, as well as regulations that apply and related to sustainable solid waste management system. Secondly, analysis of existing solid waste management practices. On this step primary data (solid waste generation, composition, and recycle potential) were collected through direct measurement on field.

Sampling location based on the facilities exist on Air Manis Area, as shown on Table 1.

The measurement of solid waste generation based on SNI 19-3964-1994 includes measurement of the weight and volume of waste from each sample based on the sources. Unit of volume generation is in Liter/person/day and Liter/m²/day, while weight generation unit is kg/person/day and kg/m²/day. Solid waste generation formula shows as follow:

$$= \frac{\text{weight or volume of waste (kg)}}{\text{area or number of waste producer (m}^2 \text{ or person)}}$$

Table 1. Number of sampling spot on Air Manis Area

Facility type	Facility Number	Sampling number
Mosque	2	1
School	3	1
Healthcare center	1	1
Office	1	1
Street vendors/ Stalls	271	27
Park	1	1
Total	281	33

Solid waste composition determined by measurement of the weight of each waste component compared with the total weight of the waste. Solid waste composition formula shows as follow:

$$= \frac{\text{weight of waste component (kg)}}{\text{total weight of waste (kg)}} \times 100\%$$

Determination of waste recycling potential by sorting waste that can be recycled. Solid waste recycling potential formula shows as follow:

$$= \frac{\text{weight of the recyclable waste}}{\text{total weight of waste}} \times 100 \%$$

In addition, for getting the existing management conditions obtained through observation and interviews with the manager of the tourist area. The last step was the sustainable solid waste management recommendations. This step consists of identification of problems and the need for developing technical and non-technical aspects of solid waste management based on the criteria of the waste management system that regulated in Indonesia, which is then continued by the determination of future development scenarios.

3. Result And Discussion

Existing Solid Waste Management Practices

a. Solid waste generation, composition, and recycle potential

By referring SNI 19 -3964-1994 (Badan Standardisasi Nasional, 1994), the number of solid waste generation units in the Air Manis area can be seen in Table 2, with the total waste generation of 6.501 m³/day or 716.58 kg/day.

Table 2. Existing solid waste generation of Air Manis beach

Sources	Waste sources		Waste generation unit		Total waste generation	
	Number	Unit	(l/m ² /day)	(kg/cap/day)	(m ³)	(kg)
Tourism	4,500	m ²	0.379	0.037	1.705	166.50
Residential Area	1,719	cap	2.79	0.32	4.796	550.08
Total					6.501	716.58

Solid waste that generated has different composition. The highest composition is food waste with a percentage of 76.513% (weight base), while the smallest percentage is rubber as 0.085% (weight base), more details can be seen in Table 3.

Recycling potential of solid waste generated varied as the highest recycling potential as garbage as 94.029% of the garbage generated, plastic as 89,282% of the total plastic waste generated, paper as 71.94% of total paper generated, all metal waste generated, and 50% of total glass generated. For more details can be seen in Table 4.

Table 3. Waste Composition in Air Manis Area

Waste Components	Waste Generation	
	(kg)	(%)
Organic		
Food waste	99.653	76.513
Paper	3.528	2.709
Plastic	8.501	6.527
Textile	1.124	0.863
Rubber	0.111	0.085
Yard waste	12.159	9.336
Wood	1.751	1.344
Total Organic	126.828	97.377
Inorganic		
Glass	0,750	0.576
Ferrous Metal	0.098	0.075
Non Ferrous Metal	0.118	0.090
Other	2.450	1.881
Total inorganic	3.42	2.623
Total	130.244	100.000

Table 4. Recycling Potential in Air Manis Area

Component	Weight based	
	% Recycled	% Residual
Garbage	94.03	5.97
Plastic	89.28	10.72
Paper	71.94	28.06
Metal	100	0

Glass	50.00	50.00
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b. Solid waste management practices

In general, the solid waste management of the Air Manis area still has not received full attention from the Municipal Government. The solid waste management system is carried out independently by the community by implementing an open dumping approach. The Community discards the garbage that has been collected in an open land without any prior processing, even applying open burning.

Sustainable Solid Waste Recommendation

a. Evaluation and development opportunity

By comparing with national standard for municipal solid waste management system (Damanhuri dan Padmi, 2016; Kementrian PU, 2013), it can be seen that some problem related to existing practices and the development needed for better system, as seen on Table 5.

Table 5. Problem identification and development plan

Item	Problems	Development needed
Service level and area	No exactly level and area of service	Has to reach 100% of service level and area covers
Technical aspects		
Storage	1. The existing solid waste container is not properly maintained so that it cannot function properly. 2. Unequal distribution of waste storage.	1. Providing 3-color storage for waste separation at sources 2. Socialization of waste sorting at sources related to practices of community-based solid waste treatment by 3R method.
Collection	Cleaning officers collect solid waste using wheel barrows and brought is piled on an open land.	1. Apply the communal patterns for collecting the garbage of tourist areas 2. Use a motorized tricycle as a collecting tool
Treatment	No treatment facility and no community or NGO that involves	1. Build a waste recycling center; 2. Socialization and training related to recycling center and waste bank into the visitor and trader and also the owner of the shops to enhance community participation in solid waste management.
Transportation	No transportation system applies.	1. Planning the route of transportation; 2. Arrangement of transportation schedule.
Nontechnical aspects		
Institution	The management and operation of the solid waste system is managed by Tourism and Cultural Agency of Padang City.	1. Optimizing cooperation with Environmental Agency of Padang City; 2. Conducting partnership relationships with business entities or communities in community-based management.
Financial	The current pattern of waste management is carried out with sources of funds originating from beach visitor ticket levies.	1. Retribution from collection of solid waste from community and shops on the tourist area; 2. Finding other funding sources such as the private sector as a government partner.
Regulations	1. Application of the government regulation on solid waste management not yet effective in giving sanctions for the violator;	Socialization of waste management regulations to the public, and law enforcement.

	2. Waste management provisions not well-socialized into the community.	
Community participation	1. No participation on waste sorting at the source and processing waste with the 3R concept; 2. No comply with the rules of waste disposal that have been set; 3. No collaboration among government officials, NGOs and the community.	1. Socialization of waste segregation and 3R waste management to the community; 2. Conducting waste recycling training to increase community participation in waste management with the 3R concept; 3. Carry out collaboration in waste management between agencies, NGOs and the community.

b. Sustainable solid waste management system scenario

Scenario of sustainable solid waste management system of Air Manis Region shows in Table 6.

Table 6. Scenario of sustainable solid waste management system

Items	Scenarios
Management scale	Regional scale
Service rate	100 %
Separation and Storage	Consists of individual and communal storage. The type of storage for individual: plastic bags, sacks, plastic bins and waste baskets. The communal storage for the coastal area is 80 L bin a set of 3 different colors, while the residential area uses 240 L bins, three types of colours; green, yellow and grey for compostable waste, recyclable waste, and residues.
Collection	The collection tool used is a motorized tricycle with a capacity of 1.5 m ³ . This is because the area of the road for access can be passed by a motorized tricycle
Treatment	Waste treatment done in recycling center, carried out for compostable and recyclable wastes. Compostable waste is treated by composting and recycling. Recyclable waste is processed by grinding and recycling. The composting method used is the takakura method. The residues put on container.
Transport	Waste transportation using a motorized tricycle, intended for transportation of residual waste from recycling center to nearest containers that served by municipal service.

4. Conclusion

Air Manis Beach generates solid waste as 6,501 m³/day, consists of 97.377% organic waste and 2.623% inorganic waste, and waste that has higher recycling potential is food waste, plastic, paper, metal, and glass. The solid waste management system is carried out independently by the community by implementing an open dumping approach. Based on problems identification, some development program has plan on technical and non-technical aspects. In order to implement sustainable solid waste management for supporting sustainable tourism, it is recommended that sustainable solid waste management system should be applied in the tourism area by providing storage, collection, and treatment in the recycling center that located on tourism area applying composting and recycling method, and also transportation into the nearest transfer station.

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Indonesia Efforts in Accelerating Orangutan Repatriation From Thailand to Conserve from Illegal Trading (Repatriation between 2004-2017)

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Abstract

The aims of this article are explain orangutan's repatriation process from thailand and analysis Indonesia efforts in orangutan's repatriation process. Generally, orangutan repatriation process according to IUCN Guideline for Management of Confiscated Animals. The innitilal assessment include on species identification, IUCN conservation status and priorities, health check, fitness to survive, reason for confiscation, and country of origin and arrival. Repatriation of great apes may be difficult, both politically and logistically, but this is needed to encourage the restoration of great ape ecosystems. During this repatriation, Many challenges are faced by Indonesia includes international distrust, lack of commitment and funding, and military coups.

Keywords: *Indonesia Efforts, Orangutan Repatriation, Illegal Trading*

1. Introduction

Worth between USD\$ 7-23 billion annually, the international illegal wildlife trade (IWT) has become the fourth largest criminal market in the world. In the Asia-Pacific region, the live pet trade is an increasing driver of biodiversity loss. This is an acute problem in developing countries such as Southeast Asia which does not have the regulatory capacity to manage their natural assets. Instead of promoting the economy, poor resource management leads to acts of corruption, and conflict (UNDOC). Excessive exploitation of smuggling and trafficking in wildlife decreases the population of certa in species which can harm a country's economy (Takandjandji and Sawitri, 2016).

Indonesia must anticipate the advancing of international wildlife crimes-new international crimes-through international forums including cybersecurity, protection of objects and cultural reserves from illegal trade, illegal unreported and unregulated fishing (IUUFishing) and wildlife and other forest products illegal trading. International cooperation is required to be more comprehensive considering the significant losses (Ministry of Foreign Affairs 2017). Repatriation is one of the ways to obtain Indonesian wildlife species for the special benefit of conservation organizations. Orangutan repatriation scheme between Indonesia and Thailand start from an investigation by the Thai Royal Forestry Police Division on November 22, 2013, that found smuggled over 115 orangutans at the Safari World Zoo in Bangkok Thailand. Safari World Zoo claims that young orangutans are one of the successes of breeding programs. However, after a DNA test conducted by the Orangutan Foundation, about 72 orangutans were smuggled into Thailand Although Thailand ratified CITES (Convention on International Trade in Endangered Species of Wild Flora and Fauna) in 1983, it did not protect endangered species, which were smuggled from Indonesia. (Ariastiti 2008).

Repatriation of orangutans through Indonesia and Thailand cooperation is one of the international collaborations in mainstreaming transnational crime. Both individuals and the organization, repatriation process is usually a difficult experience . In this case, Repatriation of great apes may be difficult, both politically and logistically, but this is needed to encourage the restoration of great ape ecosystems. Besides that, for anticipate of the adverse effects of re-introduction to the release area must be carried out, including a clear commitment to restore these habitats when great apes have been repatriated (B. Beck et al. 2007). The acceleration of the orangutan repatriation process from Thailand has become an opportunity and challenge for Indonesia to conserve their resource assets.

2. Orangutan's Repatriation Process From Thailand

After report from the Thailand Royal Forestry Police Division on November 22, 2003, that 115 orangutans had been exploited at the Bangkok Safari Park. CITES then uploaded it in CITES Article (1V) inviting the response of Indonesia NGOs and the International Primate Protection League (IPPL) to send letters to conduct negotiations regarding repatriation. In 2007, Before repatriation, confiscated animal must get 6