

A SWOT Analysis of Landfill Management System: Case Study of Talangagung Edu-tourism Landfill in Malang, East Java

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Abstract- The educational tourism landfill management system was one way that could be applied by the landfill manager to support environment based waste management program and environmental conservation education. This study aimed to determine the status quo of Talangagung educational tourism (edu-tourism) landfill, at Kepanjen, Malang as one landfill model of national pilot that had implemented controlled landfill management system in Indonesia. This research used qualitative approach by using SWOT and IFAS-EFAS analysis.. SWOT and IFAS-EFAS analysis used to evaluate internal (strengths, weaknesses) and external (opportunities and threats) factors regarding landfill management policy as an edu-tourism landfill. Talangagung landfill has strength and opportunities which could be utilized for further policy development. Currently, the Talangagung landfill position was in growth quadrant based on SWOT and IFAS-EFAS analysis. The appropriate management policy strategy for the current Talangagung landfill condition was to utilizing and synergizing maximally the strengths and opportunities available to achieve better management. The policy could be selected to support further development of landfill was to strengthen social relationships with surrounding communities and visitors.

Key words- edu-tourism, landfill, waste management, SWOT

I. INTRODUCTION

As one of the developing countries, municipal waste management is still a problem that has not been resolved to date in Indonesia [1], [2], [3], [4]. The increase in the amount of waste generated continues to occur as a result of the increase in human population, daily needs and the economy sector development. So far, landfill management system in Indonesia mostly still apply open dumping system, so it tends to have negative impact to the surrounding environment such as soil, water and air contamination, odors, disease vector, etc [3], [5], [7]. The negative impacts caused the existence of landfill is still not desirable or acceptable even rejected by the community. Effect of waste can bring bad impact to the community if the waste is stacked in the absence of proper management. In addition to the development of waste processing technology, the

government and related institutions must continue to build public awareness that waste reduction is everyone's duty [6]. The development of cities in Indonesia is generally uneven, so the environmental problems that arise are also different. Cities with high population growth rates will create environmental problems that are different from cities with low population growth rates [7].

Since the enactment of Law no. 18 of 2008 on waste management by the Government of Indonesia, the landfill that still apply the open dumping system must switch to controlled landfills, minimally. In this law, waste management should pay attention to the principle of reduce, reuse, and recycle (3R) [8]. In addition, waste management in the landfill should be carried out in an environmentally sound manner to avoid adverse impacts on the community and the environment itself [1], [9]. There are several factors that affect waste management practices in developing countries, such as Indonesia. These factors include the composition and amount of waste, access to waste collection site, community awareness levels, and government policies / regulations [10], [11], [12].

Waste processing is an attempt to reduce the volume of waste or change its form becomes more useful. Collected waste can be processed further, either at the location of waste sources and after arriving at landfill as final waste processing site [13]. Improper waste management can lead conflicts between the landfill managers and the surrounding communities [12]. So, how to make the existence of landfill can be accepted by the community still have to look for the solution until now. One alternative solution that can be offered is through the engineering of landfill management systems. The applied landfill management system must provide benefits not only to the environment but also community so that the existence of landfill can be sustainable for a long time.

Talangagung edu-tourism landfill, located in Kepanjen, Malang Regency is an open dumping landfill which is converted into controlled landfill nowadays. The construction of the Talangagung landfill began in September 2009, and in 2010 this landfill was developed into a prototype model for the utilization of methane gas as a product of waste management process. In January 2011, landfill improvements were conducted based on the results of discussions with experts from some local

universities [12], [14]. The current condition of Talangagung landfill serves 17 sub-districts in administrative area of Malang regency with the population reach 1,258,112 people in an area of 1313.13 km². Served landfill area are consisted of three technical unit areas (UPT) namely UPT Kepanjen, UPT Turen, and UPT Bululawang. The volume of input garbage at Talangagung landfill continuously increase. This is evidenced by the increase in garbage volume data doubled in from 2009 to 2016. In 2009, garbage input to this landfill was 114.7 m³/day then it reached to 239.4 m³/day in 2016. Due to the significant increase of waste input, if the Talangagung landfill is not managed properly then it will have negative impact on the environment around and it also will affect the occurrence of social conflict with community surrounding

Talangagung landfill is developed as educational tourist destination and applied laboratory of appropriate technology for waste management. Moreover, this landfill was also developed as a learning place to improve student's motivation and community awareness on environment conservation aspect. Educational tourism (edu-tourism) is a program where tourists visit a tourist destination with the main purpose to gain direct learning experience in the tourism object [15], [19]. Educational tourism is a tourism concept that implements nonformal education about new knowledge to tourists visiting a tourism object [16].

This study aimed to determine the status quo of Talangagung landfill as an educational tourism landfill in Malang regency. In order to achieve these objective, the SWOT analysis was used as a tool to identify internal and external factors that affect waste management of the landfill. Furthermore, these factors will be used to determine better management policies in the future through the formulation of strategic action plan. SWOT is an analytical tool designed to be used as preliminary stages of decision making on the one hand and as prior in planning management strategies on the other. According to Saaty [17], the SWOT analysis is used to maximize both strengths and opportunities, minimize external threats, turn weaknesses into strengths and take advantage of existing opportunities as long as it still minimize internal weakness and external threats.

II. RESEARCH METHOD

A. Study Area

This research was conducted in Talangagung village, Kepanjen Subdistrict, Malang Regency, East Java Province, precisely at Talangagung edu-tourism landfill. Determining the location of research was carried out intentionally, with consideration as follows (1) Talangagung landfill was the main priority program of the Malang Government in order to follow up the Government of Indonesia Act No. 18 of 2008 on Waste Management; (2) Talangagung landfill had been identified as Smart Practice 2016 by Knowledge Center, Ministry of National Development Planning of the Republic of Indonesia (BAPPENAS).

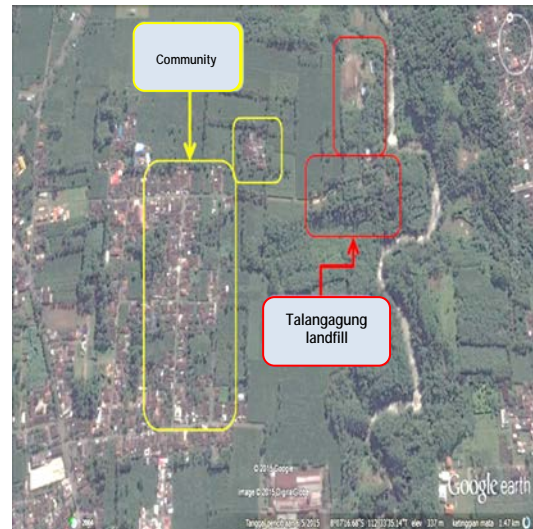


Figure 1. Study area of research at Talangagung landfill, Kepanjen, Malang

B. Data Collecting

This study used a qualitative approach through field observation, questionnaires, and structured interviews. Interview is a process of obtaining information for the purpose of research through question and answer while holding face to face between the interviewer with respondent or person interviewed, with or without using interview guidelines. Communities living around the landfill, landfill managers and visitors are used as respondents in this study. Communities and visitors were randomly selected when data collecting process. There are two stages of the activities carried out in the data collecting of this study. The first step was to identify relevant internal and external factors based on the results of the social survey that had been performed. Internal factor analysis was a comprehensive evaluation of the 'internal environment' in the form of strengths and weaknesses, while external factors include opportunities and threats that might arise. The second step was formulation of strategic action plan in landfill management based on internal and external factor analysis.

C. Data Analysis

The analysis used in determining the Talangagung landfill management policy was SWOT and IFAS-EFAS analysis. SWOT analysis was one form of analysis that could be used to interpret a plan under complex conditions. Internal and external factors in this analysis had an equally important role. SWOT analysis was an analysis to evaluate factors affecting landfill management, the factors included Strength, Weakness, Opportunity and Threats, then inventory those factors in the planning strategy used as the basis for determining policy in further landfill management. Given these linkages, there would be some basic strategies or concepts that could be used in determining appropriate management strategy Talangagung landfill.

The determination of Talangagung landfill management strategy was based on SWOT analysis by weighting using IFAS-EFAS technique. Then the factor weighting result was presented in quadrant form which would determine current position of

Talangagung landfill and type of strategy to be developed. Weighting technique was carried out on every aspect/factors of SWOT by assigning a weight between 0.00 and 1.00. If the aspect on each factor (internal / external) summed would result 1. After weighting, rating was given. This rating indicated importance level each aspect (1 = somewhat important; 2 = important; 3 = very important). Then, the weighted score was multiplied by a predetermined rating. The sum of each factor then summed in order to know position of landfill location in the SWOT quadrant for determining policy strategy of landfill management [12], [18].

III. RESULTS

SWOT analysis for evaluated on waste management of Talangagung landfill could help to understand the internal and external conditions in this landfill. This was useful as a preliminary information in developing landfill management strategies. Identified SWOT from interviews, questionnaires distribution, and field observations were presented in Table 1 below.

Table 1. SWOT analysis of internal and external factor in Talangagung landfill

Internal Factors	External Factors
Strengths S1. Good waste management system (<i>controlled landfill</i>) S2. Existence of integrated methane gas purification system S3. Availability of basic, supporting, and environmental protection facilities for community and visitors S4. The existence of independent community groups	Opportunities O1. Local government supporting for landfill improvement O2. Active participation from surrounding community O3. High interest of public community to educational tourism
Weaknesses W1. Some operational facilities are not quite adequate such as bulldozers and wheel loaders W2. Some poor quality of operational human resources W3. Decreasing in landfill area W4. The evaluation of landfill management has not involved independent consultant	Threats T1. Increase of input waste amount to landfill T2. Low budget or financial support for operational facilities

Based on previous internal factor analysis (strength and weakness), IFAS matrix could be obtained, Table 2. IFAS analysis was especially conducted on identified internal factors in Talangagung landfill. In this analysis, weighting of identified internal factors was performed. The results showed that strength factor had a higher value than weakness factor. Similar to the IFAS matrix, EFAS matrix analysis was also performed in the same way. For EFAS analysis, the external factors studied were opportunities and threats toward Talangagung landfill management system, Table 3.

Table 2. IFAS scoring on identified internal factors of Talangagung landfill

Internal Factors	Weight	Rating	Score
Strengths			
S1. Good waste management system (<i>controlled landfill</i>)	0.15	3	0.45
S2. Existence of integrated methane gas purification system	0.14	3	0.42
S3. Availability of basic, supporting, and environmental protection facilities for community and visitors	0.12	3	0.36
S4. The existence of independent community groups	0.09	2	0.18
Total	0.5		1.41
Weaknesses			
W1. Some operational facilities are not quite adequate such as bulldozers and wheel loaders	0.12	3	0.36
W2. Some poor quality of operational human resources	0.16	3	0.48
W3. Decreasing in landfill area	0.14	2	0.28
W4. The evaluation of landfill management has not involved independent consultant	0.08	2	0.16
Total	0.5		1.28

Table 3. EFAS scoring on identified external factors of Talangagung landfill

External Factors	Weight	Rating	Score
Opportunities			
O1. Local government supporting for landfill improvement	0.1	2	0.2
O2. Active participation from surrounding community	0.15	3	0.45
O3. High interest of public community to educational tourism	0.25	3	0.75
Total	0.5		1.4
Threats			
T1. Increase of input waste amount to landfill	0.2	2	0.4
T2. Low budget or financial support for operational facilities	0.3	3	0.9
Total	0.5		1.3

Talangagung landfill position in the IFAS-EFAS quadrant was determined by calculating values on the x-axis (abscissa) and y-axis (ordinate) referred to the total value of each factor. Based on the calculations with IFAS and EFAS score above, it could be seen the value of X and Y as follows:

$$\begin{aligned}
 X &= \text{Strength} + \text{Weakness} & Y &= \text{Opportunity} + \text{Threat} \\
 &= 1.41 + (-1.28) & &= 1.41 + (-1.3) \\
 &= 0.13 & &= 0.11
 \end{aligned}$$

Based on the mapping of strengths, weaknesses, opportunities, and threats identified in Talangagung landfill waste management, landfill position was obtained in IFAS-EFAS quadrant. Currently, Talangagung landfill was in quadrant I which was the growth quadrant. Quadrant I showed a situation or condition that was very good because there were strength that could be utilized to seize a profitable opportunity. The strategy that could be applied to this condition was to support a progressive growth policy. This mean that Talangagung landfill was in prime condition and steady so it was possible to continuously grow and achieve maximum progress. The

description of quadrant of Talangagung landfill management policy from EFAS IFAS matrix was shown as in Figure 2 below.

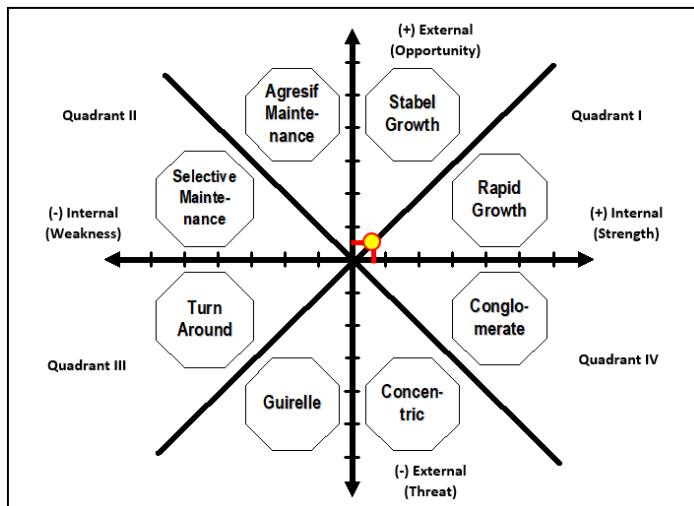


Figure 2. Quadrant position of Talangagung landfill based on IFAS-EFAS analysis

In this position, Talangagung landfill can develop by maximizing the potential strength and opportunities already exist. Development of policy strategy for better landfill management should take into account any strengths owned and then combined with open opportunities. Indeed, the Talangagung landfill management has been very well proven by the status of a national pilot landfill that can be adopted by other landfills in Indonesia. However, the current management needs to be improved so that the service and waste processing activities could be performed better.

Development of policy be applied to further management of Talangagung landfill referred to SWOT analysis result. It was shown on Table 3. The strategies developed referred to identified strengths, weaknesses, opportunities, and threats factors. The principles used in SWOT analysis to achieve core strategy include [9], [10]:

- a. Utilization of existing strength and opportunities openly
- b. Strategies that address existing threats
- c. Strategies that fix existing weaknesses

In context of Talangagung landfill management as an educational tourism destination, SWOT analysis was used to determine policy strategy in order to improve existing landfill management system. The results of this analysis could help in mapping the current conditions of landfill so that it was useful in anticipating the possibility of problems that arise in the future [6], [9].

The management policies implemented at Talangagung landfill was in line with the national policy on waste management. The implemented policies should comprehensively cover or relate to many agencies with reference to the RPJMD policy. In addition, the policy of Talangagung landfill was also in line with the vision of the Malang Government "*Madep Mantep Manetep*" with the community, with three main strategies including (1) reducing the poverty rate; (2) optimization of tourism sector; (3) environmental sustainability.

To support growth or development in improving landfill management in the future, then the policy strategies that need to be implemented include:

1. Exemption of use of methane gas costs by communities around the landfill. As known, Talangagung landfill had developed a system of utilization of methane gas as a result of waste processing activities and it integrated to community around the landfill, in their house. Since implementation of this technology, many benefits were felt by the community and landfill managers. By applying policy to free up the cost of methane gas utilization, sense of community's trust and ownership to existence landfill will also increase. Along with this, the relationship between community and landfill manager becomes better. Thus, the planned or implemented educational landfill management programs will gain support from the community as a reciprocity so that it can be well organized.
2. Increasing promotion of educational tourism in Talangagung landfill. As a landfill developed as an educational tourism destination, the existence of Talangagung landfill needs to be published massively to public. The use of mass media both of print or electronic need to be followed up with optimal. With the increasing number of visitors to Talangagung landfill, opportunity of conveying about the importance of environment-based waste management to public is also becoming greater. This is the main objective of development of Talangagung edu-tourism landfill. The process of environmental education to community need to be conducted with a rather different approach such as example of waste management practices that provide tangible benefits. This educational approach techniques can be more easily understood and acceptable by various society levels such as children, youth, adults, or low-educated citizens. Therefore, efforts to introduce educational tourism landfill by utilizing the mass media should be applied because currently access to news and information can be done very easily.
3. Improved service at landfill for the visitors. After conducting intensive promotion to public, the landfill management must also prepare themselves to provide the best service for visitors. The availability and functionality of supporting facilities waste management activities should be considered carefully. The existence of operational and supporting facilities on landfill management such as monitoring wells, leachate wells, and methane gas purification system can be a special attraction for visitors. By visiting this landfill, visitors are expected to understand the flow of waste management process in landfill well so that educational messages are delivered. The opposite will happen if the availability and functionality of such facilities are absent. This causes the educational process cannot be held successfully so that the potential for loss of information of educational message becomes high. Therefore, the existence of facilities both operational, supporting, environmental protection in Talangagung landfill is needed to support the educational landfill program.

IV. CONCLUSION

Waste management system at Talangagung educational tourism landfill had been implemented well and based on environmental

conservation concept. In addition, the existence of this landfill had positive impacts on the surrounding community. This was showed by the technological innovation of methane gas purification system which then was integrated with surrounding residents' houses. The processing of waste practiced in this landfill became an attraction or educational tourism attraction for community and visitors related to environmental conservation practices. Currently, Talangagung landfill condition was in a growth stage based on results of SWOT and IFAS-EFAS analysis. The policy that could be selected to support further development of this landfill was to strengthen social relationships with surrounding communities and visitors through improving services and environmental conservation education practices.

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REFERENCES

- [1] E. Munawar, Y. Yunardi, J. Ledere, Johann Fellner, "The development of landfill operation and management in Indonesia", *J. Mater. Cycles Waste Manag.*, 2017, DOI 10.1007/s10163-017-0676-3.
- [2] S. Sunarto, M. Bisri, Soemarno, Suyadi, "Influencing factor on society behavior towards household waste management in Tulungagung", *American Journal of Sociological Research*, 2014, 4(4): 113-122.
- [3] M. D. Rizani, Antariksa, Surjono, I. R. Dwi Ari, "Waste management strategy in urban areas to achieve the service target (A case study on waste management in Mojokerto, Indonesia)", *Journal of Applied Sciences Research*, 2016, 12(1): 18-22.
- [4] S. Darwati, 2012. "Sustainable approach for landfill management at final processing site Cikundul in Sukabumi City, Indonesia", *Iranica J. Energy & Environ.*, 2012, 3: 79-84.
- [5] H. Sudibyo, Y. S. Pradana, A. Budiman, W. Budhijanto, 2017. "Municipal solid waste management in Indonesia – A study about selection of proper solid waste reduction method in D.I. Yogyakarta Province", *Energy Procedia*, 2017, 143: 494-499.
- [6] P.K. Srivastava, K. Kulshrestha, C.S. Mohanty, P. Pushpangadan, A. Singh, "Stakeholder-based SWOT analysis for successful municipal solid waste management in Lucknow, India", 2005, 25: 531-537.
- [7] I. W. Jana, et. al., "Analisis karakteristik sampah dan limbah cair Pasar Badung dalam upaya pemilihan sistem pengelolaannya", *Jurnal Ecotrophic*, 2006, 1(2), ISSN 1907-5626.
- [8] GoI, Act 18 of 2008 of the Republic of Indonesia Number regarding Waste Management, Government of Republic Indonesia, Jakarta, Indonesia, 2008.
- [9] D. Eheliyagod, "SWOT analysis of urban waste management: A case study of Balangoda Suburb", *Journal of Global Ecology and Environment*, 2016, 5(2): 73-82.
- [10] Rahmaddin MY., T. Hidayat, B. Yanuwadi, Suyadi, "Social engineering strategy of waste management in river banks of Martapura", *Resources and Environment*, 2015, 5(3): 97-105.
- [11] M. Aljaradin, K. M. Persson, "Design of sanitary landfills in Jordan for sustainable solid waste management", *Journal of Applied Sciences Research*, 2010, 6(11): 1880-1884.
- [12] Koderi, Suyadi, A. Said, Abdul W. Muhaimin, "Knowledge, action, perception and attitude of management of Talangagung landfill toward edu-tourism program: A community perspective", *Journal of Indonesian Tourism and Development Studies*, 2018, 6(1): 41-48.
- [13] Zubair, A., et al., "Studi potensi daur ulang sampah di TPA Tamangapa Kota Makassar, Makassar, Prosiding 6, Desember 2012.

- [14] D. Rahmadhani, Y. Asyiwati, "Kajian nilai manfaat "TPA Wisata Edukasi" Talangagung di Desa Talangagung, Kecamatan Kepanjen, Kabupaten Malang", *Prosiding Perencanaan Wilayah dan Kota*, 2017, 3(1): 66-72.
- [15] Rodger, D., "Leisure, learning and travel", *Journal of Physical Education, Research and Dance*, 1998, 69 (4): 28-31.
- [16] T. Grusovnik, "Educational tourism and environmental ethics: A framework for experiential environmental education", *ANNALES. Ser. hist. social.*, 2010, 20(1): 169-176.
- [17] Saaty, T.L., "Concepts, theory, and techniques rank generation, preservation and reversal in the analytic hierarchy decision process, decision sciences", 1987, Vol. 18, pp 157-77.
- [18] Hongping Yuan, "A SWOT analysis of successful construction waste management", *Journal of Cleaner Production*, 2013, 39: 1-8.
- [19] D. W. Dantzler, Lawrence R. Gering, Thomas J. Straka, Greg K. Yarrow, "Creating a destination for tourism, recreation, and education on an active solid waste landfill site", *Natural Areas Journal*, 2008, 28(4): 410-414.

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Table 3. SWOT matrix of strategic action plan in Talangagung landfill management

IFAS EFAS	Strengths (S)	Weakness (W)
Opportunities (O)	SO Strategy	WO Strategy
	SO1. Utilization of methane gas is free of charge for the surrounding community SO2. Increasing promotion of educational tourism landfill to wider community through various mass media, electronic or printed SO3. Improving services for landfill visitors in availability facilities and infrastructure	WO1. Improving human resources competence through training and workshop about good landfill management WO2. Collaboration with academics, practitioners (independent consultants) in conducting evaluation of landfill management WO3. Involving surrounding community when landfill management evaluation is conducted WO4. TPA Recruiting some local people to work in landfill
Threats (T)	ST Strategy	WT Strategy
	ST1. Waste processing activities should be suited with planning ST2. Regularly maintain of existing facilities in order to optimally provide benefits for a long time	WT1. Utilization of organic waste processing product to be additional income for landfill management WT2. Collaboration with other landfills in the processing of waste to prevent excessive accumulation