The Strategic Effectiveness on Implementation of Solid Waste Management at Kuala Lumpur International Airport

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Abstract
Waste management can be defined as the application of techniques to assure a systematic execution of the numerous functions of collection, transport, processing, treatment, and disposal of waste. The effectiveness of solid waste management depends on the organization's strategic capabilities. The purpose of this study is to investigate factors that influence the strategic effectiveness of solid waste management at the International Airport located in state of Selangor involving Kuala Lumpur International Airport (KLIA) and Kuala Lumpur International Airport 2 (KLIA2) to improve solid waste management. The researcher choose a qualitative and quantitative approach or mixed method in this research is an abductive approach used to achieve goal in this study. The findings that researchers have learned are wastivity, waste management technologies, economic investment, execution of waste management, research and development, governmental directives, awareness and environmental pollution are the factors affecting effectiveness of strategic solid waste management. This study may indirectly reflect the current practices on how KLIA and KLIA 2 management handling the waste management and determining the key factor of success in solid waste management strategic during the implementation period. The result of this study can help to improve the lack of strategic management aspect in solid waste management and assist the company towards continuous improvement to achieve sustainable waste management.

Keyword: solid waste management, strategic effectiveness, international airport.

1.0 Introduction

Everything your business makes which is not bought by your customers can be defined as waste (Jones, 1996). Different terminologies have been used in the past to define waste. Different countries pronounced waste in their own terms. It has been known as garbage, refuse, and so on. *Vastum*, a French word meaning empty or desolate, was the first term to define waste. Later, the term waste evolved to industrialization during late 1770s. At that time, the term waste was used for excreta which had been the main cause of urban pollution and to better manage this waste, it was used as a fertilizer (Barles, 2014). This paper concentrates on waste management as an essential element of environmental management. Waste management can be defined as a collection, transportation,

disposal or recycling and monitoring of waste. This term is assigned to the waste material that is produced through human being activity (Waste Management Resources, 2009).

The purpose of waste management (Pitt et al., 2002) is to reduce the amount of waste being produced, thus reducing the disposal costs and the impact on the environment. Aviation industry has become one of the fastest growing industry sectors in the global economy nearly contributing to 3.5% of global GDP (ATAG, 2014). It is essential for airports to consider not only the existing impacts on the environment but also future impacts resulting from increases in passenger throughput. As passenger numbers increase in the long term, the waste stream will also increase. This is a serious problem as airports already produce waste levels equivalent to small cities (Pitt et al., 2002). Therefore, waste needs to be given greater emphasis in airport environmental management plans.

2.0 Problem statement

Airports are seen to have substantial influences in terms of air pollution, energy consumption, noise pollution, waste production and hydrological damage (Pitt and Brown, 2001b). Kuala Lumpur International Airport 2 (KLIA 2) is developed with robustness that will no doubt be able to cater the ever evolving and dynamic global aviation industry. State-of-the-art and modern infrastructure, world-class airport services, easy travelling processes and comfortable atmosphere at klia2 will ensure passengers' travelling needs are met. Since 2014, the terminal has successfully handled more than 3 million passenger movements and 24,000 aircraft movements. As a result, commercial aviation today becomes one of the fastest-growing industries in the world and can be relate to some airports produce waste volumes equivalent to those of small cities (Pitt et al., 2002).

KLIA and KLIA2 have waste control program with many focused-on initiatives to reducing waste such as recycling and processing of waste, waste disposal projects and separation of different type of waste. Every year those initiatives will be reviewed for continual improvement of waste management. However, there have been numerous studies on the management of Municipal Solid Waste (MSW) at the airport and the method of managing the appropriate wastes according to certain airports. Therefore, to what extent the MSW problem that International Airport are facing and the strategic planning for managing the waste cannot be ascertained?

3.0 Methodology

3.1 Sample and data collection

The study has employed questionnaire and semi-structured interviews have been conducted to maintain the flexibility and consistency between the researcher and the respondents. Fifteen respondents (15) from waste management staff at KLIA and KLIA 2 were identified to take part in this quantitative survey. During the interviews, the competent person were asked a

series of questions related to the elements of waste management. Only four elements of waste management that affect factor of solid waste management were inquired through these interviews. These elements include wastivity, waste management technologies, execution of waste management and governmental directives. The competent person were asked about the information on execution of waste management in KLIA and KLIA 2. These elements were tested in KLIA and KLIA 2.

4.0 Results and discussion

The results of data analysis and research findings with respect to the strategic effectiveness of solid waste management at Kuala Lumpur International Airport (KLIA) and Kuala Lumpur International Airport (KLIA 2) using descriptive analysis through the Statistical Package for Social Science (SPSS) version 20.

4.1 Finding from questionnaire survey (section b, c & d)

Section b: Waste management technologies

Table 4.1: Mean Score Analysis of WM Technologies

TOPIC	Mean company A	Rank	Mean company B	Rank	Mean company C	Rank	Overall mean value
The technology used to increase the recycling rate (B1)	3.67	1	3.00	4	3.50	1	3.33
The technology used is more effective if fully automated (B2)	3.67	2	3.17	3	3.33	3	3.27
The technology used can ensure the waste collection schedule is met (B5)	3.33	3	3.33	1	3.33	4	3.33
The technology used able to reduce human labour (B3)	3.33	4	3.00	5	3.50	2	3.27
The technology used can reduce waste collection period (B4)	3.00	5	3.33	2	3.33	5	3.27

The scale: 4(Strongly agree), 3(Agree), 2(Disagree), 1(Strongly disagree)

Referring to table 4.1, the highest mean for company A is 'the technology used is more effective if fully automated' and 'the technology used to increase the recycling rate'. For company B the highest mean is 'the technology used can ensure the waste collection schedule is met' and 'the technology used can reduce waste collection period'. The highest mean score for company C is 'the technology used to increase the recycling rate' and 'the technology used able to reduce human labour'. The inference that can be drawn from this result (Table 4.1) is majority of the employee agree that waste management technologies significantly impact to the waste management scenario.

Aviation industry has become one of the fastest growing industry sectors in the global economy nearly contributing to 3.5% of global GDP (ATAG, 2014). It is essential for airports to consider not only the existing impacts on the environment but also future impacts resulting from increases in passenger throughput. This shows that technology not only plays a vital role in better waste management but also helps in generating wealth from waste (Shetty, 2011). Airports need to develop a waste management system that incorporates a range of measures. These include source separation and recycling of waste on the airport site; waste minimization; a charging regime for airport waste; and the re-use of equipment and material whenever this is possible. In addition, airports should promote the usage of products that are renewable and have the least environmental impact (Glen Baxter, 2018)

Section b: Execution of waste management

Table 4.2: Mean Score Analysis of Execution Waste Management

TOPIC	Mean company A	Rank	Mean company B	Rank	Mean company C	Rank	Overall mean value
The employees involved are well aware of the services that should be provided as subject to the service level agreement (SLA's) (C1)	3.67	1	3.17	2	3.17	1	3.27
The standard operating procedures (SOP) related to waste management operations need improvement (C2)	3.33	2	3.33	1	3.17	2	3.27
The minutes of meetings assist in measuring performance (C3)	3.0	3	3.17	3	1.83	3	2.60

The scale: 4(Strongly agree), 3(Agree), 2(Disagree), 1(Strongly disagree)

From table 4.2, the highest mean score company A for execution of waste management is 'the employees involved are well aware of the services that should be provided as subject to the service level agreement (SLA's)', while company B 'the standard operating procedures (SOP) related to waste management operations need improvement' is ranked first. For company C, the highest mean score is 'the employees involved are well aware of the services that should be provided as subject to the service level agreement (SLA's)' and 'the standard operating procedures (SOP) related to waste management operations need

improvement'. 'The interference that can be drawn from company A and company C is that almost all respondents agreed with the question submitted in the questionnaire and has a high level of understanding and knowledge in execution of waste management which demonstrates the level of understanding and disclosure of workers to the service level agreement. Based on company B, 'the standard operating procedures (SOP) related to waste management operations need improvement' this shows that SOP used in managing waste is practicable and manageable for the employees. The lowest mean score for all the company are 'the minutes of meetings assist in measuring performance' but the mean score still indicate some of them are agree referring table 4.2. Statement in item C3 is the minutes of meetings assist in measuring performance, it can be said to help the company in measuring progress performance in relation to the initiative involving waste management strategic improvement.

In the case of input waste, execution is the most important aspect of its management (Zu et al., 2008). Lack of execution results in deprived waste management instead of well-defined policies and good economic support; this displays the acute role of execution in managing waste in the organization (Manga et al., 2008). The execution of waste management can be improved by updating the standard operating procedure for solid waste management appropriate on site and resource requirement. Service Level Agreements will be reviewed every one year and waste management meeting will be held quarterly. Hence, reporting data based on customer complaint to assist in monitor performance.

Section d: Governmental directives

Table 4.3: Mean Score Analysis of Governmental Directives

TOPIC	Mean company A	Rank	Mean company B	Rank	Mean company C	Rank	Overall mean value
The company manages solid waste management in accordance with the standards set by the government (D1)	1.67	1	3.00	4	2.50	1	2.53
Act 127 environmental quality used in waste management SLA's (D4)	1.67	2	3.17	1	1.50	5	2.20
Act 127 environmental quality guidelines used in waste management SOP (D7)	1.67	3	3.17	2	1.33	7	2.13

The standard waste reduction strategy used in waste management SLA's score (D2)	1.0	4	3.17	3	2.33	2	2.40
Act 672 standard solid waste used in waste management SLA's (D3)	1.0	5	2.83	6	1.50	6	1.93
The waste reduction strategy guidelines used in waste management SOP (D5)	1.0	6	2.50	7	1.67	3	1.87
The Act 672 solid waste guidelines used in waste management SOP (D6)	1.0	7	3.00	5	1.67	4	2.07

The scale: 4(Strongly agree), 3(Agree), 2(Disagree), 1(Strongly disagree)

Regarding table 4.3, the highest means score for company A is 'the company manages solid waste management in accordance with the standards set by the government', 'Act 127 environmental quality used in waste management SLA's' and 'Act 127 environmental quality guidelines used in waste management SOP'. For company B, the highest mean score is 'Act 127 environmental quality used in waste management SLA's', Act 127 environmental quality guidelines used in waste management SOP and 'the standard waste reduction strategy used in waste management SLA's score'. The highest mean score for company C is 'the company manages solid waste management in accordance with the standards set by the government'.

The inference that can be drawn from this result (Table 4.3) indicate all company have different views upon the government directive factor. Table 4.3 shows all company have different level of compliance towards the governmental directives. Government plays a vital role in policy formation. Waste can be managed by following government policies, and acts. In 1986, the environmental pollution, hazardous substance and pollution was defined under Environmental Protection Act (EPA) and the central government was powered through this act to protect the environment within different sections. EPA was used to define the type and level of pollution generated by the organizations. Organizations which are not following the act as per EPA come under penalties and strict punishments (EPA, 2015).

4.2 Finding from document analysis

The term wastivity is defined as the ratio of the waste to input. Wastivity has been used to find the amount of waste generated and its controlling elements (Sushil and Vrat, 1989). It is an activity that adversely affects the value equation for the customer.

Table 4.4: Total Waste Disposal

	KLIA	KLIA 2	TOTAL DISPOSAL
2013	-	-	22,375,485
2014	-	-	21,445,606
2015	-	-	17,851,872
2016	12,284,790 kg	2,718,400 kg	15,003,190
2017	10,245,940 kg	2,302,840 kg	12,548,780

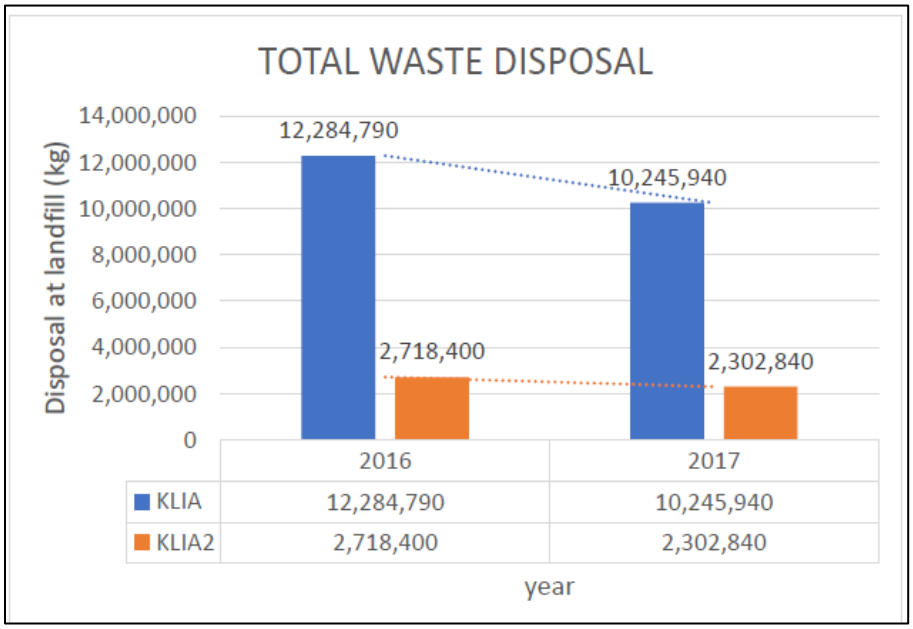

Figure 4.1: Total Waste Disposal

Referring to Table 4.10 and Figure 4.1 it shows that total waste disposal from year 2016 to 2017 has decreased from 12,284,790 kg to 10,245,940 kg for KLIA and 2,718,400 kg to 2,302,840 kg for KLIA 2.

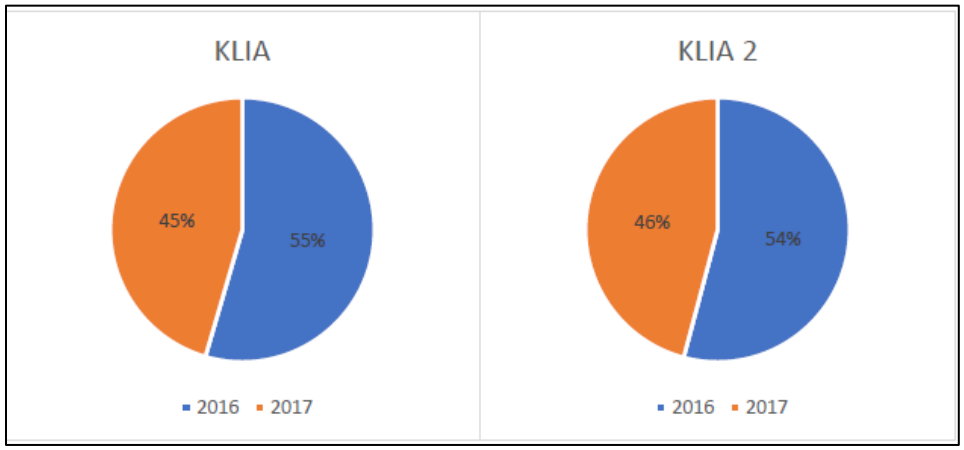

Figure 4.2: Percentage of Total Waste Disposal

Total waste disposal from year 2016 to 2017 for KLIA is 22,530,730 kg and for KLIA 2 is 5,021,240 kg. Referring to figure 4.2, total waste disposal of KLIA for both year by 55% is dominated from 2016 and similarly for KLIA 2 which is by 54% total waste disposal from 2016. This result has proven the wastivity system is effective by the reduction of waste output.

4.0 Conclusion

In conclusion, this study will be used as a guide and reference to companies in solid waste management at airports or other industries. Factors affecting the strategic effectiveness of solid waste management are wastivity, waste management technologies, execution of waste management and governmental directives identified and discussed in this research will give an impact on waste management performance. This matter should be considered in the strategic planning of solid waste management in line with the company's policies and objectives. The findings in this research is also expected to address existing weaknesses in order to overcome the problems encountered. The results of this research will help the company towards continuous improvement to achieve sustainable waste management.

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