

## [OT 16] GARDEN WASTE MANAGEMENT: PROCESS ENVIRONMENT

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### ABSTRACT

Nowadays, the increase in garden waste resulted in an increase of waste in landfills. Garden waste is the waste generated from plants in the public gardens and small orchard. The uncertainty rate of garden waste generation is due to factors such as location and season. Recently, there is an increasing pattern of garden waste generation in Malaysia. Thus, studies on garden waste management will help to monitor and organize a proper standard for waste management in Malaysia. This qualitative study was obtained interviewing the selected company that is Environment E-Idaman Sdn. Bhd. in Kubang Pasu, Kedah to study on the garden waste management that is applied in Kubang Pasu district. Therefore, this study will identify the processes involved and assess their impact on the environment through the ongoing management. The output of the study can help the stakeholder in implementing the policy regarding the garden waste management. With garden waste management, there are ongoing expectations derived from the waste management system that is a systematically gardens can have a positive impact on the environment.

**Keywords:** *garden waste, process, environment*

### INTRODUCTION

Garden waste management is very important for a country to avoid contamination. The best strategy to solve the increase in the use and preventing the occurrence of residual persistent contamination is by residual method of re-using it. Method in improvement processing controls the rest of the strategy known as 3R (reduce, reuse, recycle) policy (Tanaka1999; Wilson, 2007). The strategy used in Denmark for garden waste management in the country is through one of the two methods of composting and centralizing composting at home. Centralized composting that is fully treated, namely 99% of garden waste was collected in 2006 (Miljostyrelsen, 2008). Control strategies in managing the rest of the park is better for the re-use of waste without increase in the dispose capacity by more than 50% which is available in composting plants for the process to take care of garden waste in Denmark (Petersen & Hansen, 2003). For the management of organic waste or garden waste in Thailand, it is managed by Bangkok Metropolitan Administration (BMA). The BMA in partnership with the Department of Environment organize a training course to educate the community about the waste management awareness. Average wood and dry leaves in each area were collected for re-use as the dried leaves are used for fuel source and wood is used to make furniture. In Malaysia, garden waste management is handled by the Department of Environment with the assistance of the Municipal Council, District Councils and private companies. For waste management in the state gardens, garden waste management in the country

is managed by the private company, namely the company E-Idaman Environment. This company is conducting a strategic management to solve the remaining problems with a better solution to reuse the garden. Studies show that garden waste management is managed systematically and the rest of the garden can be reused without having negative impact on the environment. This study was conducted to analyze in detail on the processes that are needed to solve the problem of waste from parks and gardens and to know the impact of this waste management on the environment.

## **PROBLEM STATEMENT**

In Malaysia, the average income of an individual is estimated to increase each year due to the increasing use of consumer products (Latifah, 2001). This problem resulted to the increase of waste thus, causing an increase in landfill waste. The increase in population every year also affects the rate of waste generation and cause the short life span of the landfill (Tchobanoglous & Keith, 2002). This led to a new strategy that is needed to address the increase in waste dump site by making compost from the waste. Increase in garden waste generation also occurred due to factors to beautify the city.

The process of urbanization is made to meet the various needs of people through the establishment of the city police (McGee, 2010; Abdul Hadi, 2010). This can be seen from the development of the parks in the city in order to beautify the city by planting trees in the city. This situation resulted in the generation of waste generated in urban gardens. Garden waste management will be handled by the municipalities or private companies that have been given the responsibility by the government. For the waste management field in Kedah, the responsibility for waste management farms is managed by the company E-Idaman environment. Garden waste management varies from the solid waste management of its residual waste obtained from the garden such as dry leaves, wood and wood chain. Garden waste management is done by the process of reducing the size of the rest of the machine technology to facilitate the composting process occurs. However, the public still does not know on how the process conducted by the E-Idaman was done without making the combustion process for the purpose of disposing of the waste. Thus, the process must be known to public for them to aware on the effective way to control environmental pollution. In addition, the methods used by the company E-Idaman were very effective in processing the garden waste and controlling the environmental pollution. In this study, several key objectives as the basis for research to achieve the desired goals are identified as follows:

1. To determine the processes involved in managing the rest of the garden.
2. To determine the environment impact of the management of the estates.

## **LITERATURE REVIEW**

Garden waste is obtained from maintenance activities in the park that is performed for cleaning work. This waste consists of organic material such as twigs, grass clippings, dry leaves and wood. For developing countries, they use a different approach in dealing with garden waste. Garden waste management is systematically managed to reuse the

potential garden waste to the other material resources. In a study conducted, Denmark is a country that is efficient in the garden waste management strategy. Collection of solid waste and garden waste were collected separately in order to avoid mixing of solid waste and garden waste. (Eurostat, 2005). Garden waste management in Denmark was conducted separately from solid waste since 1994. The collection of garden waste in Denmark for 2006 represents more than 18% of municipal waste generation (Miljostyrelsen, 2008). The increase in the collection of garden waste is due to the awareness of the use of garden waste as a resource that can be reused without having to burn it to dispose the waste. Garden waste collection is done for the process to reuse garden waste in order to prevent the waste in the landfill.

For Denmark, the gardens waste management is efficiently carried out by making compost to reuse the garden waste generated. The management for the rest of the garden was done by the method of composting and the information on waste management is necessary in order to know on how to facilitate the process that is performed for the treatment (Burnley 2007). The increase for garden waste treatment in composting plants showed a significant improvement in treatment site and the compost produced generates demand from gardeners. However, its use is still used in the gardens themselves (Petersen, 2001). The use of direct methods to facilitate the treatment process is through the separation of garden waste generated and then sent it to the factory composting garden waste. The rest of the gardens were taken to the treatment plant will be isolated and divided into fragments as small items, wood and hard materials. After that, the garden waste treatment will be done by composting to produce fertilizer from farm waste treated.

In Thailand, the party responsible for waste management in the garden is the Bangkok Metropolitan Administration (BMA). BMA has been promoting the use of the garden waste or organic waste or garden waste management effectively. The BMA has a strategy to manage the rest of the garden through the garden waste collected that is reused with garden turning waste into energy and fertilizer from farm waste to replace chemical fertilizers and pesticides. For local officials in Sai Mai, garden wastes such as dried leaves have been composted to produce fertilizer. Steel produced is used for trees in the office area. On Nut factory and Nong Kheam, the collection of garden waste is used to produce fertilizer. Since 2010, the Department of Environment and the Regional Office conducted a strategic management to manage the timber removed and reused by selling the donated wood to the private sector as a fuel source.

## **METHODOLOGY**

In this study, the Environment E-Idaman is selected as the source to get the information about the study. Qualitative method of interviewing the representative of the company was done to obtain the necessary information. The purpose of the interview was to obtain the information about garden waste management process implemented by the company and the impact on the environment.

The aim of this method is to achieve the objectives of the research study and may assist the reader in understanding the process taken for garden waste management and the environmental impact of waste management on the importance of gardens run by this company. The interview was done by interviewing the representatives from the

companies that is in charge of operations and investigations in the field of waste management that was carried out in the company, E-Idaman. The main aspects of this study is to achieve the objectives of the processes in the field of waste management and environmental impact, and how the rest of the park can be reused.

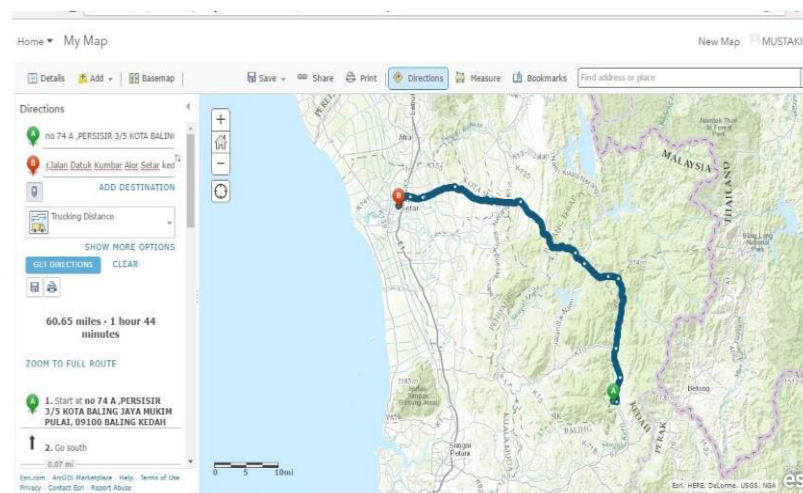
### Questions designed

1. To determine the processes involved in managing the rest of the garden.
2. To determine the impact of the management of the estates of the environment.
3. To study the system and method that should be used.
4. What is the technology used to process garden waste management?

### Steps interviews

Some of the steps are required to carry out the interview process. The steps that must be taken before performing the method of this interview are as follows:

1. Identify the study site and make an appointment
2. Identify the question for the issues involved in this study as well as the necessary facts.
3. Prepare the questions before the interview process is done in order to avoid wastage of questions that are not relevant.
4. Respondent give feedback to the interviewer with a clear answer to the questions asked.
5. Researchers will take notes and ask permission to record the interview sessions that were conducted and ask questions if the information obtained is not clear.



**Figure 1**  
Example method in calculated the distance

The method used to measure the distance to the central collection point for the collection. The distance is between the collection point in each area with collection point in the state as well as a collection point in each area where the composting of garden waste management company Environment E-Idaman States located at. The distance is calculated by using system GIS (Geographic Information System). Figure 1 show the example method in calculated the distance.

## RESULT

From this interview, we can gather the information and know the processes carried out in the garden waste management and environmental impact achieved through an effective strategy by the company to manage the rest of the garden. Figure 2 indicates the garden waste management process by Environment E-Idaman.

### Garden waste management process

Garden waste management process done by Company Environment E-Idaman was shown in managing the rest of the gardens. The process has five steps that is used for garden waste management, namely generation, collection, transport, recycling and disposal.



**Figure 2**

Garden waste management process by Environment E-Idaman.

### *Generation*

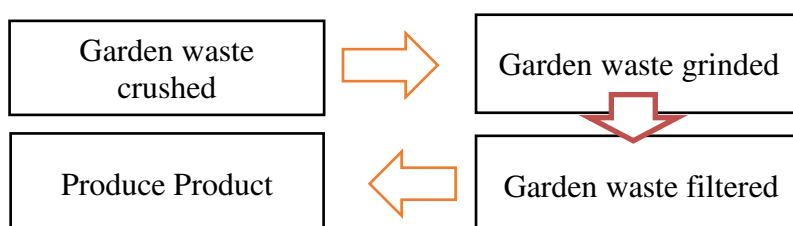
Generation process is a key measure used by the company to manage waste generated garden area such as parks, roadsides and houses. Garden waste is generated throughout the area or areas in the state. Therefore, the need for proper disposal is available in every county in the state to facilitate ongoing garden waste management. Besides, garden waste generation was lack in the management of solid waste and the company's operations for transporting garden waste is done only for once a week. This is because the waste generation gardener collected every week does not cause a lot of changes. Garden waste generation is measured by the truckload truck garden waste collector. Estimated garden waste collected is about 100 to 120 tons per month.

### *Collection*

Step 2 that is carried out for the garden waste management is the process of collecting. This process is conducted in each area by providing bins for garden waste generated. The waste collection is done on a weekly basis due to less generation of garden waste from solid waste.

### *Transport*

Step 3 is the transport process. In this process, the truck used is the Muliti Arm Role Purpose for transporting the garden waste collected to landfills in every district. Truck capacity is as much as 3 tons to load the rest of the garden that has been collected.



**Figure 3**

Recycle process for garden waste

Step 4 is the recycling process. Figure 3 show the process for garden waste. This process has several stages before being made into compost. This figure shows the process performed in the management of waste recycling garden. The process of recycling is done to reduce the remaining large estates. If this step is skipped, it will cause longer time for the decomposition process of garden waste collected.

#### *Disposal*

Disposal is the last step to produce the compost. This process is performed after carrying out the work of recycling through miniaturization size for garden waste collected. The time taken for the disposal of this maturity is 3 months. Each garden waste management process should be carried out through all the steps that have been drafted. This is because if the rest of the garden is collected directly to the disposal of waste, the waste might not be decomposed during the disposal of garden waste such as wood, which will require more time for the process of decomposition. Thus, it will result in the garden waste that is still not decomposed.

#### **Environment impact**

Table 1 show the GHG emissions for each district in Kedah. The highest contribution to the GHG impact is from Bandar Baharu Service Unit. This is due coverage area is very large compare with others service units. Introduce more service unit could reduce the emissions impact.

**Table 1**

Distance lorry to bring the rest of the garden from the collection in each district to place the garden waste collection center

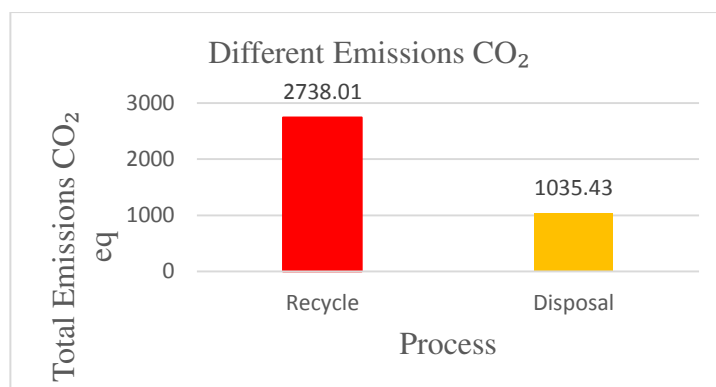
District	Distance to centre (KM), Da	Time (Hour), h	Emissions (KG)		
			CO <sub>2</sub>	CH <sub>4</sub>	NO <sub>2</sub>
Baling Service Unit (BSU)	107.89	1.36	70.08	0.04	1.18
Bandar Baharu Service Unit (BBSU)	137.82	2.07	89.52	0.07	1.79
Kubang Pasu Service Unit (KPSU)	28.60	0.43	18.58	0.01	0.37
Kulim Service Unit (KSU)	115.86	1.75	75.26	0.06	1.52
Padang Terap Service Unit (PTSU)	37.24	0.55	24.19	0.02	0.48
Pendang Service Unit (PSU)	22.55	0.33	14.65	0.01	0.29
Sik Service Unit (SSU)	61.82	0.93	40.16	0.03	0.81
Sungai Petani Service Unit (SPSU)	70.28	1.05	45.65	0.03	0.91
Yan Service Unit (YSU)	28.69	0.43	18.64	0.01	0.37

**Table 2**

Show the GHG emissions from collection to landfills. The highest are come from Baling service unit

District	Distance to disposal (KM), Da	Time (Hour), h	Emissions (KG)		
			CO <sub>2</sub>	CH <sub>4</sub>	NO <sub>2</sub>
Baling Service Unit (BSU)	28.16	0.47	54.88	0.02	0.41
Bandar Baharu Service Unit (BBSU)	22.74	0.45	14.77	0.01	0.39
Kubang Pasu Service Unit (KPSU)	18.33	0.35	11.91	0.01	0.30
Kulim Service Unit (KSU)	26.80	0.50	17.41	0.02	0.43
Padang Terap Service Unit (PTSU)	8.36	0.13	5.43	0.00	0.11
Pendang Service Unit (PSU)	13.21	0.32	8.58	0.01	0.28
Sik Service Unit (SSU)	14.40	0.20	9.35	0.01	0.17
Sungai Petani Service Unit (SPSU)	38.56	0.60	25.05	0.02	0.52
Yan Service Unit (YSU)	18.93	0.35	12.30	0.01	0.30

This analysis is based on the movement of trucks to transport the waste to a central collection station. The equation  $N_2O = h \times 0.2886 \times WGW$  and  $CH_4 = h \times 4.5359^{-3} \times WGW$  is used to calculate the emission rate. WGW (garden waste capacity) is 3 tons and h (hour) used in the transport process. The equation  $CO_2 = 0.1818 \times Da \times 3.573$  used to calculate the emission. The CO<sub>2</sub> emission, for each collection point in each area to a center collection of garden waste was shown in the figure 2. Da (direction) represents a collection in each district to the collection center.

**Figure 4**

The differences between CO<sub>2</sub> emissions in garden waste collection and landfills

Values for CO<sub>2</sub> emissions to a collection point for the distance are 2738.01 and 1035.43 for the disposal of garden waste management. This number is obtained by using formula  $CO_2\text{-eq} = CO_2 + (CH_4 \times 25) + (NO_2 \times 300)$ . The formula was used to determine the value of GHG between the two places. The difference between the two GHG for this place was 1702.58 and the percentage ratio of the distance between the two places is as much as 45%. Garden waste management processes at the level of recycling is the highest amount of GHG emissions due to the proximity of places to recycle more than

a disposal in any area of the district. Collection point for the recycling of garden waste is located in Alor Setar. The distances to disposal sites in each area are too far when compared with the disposal. For the distance to the disposal of garden waste management in each area, the results shows that the total GHG emissions are low due to the lower distance necessary to send the rest of the estate when compared with the proximity to recycling. Figure 4 indicate the difference of CO<sub>2</sub> emissions for garden waste process, between recycle and landfills. From the figure shown, there is so much difference of GHG emissions to a collection point for the recycling process compared to the disposal site. Each district has a landfill for waste management field, but equipment for the process to reduce the size of the garden waste collected is not available in every region. Therefore, the rest of the gardens cannot be managed onsite disposal as there are in every area of the district.

## **DISSCUSSION AND IMPLICATIONS**

The study showed different levels of CO<sub>2</sub> emissions and the distances between the places of collection in each region with the collection center. The distance can be reduced in order to decrease the CO<sub>2</sub> emissions. Construction of more garden waste collection points will assist in the strategy to reduce CO<sub>2</sub> emissions to the environment. Thus, this distance can be reduced if it can solve all the problems of N<sub>2</sub>O, CH<sub>4</sub> and CO<sub>2</sub> on the environment. Therefore, based on the calculation of GHG emissions for CO<sub>2</sub> ratio between the distances to the center of the collection is very high when compared with the distance to disposal. If the rest of the estate was taken directly to the place of disposal, it will reduce the impact on the environment. In addition, the compost produced from crops can be marketed in the rest of the market and not only sold when there is a request. Next, it also provides disclosure to the public about waste management in the area of home gardens to avoid the burning of garden waste to dispose of garden waste at home.

## **CONCLUSION**

The results of the studies that have been done revealed that there is not much of exposure on garden waste management. Total GHG emissions were also obtained by calculating the distance traveled to manage the rest of the gardens of the area in each area as well as a comparison of the distance to a collection point for the recycling process with the proximity to disposal in any area of the district. Therefore, this study may help to understand the processes that take place against the rest of the garden as well as the steps taken to manage the rest of the garden without having to burn and can be reused by composting of garden waste. In addition, the environmental impact is also known for managing the rest of the garden. From this study, it can be concluded that there is a lot of research carried out in the garden waste management and its impact on the environment. Thus, through interviews conducted we can learn in more detail about the processes that are run in the waste management field and its impact on the environment. Processes that are run hard to produce compost from the garden waste that has been done by the company Environment E-Idaman will contribute to assist the public in dealing with garden waste.



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