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ABSTRACT

Through the growing era of globalization, an increase in the number of solid waste generation is one of the most severe problems in Malaysia that are often discussed. In general, financial problem scenarios have been a major issue in determining the effectiveness of solid waste in collection and transportation. Although studies on the effectiveness of solid waste have been widely conducted in previous studies, however in terms of handling and solid waste management, is still not achieving the expected effectiveness. Therefore, this study was conducted to produce the best practice in managing solid waste in aspect collection and transportation. Therefore, to achieve the aim of this study Pragmatism philosophy will be used as a reference while an abductive approach. The research strategy used is a mix method. Meanwhile, the research instruments used are semi-structured interview methods and questionnaires. In addition, the appropriate analysis technique used in this study is descriptive analysis that is factor analysis and mean score by using Statistical Package for Social Sciences (SPSS) software. For this study researchers will use stratified random sampling type in the research and the sample involved is 148 respondents for the questionnaire consisting of management and employees of solid waste company in Pulau Pinang. The findings have found that the factors that affect the effectiveness of solid waste depend on how financial factors are handled, information among employees applied, changes in standard of procedures used as well as travel distance and work schedule are implemented through the management company initiative.

Keywords: Effectiveness of solid waste, solid waste, solid waste collection, solid waste transportation

CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

Through the growing era of globalization, an increase in the number of solid waste generation is one of the most severe problems in Malaysia that are often discussed. Various problems are said to have arisen the management of solid waste that is not systematic even though various steps are executed. In addition, it is also seen that the increase of solid waste, any source that has no exile work carried out and lack of science and the awareness phase of the recycling is said to further aggravate the situation. The knowledge related to the generation and composition of solid remnants is necessary to be used as a solid waste management strategy that is more effective.

According to Sakawi, Z. et.al (2017) Global environment issues and issues relating to the rest of the solid are faced not only in developing countries such as Malaysia, even in other countries such as India, Indonesia, Thailand and the Philippines, including more countries such as the United Kingdom, Europe, Japan, Australia and so on. The increase of solid waste is equated with the advancement of urbanizations that is dense as the population increases. In Malaysia, the advancement and the rapid development and urban modernization are said to provide a new atmosphere where the remaining number of incomes increases according to the time circulation.

The Global Environment Centre (2012) states the present period of solid waste issues is one of the three major environmental problems found in Malaysia besides water pollution and air pollution. Looking at the rapid development of urbanization and industries has changed the number of solid waste generation in Malaysia (Manaf, 2009). The number of solid waste generation in Malaysia showed a substantial increase of 9.0 million tons in 2000 to 10.9 million tons in the year 2010. According to Agamuthu (2011) The resulting solid waste will increase by 15.6 million tons by year

2020 while the recycling rate is said to increase by 10%. Solid waste and public brushing Management Corporation (PPSPPA) 2012.

Therefore, a study focused on the effectiveness of the effective collection and transportation of solid waste in Pulau Pinang is important to support the environment campaign so that 30,000 tons of solid waste by 2020 can be reduced.

1.2 CONCEPTUAL STUDY CONCEPT

The sub-topic of determining the concept of this study will discuss the statement of the issue of study, study goals, study issues, study objectives, study scope, and study interests.

1.2.1 Problem Statement

In Malaysia, among one of the main factors showing the increase of solid residual numbers is due to the dismissal of concession companies in the managing of solid waste in accordance with established guidelines. According to Hasnah et al., (2012), solid waste management became severe when there was a defect in the management system and labor shortages in performing the task entrusted. This can also interfere with solid waste management in terms of collection to the disposal.

In addition, high cost expenditure is a contributor to one of the effectiveness barriers factors of the process of residual management (Abas, A. 2013, Hasnah et al. 2012). This is due to a shortage of financial resources in providing additional collector vehicles and paying a collection of fees. This resulted in the remaining daily levies of only 70 to 80 percent covering the service area. Deficiencies in the service can also cause negative impact to the environment such as disposal and combustion of uncontrolled garbage.

Further, failure in compliance with the schedule also resulted in the total accumulated solid wastes (Hussein I. Abdel – Shafy... Mona S.M. Mansour 2018). As a concession company that has been responsible for managing this solid waste, must ensure that the planned scheduling framework must be followed by employees assigned to collect solid waste. The upper parties should also ensure that employees on duty to attend their collection schedule by clearing the solid waste which are left scattered before being transported and taken to the landfill.

Besides that, the lack of information, storage facilities are still lacking and the problem of garbage collection vehicles that are not properly maintained between frequently occurring problems (TaWee, S. 2012). This is very difficult because, with information on solid waste management will make waste management better. Due to the production of solid waste increasing year-to-year, the concession company has to ensure that garbage collection vehicles will be able to function properly and enhance the available storage facilities. This is to reduce the problems that will arise throughout the solid waste management.

Referring to previous discussions, clearly indicating that studies involving the effectiveness of solid waste collection and transport in Penang should be implemented. It is in line with what is recommended by the Government and has been described in the National Solid Waste Management Policy (PSPN) 2016, where improvement measures have been effectively undertaken in order to achieve a developed nation status and solid waste management. Stronger. Although there are guidelines for solid waste Management 2012 and the National Solid Waste Management Policy (PSPN) 2016, however in terms of handling and solid waste management, is still not achieving the expected effectiveness. Therefore, this study is conducted to identify factors that affect the effectiveness of solid waste collection and transport.

1.2.2 Research Question

When solid waste quotes and transportation are not properly managed, exposure to the public and the environment can lead to the value of a reduced area of the region and there are side effects such as disturbing diseases Human health. Although there are solid waste management guidelines 2012 and the state Solid waste Management (PSPN) policy 2016, the level of solid waste management and worker awareness and concession companies are still lacking in residual management that can cause many problems especially threats to health, safety and the environment. The main issue of the study is based on the objective of the studies which is to be examined, how to ensure the best practice in managing solid waste collection and transportation is achieved?

1.2.3 RESEARCH AIM

To meet the study, a study goal was made to ensure that the study was effective by to produce the best practice in managing solid waste in aspect collection and transportation.

1.2.4 SECONDARY RESEARCH QUESTIONS

From the problems discussed, there are several questions used as a basic guide to the overall implementation of this study. The study aims to obtain answers to the following study questions:

- 1) What is the factor that influence effectiveness of solid waste collection and transportations?
- 2) How to analyse the level of effectiveness based on factors that influence of solid waste collection and transportation?
- 3) How to enhance the effectiveness of solid waste collection and transportation?

1.2.5 Objective of The Research

Researchers need to conduct studies on the effectiveness of solid waste collection and transport in Penang. To achieve the objectives of the study and the question of the study, several main objectives of study have been established:

- 1) To identify factor that influence effectiveness of solid waste collection and transportation.
- 2) To analyse the level of effectiveness of solid waste collection and transportation.
- 3) To suggest an improvement to enhance the solid waste collection and transportation.

1.3 SCOPRE OF THE RESEARCH

In conducting this study for garbage collection, transport and disposal services, the services are divided into 8 zones and researchers have chosen 8 zones in Pulau Pinang to obtain data. The 8 zones are **Tanjung Tokong Zone, Pulau Tikus Zone, Padang Kota Lama Zone, Jelutong Zone, Gelugor Zone, Air Itam Zone, Batu Maung Zone and Lastly Balik Pulau & Teluk Kumbar Zone**. Solid waste from hospitals managed by the Unit of Solid Waste Management department under Majlis Perbandaran Pulau Pinang (MBPP) and the rest of subcontractor were Cahaya Delima Enterprise Sdn.Bhd., Paper Plane Sdn.Bhd, Hayara Sdn.Bhd, RT Jaya Sdn.Bhd, Firwan Merican Sdn.Bhd., Era Bumiway, and lastly SP Maju Sdn.Bhd.. Each organization and selected place are visited to obtain information and data through distribution of questionnaires and interviews methods. Based on the scope of study, researchers will explain the background of the study as follows.

1.3.1 Balik Pulau & Teluk Kumbar Zone

For Balik Pulau & Teluk Kumbar zone been carried out by the Council. The municipal council of Penang Island was established on 15 December 1976 under the Local Government Act 1976. The state authority of Penang has agreed on 25 June 2010 to ensure that the Penang Municipal Council is upgraded to Penang City Council based on the provisions under section 4 (2) of the Local Government Act 1976 (Act 171). And then, it was upgraded to the Penang City Council on 1 January 2015.

The recognition of the Penang City Council has seen the addition of 4 new departments, namely landscaping department, Heritage Department, enforcement department and Solid Waste Management department and public cleansing. Due to this, the cabinet meeting on 7 November 2014 agreed to the Penang State Government proposal to change the boundaries of the MPPP and to upgrade the council to MBPP.

1.3.2 Tanjung Tokong Zone

Roads within the Tanjung Tokong Zone are Jalan Pantai Molek (City Limit border) Kampung Mesjid, Jalan Choong Lye Hock area. Part of Mount Erskine. City Limit border behind Cangkat Halia Satu, Ginger Highway Area (up to the foot of Bukit). Pepper Plantation Area, both sides of Jalan Fettes Road (except Guiellmard Reservoir) on both sides of Jalan Lembah Permai including the entire Lembah Permai area (Penang Reality) and on the left side of Jalan Lembah Permai to Special Education Secondary School to Bukit along the River Small to the sea, the entire area of Tanjung Bungah Town including the entire Chee Seng Park, both sides of Jalan Batu Feringghi, the entire Mount Pleasure area. Miami Beach floor housing area.

Both sides of Batu Feringghi include the areas of Kampung Hai Lam, Kampung Ceti, Kampung Raya Sayang, Kampung Mutiara, Kampung Din Bamboo, the entire Chin Farm area on both Jalan Teluk Bahang and Jalan Balik Pulau to the Taman Rimba area including the entire area Kampung Belakang Pekan Teluk Bahang Kampong Rawai, Kampung Tai Choon, Quarters Japatan Perhutanan Taman Kupu-kupu, Taman Rimba, Quarters PBA Kampung Masjid including Teluk Bahang dam Both sides of Jalan Hassan Abbas, Jalan Teluk Awak and the central and surrounding areas of Kampong Nelayan, Kampung Rumah 12 area and Jalan Balai coastal area Penang Mutiara Beach Resort, Coastal Area The Bayview Pacific Beach Resort, Coastal area Casuarina Beach Hotel, Kampung Belacan area, Bayu Senja area, Penang Park Royal Coastal area, Holiday Inn Beach , Golden Sands Hotel Coastal Area, Sungai Mas Housing and all hotel hotels in along Road Batu Feringgi to Sg Kecil.

This zone been carried out by the Cahaya Delima Enterprise Sdn Bhd is a Bumiputera-owned subsidiary of 100% incorporated on 5th August 1995. The address of the registered office is 56-C, 3rd Floor, Perak Plaza, Jalan Perak 10150 Penang. The operations center of the company is located at Plot 155 off Jalan Batu Maung Hilir Sg. Kluang, in the FIZ district of Bayan Lepas, Penang. Cahaya Delima Enterprise Sdn Bhd is registered with the Ministry of Finance Malaysia, obtained Bumiputera recognition and became a member of the Malaysian Chamber of Commerce for Penang Branch. Cahaya Delima Enterprise Sdn. Bhd. Has a combined workforce of 216 people trained, skilled and experienced and professional management members. The company also has modern and sophisticated machinery equipment to operate efficiently.

1.3.3 Pulau Tikus Zone

The area surrounds the left side of Jalan Perak to Jalan Pangkor, Persiaran Gurney on both sides of Jalan Tanjong Tokong to Shell

Tanjung Tokong, Jalan Mount Erskine on both sides along the City Limit Border. Gottlieb Road including Gottlieb Park, Flower Garden Road by City Limit border including Cemetery to Border Road, Air Itam Road, to Thean Teik Road by outer ring road to Yeap Chor Ee Road on the left to Jalan Masjid Negeri junction to Jalan Free junction School to Jalan Perak to Jalan Macalister, right to Jalan Pangkor.

This zone been carried out by the Paper Plane Sdn.Bhd. Paper Plane Sdn.Bhd. was established on 27 June 2008 by two entrepreneurs Mr. Sherif Ibrahim and Encik Mohamad Farouk which is a wholly-owned Bumiputra company. Paper Plane Sdn. Bhd. is a fast and forward company in the facility management, landscaping, management of parking and logistics industry where they give full dedication to customer satisfaction. Paper Plane Sdn. Bhd. has gained high reputation due to their professionalism and excellent customer relationship skills. They also believe that a friendly relationship between clients is a must for both party gains and will always work together for prosperity in the demand of the business world.

1.3.4 Padang Kota Lama Zone

The area around the left of Jalan Sungai Pinang from the junction of Jalan Perak to Lebuhraya Tun Dr. Lim Chong Eu left and right heading to Jalan Pengkalan Weld, Jalan Merdeka, Lebuhraya Merdeka, including the above sea housing area (Pengkalan Jeti). King Edward retiree, Jalan Tun Syed Sheh Barakbah to Lebu Farquhar including Jalan Green Hall, Gat Lebu Leith, Jalan Sultan Ahmad Shah left and right up to the sea, Jalan Pangkor on the left leading to the junction of Jalan Perak on the left to Jalan Sungai Pinang.

This zone been carried out by the Hayara Sdn.Bhd. The company, Hayara Sdn. Bhd, was established on 3rd September 1987. The company began as a company that has been actively moving in maritime management. The business areas of the company include the processing of fertilizer in bulk from ships. The company further expanded its business towards the supply and management of human manpower.

Building cleaning services and areas are development efforts of the company. Solid waste management is a continuous plan of the company's empowerment to continue to be superior to the upcoming era of globalisation.

1.3.5 Jelutong Zone

Areas surrounded by Jalan Tunku Kudin (city limit area) to Jalan Masjid Negeri, Jalan Free School, Jalan Perak, Jalan Sungai Pinang, Jalan Jelutong, left to right to the sea including Lebu Bakau, Solok Sungai Pinang 1, and Halaman Bakau, Jalan Tengku, Jalan Madrasah, Jalan Hajah Rehman, Jalan Batu Gajah, Jalan Faraday. This zone been carried out by the RT Jaya Sdn.Bhd. in 2002, RT Jaya Sdn Bhd is the leading environmental management company in Penang which is dedicated to providing services to the community to manage and reduce waste with minimal environmental impact. To be a holder of solid waste management and public cleansing privatisation project, RT Jaya Sdn Bhd provides comprehensive waste management services to several concession areas in Penang. RT Jaya understands environmental welfare is essential for the health and well-being of the community. RT Jaya actively seeks projects and initiatives that are lucrative to waste industry, community and ecosystem

1.3.6 Gelugor Zone

Roads within Gelugor Zone are Sungai Nibong Highway, Jalan Udini to Jalan Masjid Negeri enter Jalan Yap Chor Ee, Jalan Bukit Gambir (including the entire Cangkat Bukit Gambir), Lintang Bukit Jambul (including Bukit Jambul area), Persiaran Bukit Jambul, Jalan Paya Terubong, from Bukit Jambul Level One and the surrounding area, Jalan Tun Dr. Awang, Jalan Bayan (traffic light in front of SJKC Chong Cheng Sungai Ara), Jalan Dato Ismail Hashim to Persiaran Kelicap (opposite Sungai Ara Slogan Camp) including Jalan Relau, Persiaran

Relau, Taman Sungai Ara, Taman Desa Ria area (Jalan Sungai Ara 1, Jalan Kenari and so on), Kenari Floor, Kenari Shortcut and the entire Kedidi Housing Park and Kenari Park.

This zone been carried out by the Firwan Merican Sdn. Bhd. Firwan Merican Sdn.Bhd. was incorporated on 9 December 1992 in Penang. The company was founded by Noorsa Merican bin Ghouse since 1985 and is currently the managing director of the company. The company of Firwan Merican Sdn. Bhd. has been actively involved in various fields of work and has vast experience especially in areas of cleansing service and garbage collection. In an effort to expand the business, Firwan Merican Sdn. Bhd. has embarked on a systematic collection of garbage and dumping services in early 1991. Subsequently, the result of the efforts of all employees, in 1994 had witnessed the company to be appointed by Majlis Perbandaran Seberang Perai as the excellent transport contractor and the disposal of rubbish garbage. By having high reputation, dedication, support from professionals, technological knowledge and high spirits, the company grew rapidly in improving its services to achieve the best quality level to meet the customer's dreams and expectations. Today, the company is proud to have a number of multi-purpose garbage lorries to be added from time to time, service facilities and repairs of lorries and individual expertise with knowledge in the environment sector. It is the principle of the company to ensure that all the work entrusted are in accordance with specifications and completion within the stipulated time frame. The company Firwan Merican Sdn. Bhd. is also committed to develop and enhance the participation of bumiputra entrepreneurs in the industry with their experience and capabilities. The company of Firwan Merican Sdn. Bhd. Plans and strives to become a dynamic bumiputra contractor to achieve the government's objective of making Malaysia a developed nation by the year 2020.

1.3.7 Batu Maung and Bayan Baru Zone

Roads within Air Itam Zone are areas include both sides of Jalan Paya Terubong from Majestic Heights Apartment, Tingkat Paya Terubong 4, Tingkat Paya Terubong 2, Flat SUK, Jalan Bukit Kukus including Taman Oriental and Taman Rambai, Kawasan Lengkok and Solok Paya Terubong. Farlim Bandar Baru, Lintang Paya Terubong Satu including Taman Lembah Ria, Jalan Rambutan and Kampung Pisang area, Jalan Pasar Ayer Itam Village Area, Jalan Balik Pulau left and right, including Kampong Jalan Air Itam area, Jalan Keretapi Bukit (Jalan Rail Railway) , Jalan Air Itam left and right including Reservoir Garden, Padang Tembak, Zoo road area, Jalan Air Putih to Jalan Sempadan and right to Jalan Thean Teik.

This zone been carried out by the SP Maju Sdn.Bhd. The company's vision is to become a leading environmental management company and is committed to improving the quality of life of the company's mission, committed to the clean environment, committed to excellent customer service, will optimise returns to shareholders consistently, committed towards a skilled, dedicated and knowledgeable workforce.

1.3.8 Air Itam Zone

Roads within Air Itam Zone are areas include both sides of Jalan Paya Terubong from Majestic Heights Apartment, Tingkat Paya Terubong 4, Tingkat Paya Terubong 2, Flat SUK, Jalan Bukit Kukus including Taman Oriental and Taman Rambai, Kawasan Lengkok and Solok Paya Terubong. Farlim Bandar Baru, Lintang Paya Terubong Satu including Taman Lembah Ria, Jalan Rambutan and Kampung Pisang area, Jalan Pasar Ayer Itam Village Area, Jalan Balik Pulau left and right, including Kampong Jalan Air Itam area, Jalan Keretapi Bukit (Jalan Rail Railway) , Jalan Air Itam left and right including Reservoir Garden, Padang Tembak, Zoo road area, Jalan Air Putih to Jalan Sempadan and right to Jalan Thean Teik.

This zone been carried out by the SP Maju Sdn.Bhd. The company's vision is to become a leading environmental management company and is committed to improving the quality of life of the company's mission, committed to the clean environment, committed to excellent customer service, will optimise returns to shareholders consistently, committed towards a skilled, dedicated and knowledgeable workforce.

1.4 THE IMPORTANCE OF RESEARCH

This study is an investigation that can give an overview and supply data related to the effectiveness of solid waste collection and transportation and to propose improvements to the environmental and health aspects of the environment in Solid Waste management. Environmental sustainability is an important thing that needs to be cared for while conducting solid waste management work in support of the surrounding natural campaign to allow the remaining 30.000-solid waste of the 2020 to be reduced and do not interfere with the ecosystem The Earth. In the managing of solid waste. Beside that, the results of this study can help the management of the remainder in enhancing the environmental sustainability and the health of the residents and reduce the number of solid wastes accumulated when conducting solid waste management processes.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

According to Cambridge Dictionary the effectiveness can be seen as the ability to be successful and produce the intended results that may be needed and also can be said as the quality of being successful in achieving what is wanted and also what has been called the capability of producing a desired result or the ability to produce desired output also can be put (Wikipedia).

Solid wastes are interpreted as rubbish or waste that are not in the form of liquid and gas. Disposal and management of solid waste is a good management system for environmental sustainability. Solid waste management is called one of the main issues of developing countries. This is due to the increasing number of solid wastes in the day that showed a malfunction in the management of solid waste. In addition, the aspect of disposal and collection of solid waste is a very important matter that does not only involve national development issues but also closely related to the aspects of public health that touched the daily lives of Malaysians. (Haslinda, M.A., Harlida, A.W., 2015).

Solid waste management comprises five critical aspects in the process of solid waste generation including generation, storage, collection/transport, re-procurement / treatment, and disposal (PPSPPA, 2015). In addition, according to the Concise Oxford Dictionary, the waste can be interpreted as something less valuable or underused material, or something surplus useless. Waste is resulting from the diversity of human activity. Generally, the waste contains the same material as found in useful materials, but the difference is in terms of less value (White et al., 1995). Aside from that, as referred to in the provisions of Act 672 Section 2 controlled solid waste is classified as solid waste which falls into the following categories of commercial solid waste, construction solid waste, household solid waste,

industrial solid waste, institutional solid waste; solid waste imports; public solid waste.

By referring to the Eleventh Malaysia Plan 2016-2020, a reduction of 30.0% is expected to occur over household recycling rates. According to Mohd Yusoff Ishak (2019) obviously, the implementation requires the role of the solid waste management concessionaire to be more active, to meet the needs of managing the solid waste collected, by providing facilities for weighing stations and stock collection and rewards. When people begin to generate 37,890 tan waste every day and an average of 1.17kg of wastes daily at 2018 and with the latest statistics show plastic forming 20 percent of waste content, all parties should be more active in giving commitments especially the industry First ' generate ' waste.

Deputy Chief Executive Officer (Technical) Solid Waste and Public Cleansing Management Corporation (SWCorp), Dr Mohd Pauze Mohamad Taha said everyone should take action and responsibility in reducing waste generation every day because of the cost of Government-produced for waste management is extremely high. Also been stated that the cost of garbage management for seven states under the management of the SWCorp, federal territory of Putrajaya and Kuala Lumpur; Johor Melaka Negeri Sembilan; Pahang Kedah and Perlis had also reached nearly RM2 billion each year.

In Kuala Lumpur and Selangor, in 2008 statistics issued by solid waste and public Cleansing Management Corporation (PPSPPA) showed a total domestic garbage of 1.8 million ton, increasing to 1.9 million ton in 2009 (report Special, 2011). From the total solid wastes, it is seen that food waste is the main composition that contributes to 45% other than waste such as plastic, paper, metal, glass and others (economic Planning Unit, 2005). In addition, some challenges must be faced by the Government to ensure that solid waste management can be implemented effectively. Among them are, low recycling rate, environmental deterioration, less effective governance, lack of emphasis on efficient technology, less competitive economy and many others. The government has also found the local authority (PBT) which should manage the solid waste and public cleansing experience the

lack of financial, expertise and human resources to provide solid waste management services and Quality public Cleansing (2013A).

Solid waste may be a major problem for cities in developing countries. It is a big challenge because it needs some commitment, time and effort from businesses and householders to practiced reduction, reuse and recycling. It also requires a major financial investment as well as infrastructure development. A well-planned collection and transfer process can be led to significant reductions in the overall cost of waste management. In order to avoid that, four stages of waste management chain been provided to reducing and make the waste management work smoothly.

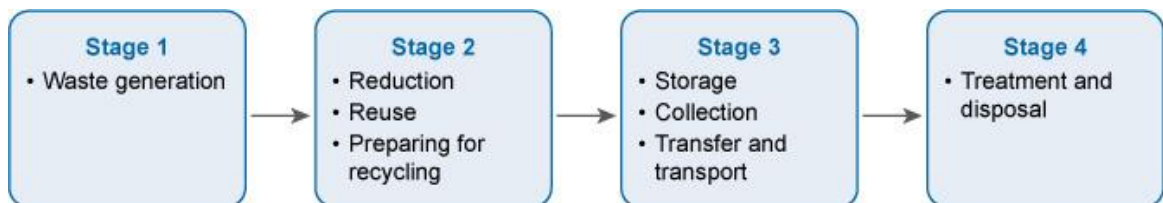


Figure 2.1: Four stage of waste management chain

2.1.1 Waste Storage Containers

The third stage of the waste management chain (Figure 2.1) starts when a householder or business employee puts their waste in a container. The choice of container will depend on the amount of waste to be collected. It will also depend on the collection system either is it collected from outside the house or does the householder have to empty it into a communal container.

The simplest and cheapest storage containers for individual households are some lidded food containers. It is easy for a householder to empty these containers into a communal bin for collection. At the other extreme are wheeled bins that can hold up to 240 liters of waste (Figure 2.2(c)). These need to be emptied into a vehicle fitted with lifting equipment. Any system using this

sort of bin needs well-maintained wide roads within 10 m approximately of every property served.



Figure 2.2: Household waste storage containers: (a) plastic dustbin liters food container; (b) 68-litre fiber garbage dustbin; (c) 240-litre wheeled bin.

(Cowing et al., 2014)

Communal bins need to be larger than domestic containers and they should also be sturdier. Often, they need to be emptied by a specialized vehicle fitted with lifting equipment. Some examples are shown in Figure 2.3.



Figure 2.3: Communal waste containers: (a) 660-liter mobile garbage bin with 1 m³ capacity (b) Waste skip – metal leach bin 1100 these can range from 3 to 15 m³. (Cowing et al., 2014)

Effective waste management in needs commitment from both the local people and the authorities. The people should use the communal waste containers in the correct way and avoid littering. In return, the authorities (or its contractors) should empty the containers at regular, predetermined times (for example, every Tuesday and Thursday morning) and keep the containers and immediate area clean

2.1.2 Primary and Secondary Collection

The next step is collection. Primary collection is the collection of waste from the point where it is placed by the person or organization that has produced it. These collection points could be located outside each individual household and business, communal containers serving several households in the surrounding area. Depending on the collection vehicle and the distance to the waste treatment/disposal site, the waste at this stage may be taken to the final disposal site or to a transfer station. Secondary collections are where the waste from several primary collections is taken from the transfer station to the final

disposal site. The most expensive collection/transfer vehicle, only suitable for collecting low-density waste in large quantities where road conditions are good. Of little use outside major cities.



Figure 2.4: Truck mounted garbage compactor

2.1.3 Planning The Route for Waste Collection

Vehicles

For any location, there is likely to be several transfer stations distributed around the town. The waste will be collecting from all these stations as well as directly from businesses, institutions and some households. For final treatment and disposal, in most locations there are only one site, in which the waste must be transported, and this is usually situated at the edge of the town. To make the best use of the resources available, it is important to plan the routes for the waste collection vehicle or vehicles. This can keep the costs down and gives people the best possible service. Route planning is a complex operation, but the basic process consists of three stages:

- 1) By identifying the pickup points and the amounts of waste to be collected from each point.
- 2) To form 'collection rounds' grouping pickup points been made that eventually can be served by a single collection vehicle.

- 3) Planning each route in each collection round by taking account of the distance travelled, traffic levels and safety to the public and also the waste collectors.

Thus, this study was conducted to improve the effectiveness of solid waste collection and transportation in Pulau Pinang. In addition to reasonable exercise to the residual controller for the process of exile, the control and transportation of the remainder can be in the impression of ensuring the safety and health of residual workers. However, solid waste control minimizes residual management is lacking.

2.2 CONCEPTUAL FRAMEWORK

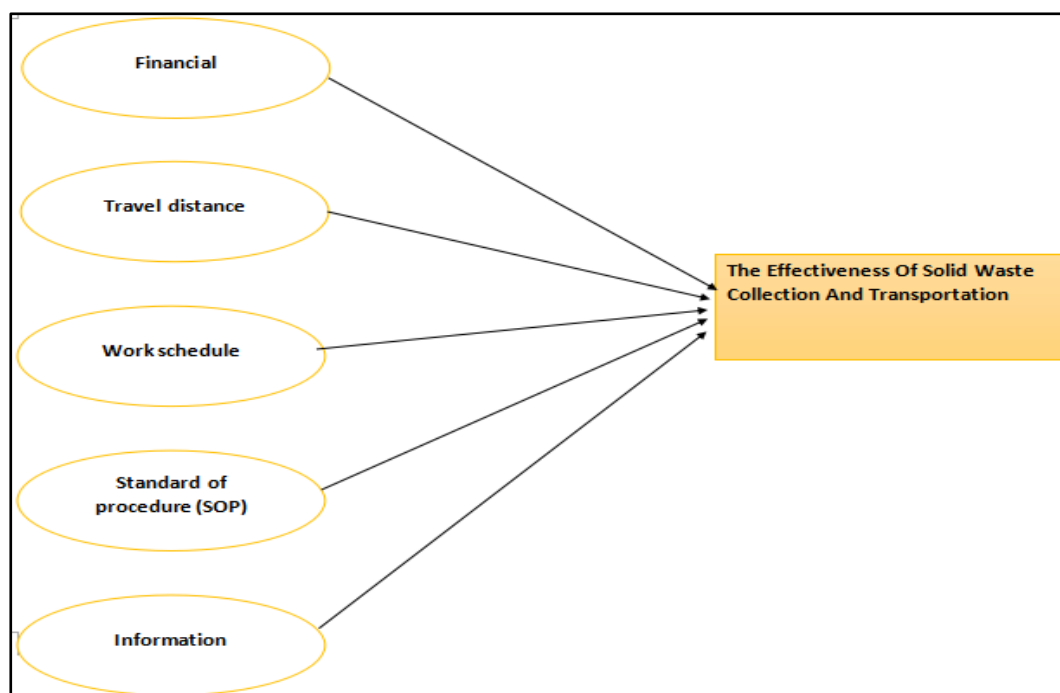


Figure 2.5: Conceptual Framework of The Study

2.2.1 Financial

By referring to Corporate Finance Institute (CFI) finance is defined as the management of money and includes activities like investing, borrowing, lending, budgeting, saving, and forecasting.

In solid waste management, financial it is often known as one of the challenges factors in the management of solid waste in Malaysia. Abas. A 2013, Hasnah et. Al 2012 stated that the high cost is the norm of a waste management process. It also been said that budget constraints are one of the reasons why the housing solid waste collection works led to low-collection frequency due to limited municipal budget and making process of collection and transportation often delay (Asian Productivity Organization (APO) 2007). Aside from that, since the total cleansing bills for managing solid waste in a local authority comes to about 30–40% of the total budgets of the councils, the collection and transportation of waste costs the ratepayers dearly, (Lee 2007). Indirectly it resulted in some collection and transport of solid waste due to the subject and increase in complaints from the residents of housing in Malaysia.

2.2.2 Distance / Position

Distance is the amounts of places or things (Cambridge dictionary). Before process collection form, position for garbage bin placed also important in order to make sure that bin storage areas should be located to minimize nuisance to adjoining properties.

Even though all requirement on the guidelines been stated and follow and the collectors go from house to

house to collect the garbage bags, which are then left at strategic locations to wait for the vehicles, there are complaints from citizens since stray animals tend to get to the garbage bags before they are loaded into the compactors. In addition, no one wants waste stored in front of his house because of the odors and unsightliness (Lee,2007). In order to avoid all the circumstances, there also must be enough space for the occupants to easily for them to access both their refuse and recycling bins to deposit waste, and it must be also possible for the lids of all bins to be fully opened. To enable ease of movement, there should be clearance of 150mm around and between each bin. All collections for individual houses must take place at the front of the premises. Residents are been required to present their wheelie bins for collection at the edge of their premises. Appropriate access for collection crews must even be included within the design of the surface space. The distance from the presentation point to where the collection vehicle can safely stop should be no more than 15m for bins of up to 240-litres, or 10m for larger containers (Waste Management Guidelines for Architects and Property Developers,2014).

Apart from complaints regarding garbage bins at home and perms, the distance of the journey after solid waste collection to landfill will also bring undesirable issues. As mentioned by Idris. R (2005) transfer and transportation to be a necessity when transport from the collection area to the disposal site is further due to the transportation of solid waste collection directly to the landfills is no longer economical. To avoid that, planning each route in each collection round by taking account of the distance travelled, traffic levels and safety to the public and also the waste collectors to make sure that when

directly transport the solid waste collection to the landfills there will be no problem occur ahead.

2.2.3 Working Schedule

A schedule, often called a roster, may be a list of employees, and associated information e.g. location, working times, responsibilities for a given period of time e.g. week, month or sports season. A schedule usually often created by a manager. For a larger operation, a human resources manager or scheduling specialist may be solely dedicated in creating and maintaining the schedule. A schedule by this definition is sometimes referred to as workflow (Wikipedia).

However, there still various complain about waste collection. Complaints include selective collection (some items are left behind), failure to collect on scheduled days, spillage, leachate when compactors operate in residential areas, and a demand for extra payment had been voice out over the year (Lee,2007). Failure to comply with the planned collection schedule also resulted in total accumulated solid wastes (Hasnah et.al, 2012).

Besides that, most of the problems are complaints to the community when solid wastes are not collected by the local authorities and the provision of insufficient trash bins (Hashim et.al). This is a slight cause when tourists come to Malaysia, they will see and evaluate the non-clean environment, causing disease, in the area of wild animals as well as resulting in the country's economy as a result of residual collection solids that do not follow the correct scheduling.

2.2.4 Lack of Information

Lack of information and inconsiderate in solid waste management also will greatly affect the management and environment surrounding. Lack of information, storage facilities are still less and the problem of garbage collection vehicles that are not properly maintained between frequently occurring problems (TaWee ,2012). Both the problems discussed above (lack of storage facilities and waste transportation) require high costs to be properly addressed. The fact that MEC himself does not regard waste management as a priority in the assignments and services rendered (as discussed in the previous sub-section) causing the effort to resolve it to be more difficult. Apart from the problems relating to the solid waste storage bin facility, the facilities for wastewater vehicles are quite unsatisfactory with obsolete waste carrier vehicles are also often damaged and this is annoying to the collection schedule. In addition, the vehicle also requires high repair and maintenance costs. (Fatimah et.al 2016).

2.2.5 Standard of Procedure

Standard operating procedure can be defined as a procedure specific to our operation that describes entirely the activities that are necessary to complete tasks in accordance with industry regulations. Any document that is a "how to" will eventually fall into the category of procedures. Pursuant to Act 672 Public Waste Management and Removal Act 2007, solid waste management services are defined as isolation, storage, collection, transportation, relocation, processing, recycling, processing and disposal of solid waste. However, although guidelines have been provided, issues in collection and transportation remain.

Apart from that, although some guidelines and regulations have been implemented at this stage, such as the guideline of collection, management and disposal of residual and so on but the problem of solid waste and public cleaning is still not reaching the level of cleanliness desired. Complaints received relating to non-clean and dirty environments showing waste collection and public cleansing services are not properly performed (Sakawi et.al 2017). Even though, all the schedule been follows well, cleanliness must be looked up frequently. It for in order to ensure that, there no rubbish been left behind after done the collection.

Even though all requirement on the guidelines been stated and follow and the collectors go from house to house to collect the garbage bags, which are then left at strategic locations to wait for the vehicles, there are complaints from citizens since stray animals tend to get to the garbage bags before they are loaded into the compactors. In additions no one wants waste stored in front of his house because of the odors and unsightliness (Lee,2007).

One of the most important steps to city planning waste management is because without prior waste management and disposal we can't make a city clean and hygienic. Waste collection and rubbish disposal play an extremely important role in the cleanliness and sustainability drive, with people's health and the conservation of resources being the responsibility of every authorize. The protection of the environment and the health of the population is one of the most important reason for waste collection is. Lastly, waste management and recycling collection can help to conserve our planet's natural beauty which can be flawed by thoughtless disposal of waste.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter reviews related concepts of research methodology and point out the proposed research design for this study. (Saunders et al., (2012) also referring research methodology as the theory of how research should be undertaken. Research can be stated as an activity that involves finding out, in a systematic way (Walliman 2011). While for Methodology is being stated that the philosophical framework within which the research is conducted or the foundation upon which the research is based (Brown, 2006). As being stated in the title, this chapter will be including the research methodology of the dissertation. In more details, in this chapter will outlines the research method, the research approach, the methods of data collection, the selection of the sample and the type of data analysis.

3.2 PHILOSOPHY AND RESEARCH APPROACH

Philosophy is concern with the assumptions made during the knowledge development process, thus it explaining much on the nature of the output, which is the developed the knowledge for the topic (Fauzi , 2010)..This chapter is indicates a flexible approach that should be included in the application of mixed methods research in solid waste research by conducting it within the pragmatic paradigm, especially when a paradigm is defined as shared beliefs among members of a specialty area. (Brierley, 2017). It had a difficulty in developing a corresponding philosophical paradigm when mixed methods research has been regarded as the third methodological movement after quantitative and qualitative research (Johnson and Gray, 2010).

3.2.1 Research Philosophy

Saunders et al. (2012) have also provided four alternatives of epistemological approaches as being called Positivism, Realism, Interpretivism and Pragmatism. According to Saunders and Paul (2012), the impact of practical findings on the importance of research is underpinned by the philosophy of pragmatism used by researchers. The same can be said when Pragmatism shown that the research question should be determine the research philosophy adoption. Since the research question drives the research flow, the pragmatist focuses on practical approaches to answer practical

3.2.2.1 Inductive

According to Thagard et.al. (2005) Inductive begins with observations that are more specific and limited in scope, and proceeds to a conclusion that is likely considering accumulated evidence. Besides that, research is carried out by the inductive method that are gathering evidence, seeking patterns, and forming a hypothesis or theory to explain what is seen.

3.2.2.2 Abductive

Abductive typically begins with an incomplete set of observations and proceeds to the likeliest possible explanation for the research. Abductive which often is incomplete when it yields the kind of daily decision-making that does its best with the information at hand. (Thagard et.al., 2005). This type of study is a combination of quantitative approaches and qualitative (mixed method).

The study seeks to find out the factors that influence the effectiveness of solid waste collection and transportation.

Build it later is formed through existing theories or explanatory studies and observation of phenomena or real situations (exploratory study).

Therefore, to achieve the aim of this study Pragmatism philosophy will be used as a reference while an abductive approach and type method which is mix method will be used.

3.3 RESEARCH DESIGN

In producing a research study, there are a few approaches used in this research method design. The purpose of this chapter is to style the methodology of the research approach through mixed sorts of research techniques. The research design is intended to provide an appropriate framework for a study. By referring research design by Maxwell (2012), the following diagram included of 5 main component and that is aim, conceptual framework, research questions, methods and lastly validity. A very significant decision in research design process is the choice to be made regarding research approach since it determines how relevant information for a study will be obtained.

This study employed a mixed type of methods. The first part of the study consisted of a series of well-structured questionnaires for worker of solid waste management. The other design used is a field observation at the selected industrial sites was undertaken. What is innovative is that the way the relationships among the components are conceptualized.

In this model, the various parts of a design form an integrated and interacting whole, with each component closely tied to many others, instead of being linked during a linear or cyclic sequence. The most important relationships among these five components are displayed in Figure 3.1. The description of the

study design is based on Maxwell (2012) as in the following diagram:

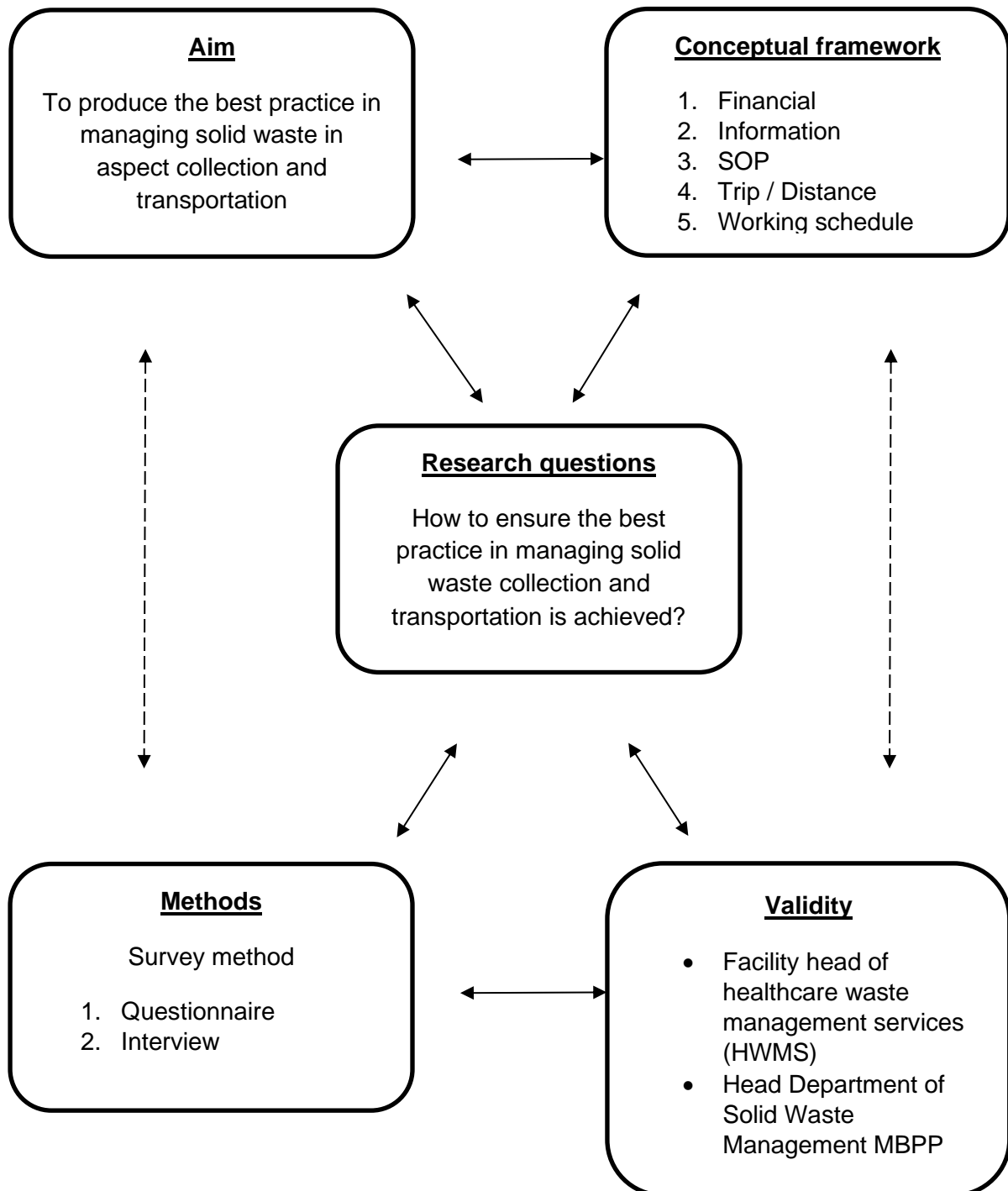


Figure 3.1 Research design (Maxwell, 2012)

3.3.1 Aim

In producing a research study, there are a few approaches used in this research method design. The purpose of this chapter is to style the methodology of the research approach through mixed sorts of research techniques. The research design is intended to provide an appropriate framework for a study. By referring research design by Maxwell (2012), the following diagram included of 5 main component and that is aim, conceptual framework, research questions, methods and lastly validity. A very significant decision in research design process is the choice to be made regarding research approach since it determines how relevant information for a study will be obtained.

3.3.2 Conceptual Framework

Referring to the conceptual framework (Figure 2.1) in chapter 2. Conceptual framework consists of 5 constructs representing factors that influence the effectiveness of solid waste collection and transportation.

The first formulation is financially of collection and transportation for solid waste collecting and transportation affect much solid waste management.

While the second construct pertains to information and knowledge on collection and delivery of solid waste, collection scheduling and transportation of solid waste.

The third construct is on standard operating procedures (SOP) of collection and transportation solid waste in terms of collection and delivery schedules.

The fourth construct is about on travel and distance collection and transportation solid waste in terms of collection and delivery schedules.

Lastly, schedule of work of collection and transportation solid waste in terms of collection and delivery schedules.

3.3.3 Research Questions

The research question is one of the most important aspects of a study, as it is one of the key factors in generating research goals, conceptual frameworks, appropriate methods for gathering information and validating the results of the study. In order to carry out this study, several research questions have been raised and need to be addressed. In conducting the study, the research question becomes a very important guide. In addition, a study was conducted to find the solution for the following:

- 1) What is the factor that influence effectiveness of solid waste collection and transportation?
- 2) How to analyse the level of effectiveness based on factors that influence of solid waste collection and transportation?
- 3) How to improve the effectiveness of solid waste collection and transportation?

3.3.4 Method

The methodology use by the researcher for this study is quantitative (questionnaire) and qualitative (case study). The primary mostly will be focusing on quantitative is worker of solid waste management while for qualitative, the researcher thinks that by referring to interview will help in answering the research questions.

3.3.5 Validity

According to Kothari (2004) validity is a criterion and is an indication of how sound the research was. More specifically, validity can apply both the design and methods of the research. Validity in data collection means the findings truly represent the phenomenon claiming to live. In research, one of the main concerns is validity and by controlling all possible factors that can threaten the research validity for every good researcher is a primary responsibility.

The researcher has obtained the approval and conduct of expert interviews from the Penang hospital's Facility head of healthcare waste management services (HWMS), head of the Penang City Council's Solid Waste Management Department (MBPP) to ensure that the items used in the questionnaire meet the research requirements. It will also be evaluated in terms of the content of language usage and the format of the questionnaire used.

Once this study is carried out, the conclusions from the overall data of this study will also be verified by the Facility Head of Healthcare Waste Management Services (HWMS) for the concession company Edgenta Mediserve Sdn Bhd for the Hospital Pulau Pinang

3.4 DATA COLLECTION METHOD

Referring to Collis & Hussey (2003) In order to satisfy the objectives of the dissertation, a combination of quantitative approaches and qualitative (mixed method) research was held. However, the effectiveness of quantitative and qualitative research is mostly based on the skills and abilities of researchers, while the outcomes may not be perceived as wanted. Because it is more appropriate for the small samples, it is also can be risky for the results of quantitative and qualitative research to be perceived as reflecting the opinions of a wider population (Bell, 2005). In order to get the

specific results, researches will used survey methods which is semi-interview and questionnaire.

3.4.1 Questionnaire

Both quantitative and qualitative method on questionnaires can be classified depending on the questions. Aside from that, answers obtained through the closed-ended questions with multiple choice answer options are been analyzed using quantitative methods and that they maybe involve pie-charts, bar-charts and percentages. (Dudovsky,2019)

There are following types of questionnaire are computer questionnaire, telephone questionnaire, in-house survey, mail questionnaire. For this type of questionnaire method that can be used in this research were in-house survey. It is because this type of questionnaire needs to visit respondents in their houses or workplaces. The advantage of in-house survey is that can focus more towards the questions be gained from respondents. However, in-house surveys also have disadvantages which including time consuming, more expensive and for various reasons respondents may not want to have the researcher in their houses or workplaces.

Types of question can be found on questionnaire are open questions questionnaire, multiple choice questions, dichotomous questions and scaling questions. For this type of questions are be used were multiple choices, dichotomous and scaling questions.

3.4.2 Sampling

Sampling is a one of the process used in a statistical analysis in which a predetermined number of observations are been taken from a larger population. Depends on the type of analysis being performed, the methodology is used to sample

from a larger population, but it may can be include simple random sampling or systematic sampling. (Alicia Touvila,2019).

Selection of sampling method must depend on the type of research study. There are three types of sampling methods which is probability sampling and non-probability sampling. Each of these methods includes different types of techniques of sampling (Hamed,2016). Figure 3.2 illustrates the stages that are likely to go through when conducting sampling (Hamed,2016).

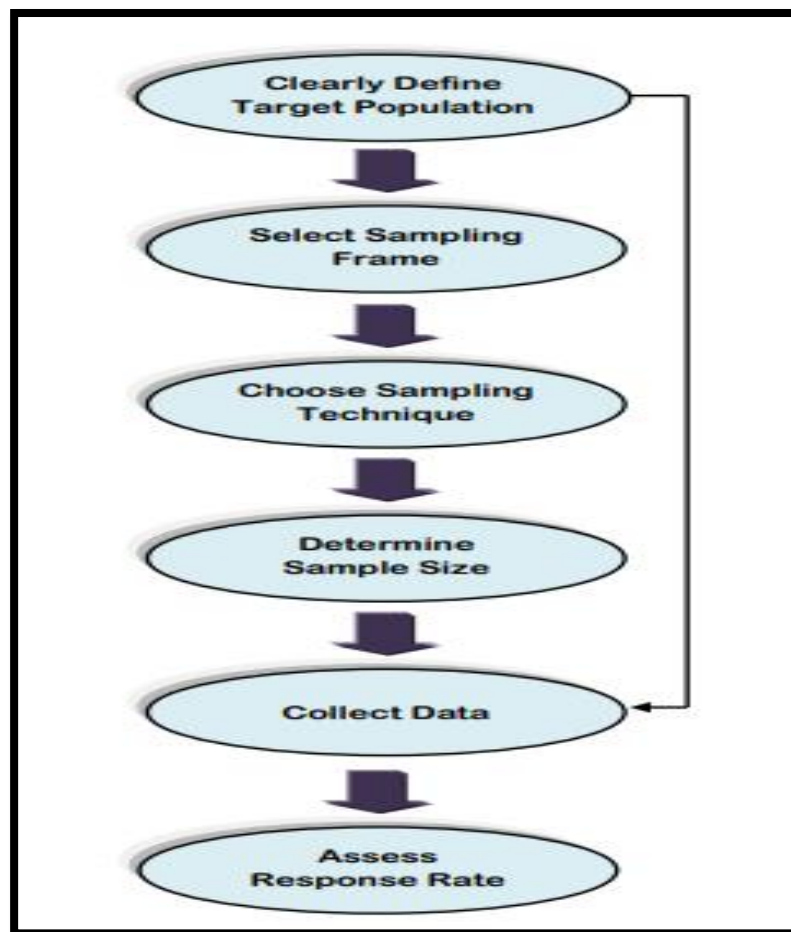


Figure 3.2: Sampling Process Steps

The sampling however has to do with the subject selection process of the population which is the respondent for the study to be conducted. The use of inconsistent and clear samples will significantly reduce and affect reliability and validity (Kaarthiek, 2018). The accuracy of sampling planning in data collection to a

minimum can reduce errors and save more time and money while doing research (Sabitha, 2006). The design of the sampling size is determined by the purpose of the study, the sample size as desired by the researcher, the appropriate time and cost of the study.

3.5 SUMMARY OF CHAPTER

There are various methods and approaches that can be used to conduct the study in order to obtain the data and information needed to obtain the results. The research methods and data acquisition as discussed above have been applied in this study to meet the needs of the study. Through case study, the process of analyzing the data obtained is from the questionnaire form. In addition to the analysis process, this chapter will also explain the methods, instruments and sampling used to carry out the research process and learn how to use data analysis using SPSS (Statistical Package for Science Social).

CHAPTER FOUR

DATA COLLECTION

4.1 INTRODUCTION

In this chapter we will touch on how data collection is implemented. As is well known, data collection is one of the processes of gathering and measuring information on variables of interest that enables the respondent to answer stated research questions, test hypotheses, and evaluate the outcomes. The data collection factor of research is common to all fields while it also emphasis on ensuring by getting accurate and honest collection from respondents. In addition, the description in this chapter is a general extension of Chapter 1 of the description of the methodology study approach designed to adjust with the objective of the study, to produce the best practice in managing solid waste in aspect collection and transportation.

In implementing this study, researchers will see more specifically related to the scope of study namely the effectiveness of solid waste collection and transportation at eight zone and solid waste management company. As such, Chapter 4 will further explain the purpose of each item that will be used in the review instrument in more detail and followed by data collection methods used in conducting research.

4.2 RESEARCH SAMPLING

Sample research are a very important aspect in the study because the use of inappropriate samples will reduce the validity and accuracy of any survey study. Sampling refers to the process in selecting a number of samples from the population which refers to the target group of researchers, the group to whom the results will be generated and as respondent of research (Awi. H ,2013). According to (Awi. H, 2013) the sample of the study consists of respondents of study respondents who have been chosen to delegate a population. The setting of a population study is important in the

study as the population will be able to determine how and the number of samples to be selected in the study.

In this study, the sample study was a very limited type of study because it contained the number of samples that could only be calculated. The sample of this study is comprised of all solid waste workers and solid waste management (SWM) as a respondent managed by the selected solid waste management company.

4.2.1 Sampling Design

Sampling design is a process to choose objects that can be used for research that can represent a large group chosen by the researchers (Noraini, 2013). According to (Sabitha, 2006) A sample design can be determined based on the purpose of a study, the need for sample size, cost and time required and provided for the study.

The sample design also refers to the plans and methods that can be followed in selecting the sample from the target population and getting knew the estimation technique formula for computing the sample statistics (Muhammad.S, 2016). These statistics functional to estimates and infer the population parameters to know who do you want to generalize to, what population can you get access to, how can you get access to them and also who is in your study that can help you to achieve the best result in your research.

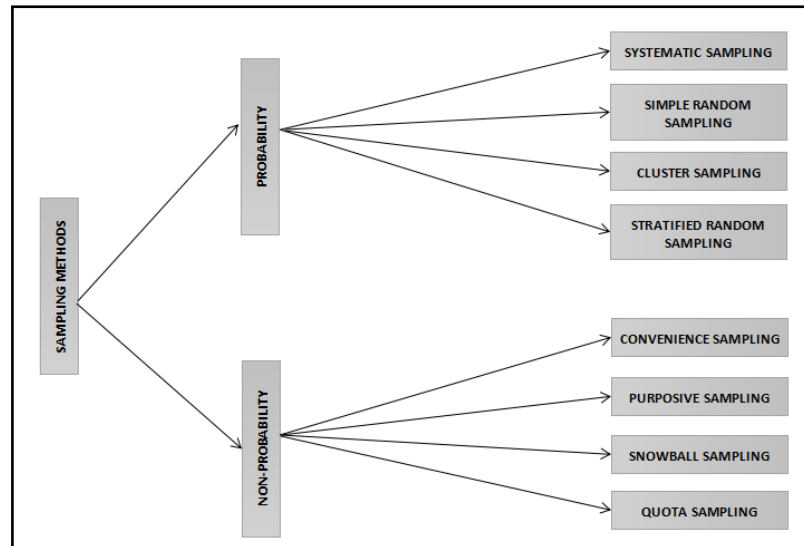


Figure 4.1: Sampling design

The sampling consists of two categories, which are probability sampling and non - probability sampling. Based on the sampling design stated, for this study researchers will use stratified random sampling type in the research.

Sampling is a process that allows information to be obtained from a portion of a larger group or by seeking a sample from the target population set out in the study. Aside from that, sampling is the process of selecting the sample for estimating the population characteristics. In other words, it is also the process to obtain information about an entire population by examining only a part of it (Muhammad.S, 2016).

4.2.2 Sample Size (N)

Sample size is one of the elements in research design when in order to planning the research, investigators need to consider these things first. To ensures research resources are used efficiently and ethically include achieving both a clinically and statistically significant result are the reasons why it needed to accurately calculate the required sample size (LM Aitken,). The

sample also represents the size of sampling and the selected samples represent the population by taking into account all the populations. As such, the results of the study have been found to represent the entire relevant population.

Study participants consent to study involvement on the basis that it has the potential to lead to increased knowledge of the concept being studied, however if a study does not include sufficient sample size to answer the question being studied in a valid manner, then enrolling participants may be unethical.

Although sample size needs to be considered in qualitative research, the principles that guide the determination of sufficient sample size are different to those that are considered in quantitative research.

There are several methods in determining the sample size of the solicitation study are:

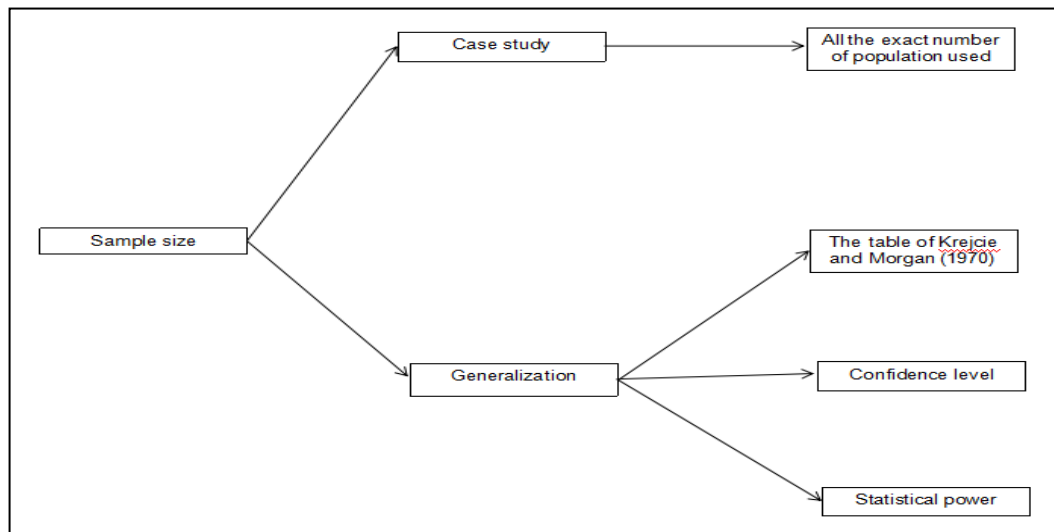


Figure 4.2: Sample size (Chua, 2006)

The table of Krejci and Morgan (1970) is used if the true number of populations are known.

Table 4.1: Table Krejci and Morgan (1970)

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note. — *N* is population size. *S* is sample size.
Source: Krejcie & Morgan, 1970

4.2.2.1 Sample of Generalization

However, in this study, researchers will use stratified random sampling because researchers will use the overall number of populations as respondents based on table Krejci and Morgan in this study.

To obtain information on the management of collecting solid waste and transport in Penang, only those who perform related work are being respondents. Then studies option to use the stratified random of sampling method. The total respondent of the Penang solid waste management company is 240 respondents. Therefore, according to the table of Krejci and Morgan (1970), questionnaire will be distributed to 224 respondents that been refer based on sample size. Since the study uses the

method of stratified random sampling, then the sample size used should be divided into several stratified random as in the following table.

Table 4.2: Total respondent involved in research

NO.	COMPANY NAME	TOTAL RESPONDENT	NO. OF SAMPLE SIZES REQUIRED	SAMPLE SIZE BY STRATIFIED RANDOM
1	Cahaya Delima Enterprise Sdn. Bhd.	30	148	28
2	Paper Plane Sdn Bhd	30		28
3	Hayara Sdn. Bhd.	30		28
4	RT Jaya Sdn. Bhd.	30		28
5	Firwan Merican Sdn. Bhd.	30		28
6	Era Bumiway	30		28
7	SP Maju Sdn. Bhd.	30		28
8	Majlis Bandaraya Pulau Pinang	30		28
	TOTAL	240		224

4.3 DATA COLLECTION INSTRUMENT

The instrument is one of the methods used in the data collection process. The data collection instruments used in this study were the survey and the interview. The questionnaire was formed in obtaining data relating to reviewing the effectiveness of quotations and transportation in solid waste management in Penang. Designing items in the questionnaire needs to be

designed in advance so that the assessment and its importance can be maintained in every question raised.

4.3.1 Instrument 1: Semi – Structured Interview

According to Boyce, C. & Neale, P. (2006) interviews are often defined as a qualitative research technique that involves conducting intensive individual interviews employing a small number of respondents to explore their perspectives on a specific idea, program or situation. Both structured and unstructured interviews are contained within the components of semi-structured interviews. In semi-structured interviews, the interviewer will prepare a group of equivalent inquiries to be answered by all the interviewees. At an equivalent time, additional questions could be asked during interviews to clarify and further expand certain issues.

When conducting interviews, the interviewer should have an open mind and refrain from displaying any disagreements in any form when viewpoints expressed by interviewees contradict with the interview's ideas. Moreover, timing and environment for interviews got to be scheduled effectively. According to Connaway, L.S.& Powell, R.P. (2010) respected scholars warn that to conducting an interview, the interviewer should plan to create a friendly, non-threatening atmosphere. The interviewer should provide a brief, casual introduction to the study and assure anonymity or a minimum of confidentiality when possible very much like one does with a canopy letter.

For semi-structured interview questions, the researcher provided interviewers with some suggestions for improvement. Here are some questions to ask:

Table 4.3: Question semi-structure interview

No.	Question and reason
1	<p>Financially, what needs to be done to improve the collection efficiency and transportation of solid waste?</p> <p>Reason: Based on the first question, the researcher would like to know in aspect of financially what solid waste management companies should take to improve the efficiency of collection and transportation of solid waste.</p>
2	<p>Does the level of knowledge of workers influence the effectiveness of collection and transportation of solid waste?</p> <p>Reason: In terms of the level of knowledge of the workforce, the researcher wants to see if it can affect the effectiveness of solid waste collection and transportation.</p>
3	<p>Do the existing guidelines assist in the collection and collection of transportation in increasing the efficiency of collection and transportation of solid waste?</p> <p>Reason: Also, as guidelines are often updated from time to time, researchers want to know whether they can assist with collection and transportation operations in improving the efficiency of collection and transportation of solid waste.</p>
4	<p>In addressing issues related to the distance traveled for collection and transportation of solid waste, what should be done in improving the efficiency of collection and transportation of solid waste?</p> <p>Reason: The researcher has also identified some of the issues raised regarding the distance traveled for collection and transportation of solid waste, based on this the researcher wants to know what action the company can take in improving the efficiency of collection and transportation of solid waste.</p>
5	<p>Although the work schedule has been created, there is still a shortage in the process of collecting and transporting solid waste. What can be suggested to address this issue.</p> <p>Reason: The researcher also found that there was a shortage in the process of collecting and transporting solid waste even after the working</p>

	schedule was created. Therefore, the researcher wants to know what can be suggested to address this issue
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4.3.2 Instrument 2: Questionnaire Survey

Questionnaires are one of the easiest ways to get information from respondents (Jasmi, 2012). The questionnaire conducted is a method used for reflection and it is also one of the methods used to study the effectiveness of solid waste collection and transportation in Penang. can be used in the review of the study conducted solely as the items contained in the questionnaire are taken based on the first, second, third, fourth and fifth constructs in the conceptual framework of the study. The questionnaire was also used to answer all three objectives and sub-questions in this study.

In the course of this study, the researcher obtained full cooperation from the solid waste management company in *Pulau Pinang* (SWMP) in obtaining the assistance of skilled workers to participate in the survey for this study.

Also, the researcher uses the Likert's scale response options from scale 1 to scale 5 as shown. The Likert's scale was chosen because the scale is easy to build and controlled by the researcher and most respondents usually respond in using this Likert's scale.

Table 4.4: The Likert scale

Answer	Point
Strongly Disagree	1
Disagree	2
Agree	4
Strongly Agree	5

The questionnaire also contains four sections. The four sections are as follows:

- i. Section A: Respondents' demographics
- ii. Section B: Identify factors that influences effectiveness of solid waste collection and transportation
- iii. Section C: Analyse the effectiveness of solid waste collection and transportation
- iv. Section D: To suggest an improvement to enhance the effectiveness solid waste collection and transportation

Section A is demographic information for obtaining relevant information that can be used for comparative purposes for the study conducted. Table 4.4 shows the items contained in demographic information.

PART A : RESPONDENT S' DEMOGRAPHIC S

Instructions: This section is a survey of your background. Please tick (/) in the space provided.

1. Company's name

Company's name	TICK (✓)
Cahaya Delima Enterprise Sdn. Bhd.	<input type="checkbox"/>
Paper Plane Sdn Bhd	<input type="checkbox"/>
Hayara Sdn. Bhd.	<input type="checkbox"/>
RT Jaya Sdn. Bhd.	<input type="checkbox"/>
Firwan Merican Sdn. Bhd.	<input type="checkbox"/>
Era Bumiway	<input type="checkbox"/>
SP Maju Sdn. Bhd.	<input type="checkbox"/>
Majlis Bandaraya Pulau Pinang	<input type="checkbox"/>

2. Gender
 Men
 Women

3. AGE

a) 16 – 25

b) 26 – 35

c) 36 – 45

d) 46 upward

4. SERVICE PERIOD

a) Less that 6 months

b) 6 months – 2 year

c) 3 year – 5 year

d) 6 year – 8 year

e) 9 year upward

5. Scope of work

Top management

Waste management

Figure 4.3: Respondent's demographics

SECTION B: IDENTIFYING FACTOR THAT INFLUENCE EFFECTIVENES OF SOLID WASTE COLLECTION AND TRANSPORTATION
 Instructions: This section is based on your experience and knowledge. Please mark (/) on a scale of 1-5.

Rating Level	Strongly Disagree	Do Not Agree	Agree	Strongly Agree
	1	2	3	4

B1. FINANCIAL		1	2	3	4
B1.1	High operating costs affect the effectiveness of waste collection, management and transportation processes.				
B1.2	Relevant workers' salaries affect the performance of the collection, collection and transportation of waste.				
B1.3	Payment of overtime incentives affects the quality of work of workers collected and transportation of solid waste.				
B2. INFORMATION					
B2.1	Performing cleaning work after collection affects the effectiveness of collection and transportation of solid waste				
B2.2	Workers need to be knowledgeable about the process of collecting and transporting solid waste				
B2.3	Effective communication between workers and employers affects the quality of solid waste collection and transportation.				
B3. STANDARD OF PROCEDURE					
B3.1	The guidelines set out facilitate the collection and transportation of solid waste				
B3.2	The company adheres to guidelines regarding the process of collection and transportation of solid waste.				
B3.3	The Solid Waste Act 672 applies to the quality of solid waste collection and transportation work.				

B4. TRIP DISTANCE		1	2	3	4
B4.1	Workers are having a hard time moving garbage from the barrels to the trucks because the public garbage can take a long time to clear.				
B4.2	Irrational routes and long delivery times to landfills and lack of transfer stations affect the process of solid waste collection and transportation.				
B5.3	The location of the landfill located far from the collection site affects the process of collecting and transporting solid waste.				
B5. WORK SCHEDULE					
B5.1	Failure to adhere to the planned collection schedule affects the effectiveness of collection and transportation of solid waste				
B5.2	Flexible working hours and breaks affect the quality of work collected and transportation of solid waste				
B5.3	The low number of workers interferes with the effectiveness of work scheduling and transportation of solid waste				

SECTION C : TO ANALYSE THE LEVEL OF EFFECTIVENES OF SOLID WASTE COLLECTION AND TRANSPORTATION

		1	2	3	4
C1. FINANCIAL					
C1.1	I find that high operating costs affect the effectiveness of waste collection, management and transportation processes.				
C1.2	I have found that relevant employee salaries affect the workload of collection, collection and transportation of waste.				
C1.3	I have found that overtime incentive payments affect the quality of work collected and solid waste transport.				

Figure 4.4: Section B (Factors that influences effectiveness of solid waste collection and transportation)

C2. INFORMATION				
C2.1	I have found that cleaning work after collection affects the effectiveness of collection and transportation of solid waste			
C2.2	I find that employees need to be knowledgeable about the process of collecting and transporting solid waste			
C2.3	I have found that effective communication between workers and employers affects the quality of work collected and transportation of solid waste.			
C3. STANDARD OF PROCEDURE				
C3.1	I find the guidelines set to facilitate the collection and transportation of solid waste			
C3.2	I find that the company adheres to the guidelines regarding the process of collecting and transporting solid waste.			
C3.3	I find the Solid Waste Act 672 to be used affects the quality of solid waste collection and transportation.			
C4. TRIP DISTANCE				
C4.1	I find that workers are having a hard time moving garbage from the barrels to the trucks because the public garbage can take a long time to clear.			
C4.2	I have found that irrelevant routes and long delivery times to landfills as well as lack of transfer stations have impacted the solid waste collection and transport process.			
C4.3	I found that the location of the landfill located far from the collection area affected the collection and transportation of solid waste.			
C5. WORK SCHEDULE				
C5.1	I have found that failure to adhere to the scheduled collection schedule affects the effectiveness of collection and transportation of solid waste			
C5.2	I have found that flexible working hours and breaks affect the quality of work collection and transportation of solid waste			
C5.3	I have found that fewer workers interfere with the effectiveness of solid waste collection and transportation scheduling			

Figure 4.5: Section C (Suggestion an improvement to enhance the effectiveness solid waste collection and transportation)

4.3.3 Pilot Study

In general, a pilot study is a preliminary study conducted on a small scale for a variety of purposes. Among the objectives are to test and build on the effectiveness of the study, evaluate the feasibility of the actual study, formulate the proposal and outline, review the suitability of the study design and evaluate the appropriateness of the research question (Chua, 2016).

Therefore, a pilot study is very important as it can influence the validity and reliability of the study as a whole. In addition, this is to ensure that the actual research is carried out as smoothly as possible.

In this study, the number of respondents used in the pilot study was 30 respondents. Respondents involved in the pilot study were those involved in the management of solid waste collection and transportation. Once the pilot study is carried out, all the data will be included in the Statistical Package for the Social Sciences (SPSS) system because SPSS is an extremely powerful tool for manipulating and deciphering survey data correctly.

SPSS is used to analyse the Cronbach's Alpha for each construct life and construct optimism. In getting the correct results for analyse, both constructs will be tested twice to make sure that the result for pilot test gets 0.8 and above and being refer as acceptable in data analysis. The results for section B and section C in pilot test are shown above:

Table 4.5: Cronbach's Alpha result

SECTION	B	C
Number of questions	15	15
Cronbach's Alpha	0.929	0.947

The reliability that above 0.7 are considered as acceptable in data analysis and also the range of result are equally the same between option that given. Based on this research, researcher able to reach both around 0.9 for Cronbach's Alpha and being able to justify that the options in the questionnaire distributed are equally chosen.

4.4 SUMMARY

Conclusions can be made, this chapter 4 explains more about the method chosen by the researcher in obtaining the data collection from the respondent from knowing how to do research sampling which includes sample size and sampling design. questionnaires, semi-structured interviews and pilot studies based on the sample size of the selected respondent population.

CHAPTER FIVE

DATA ANALYSIS AND FINDING

5.1. INTRODUCTION

For this chapter, the researchers have summarized the data analysis and findings drawn from the distributed questionnaire. This chapter also describes the analysis process based on the findings obtained from the sample using the instrument selected by the researcher, interview, and boring questionnaire related to the effectiveness of solid waste collection and transportation in *Pulau Pinang*.

This study was conducted in eight zones around Pulau Pinang namely Tanjong Tokong zone, Pulau Tikus zone, Padang Kota zone, Jelutong zone, Gelugor zone, Air Hitam zone, and Batu Maung zone. This zone was selected by the concessionaire responsible for managing solid waste around Pulau Pinang. The concessionaire responsible for this zone is Cahaya Delima Enterprise Sdn. Bhd., Era Bumiway, Firwan Merican Sdn. Bhd., Hayara Sdn. Bhd., Majlis Bandaraya Pulau Pinang, Paper Plane Sdn Bhd, RT Jaya Sdn. Bhd., SP Maju Sdn. Bhd.

The questionnaire was given to eight concessionaires who were appointed, totaling 224 questionnaires. As a result of the recitation of all 178 completed questionnaire forms, the sample was returned and analyzed.

In this study, the researcher wants to know whether the objective of the study can be achieved from the data analysis and the findings. All these findings are tested in this chapter to identify the relationship from the factor analysis. The researcher also determines data based on reliability analysis, descriptive analysis, and correlation analysis.

Results analysis of the research data obtained will be presented in the form of tables and charts. The obtained data were analyzed using SPSS version 25.0 software. The analysis method used was in the form of Cronbach's alpha, percentage, and mean obtained using SPSS

software. The respondents involved in this study were all staff members of the concessionaire.

5.2. DEMOGRAPHIC RESPONDENTS

This section describes the respondents' background analysis which consists of company, gender, age, service period, and scope of work. The percent method used to analyze the respondent's company, gender, age, service period, and scope of work and the table below shows the number of respondents by company, gender, age, service period, and scope of work.

Data on the number of respondents were also taken to determine the total number of respondents for each concession company involved in this study.

Table 5.1: Total respondent by company

Company	Total respondent	Percentage (%)
<i>Cahaya Delima Enterprise Sdn. Bhd.</i>	31	17.4
<i>Era Bumiway</i>	20	11.2
<i>Firwan Merican Sdn. Bhd.</i>	21	11.8
<i>Hayara Sdn. Bhd.</i>	21	11.8
<i>Majlis Bandaraya Pulau Pinang</i>	19	10.7
<i>Paper Plane Sdn Bhd</i>	28	15.7
<i>RT Jaya Sdn. Bhd.</i>	24	13.5
<i>SP Maju Sdn. Bhd.</i>	14	7.9
Total respondent		178

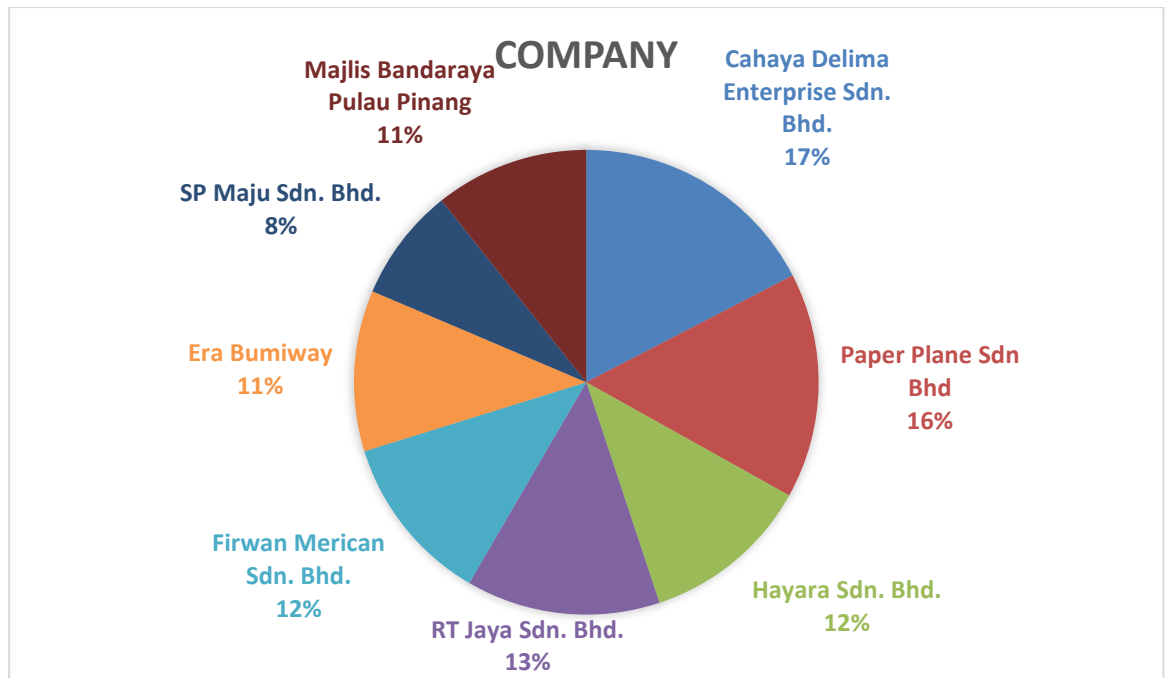


Figure 5.1 Distribution of respondent by company

Based on tables and diagrams, the researcher was able to identify the number of respondents who answered the questionnaire form at the eight concessionaires. The number of respondents in the *Cahaya Delima Enterprise Sdn.Bhd* recorded a higher percentage compared to the other consortium companies, which was 17% compared to 31 respondents. Meanwhile, respondents in the *Paper Plane Sdn bhd* recorded a 16% response rate of 28 respondents. On average, *Rt Jaya Sdn Bhd* achieve 16% accounted for the equivalent of 24 respondents. The respondents in the *Hayara sdn bhd* and the *Firwan Merican Sdn bhd* registering the same number of respondents were 21 with 12%. Besides, the *Era Bumiway* and *Majlis Bandaraya Pulau Pinang* recorded a similar percentage of 11% with the number of respondents being 20. Lastly, *Sp Maju Sdn Bhd* recorded a low percentage of 8% and the number of respondents involved was only 14.

Data on gender are also taken to determine the population by gender of each concessionaire involved.

Table 5.2: The total number of respondents by gender

Gender	Total Respondent	Percentage (%)
Male	135	75.8
Female	43	24.2

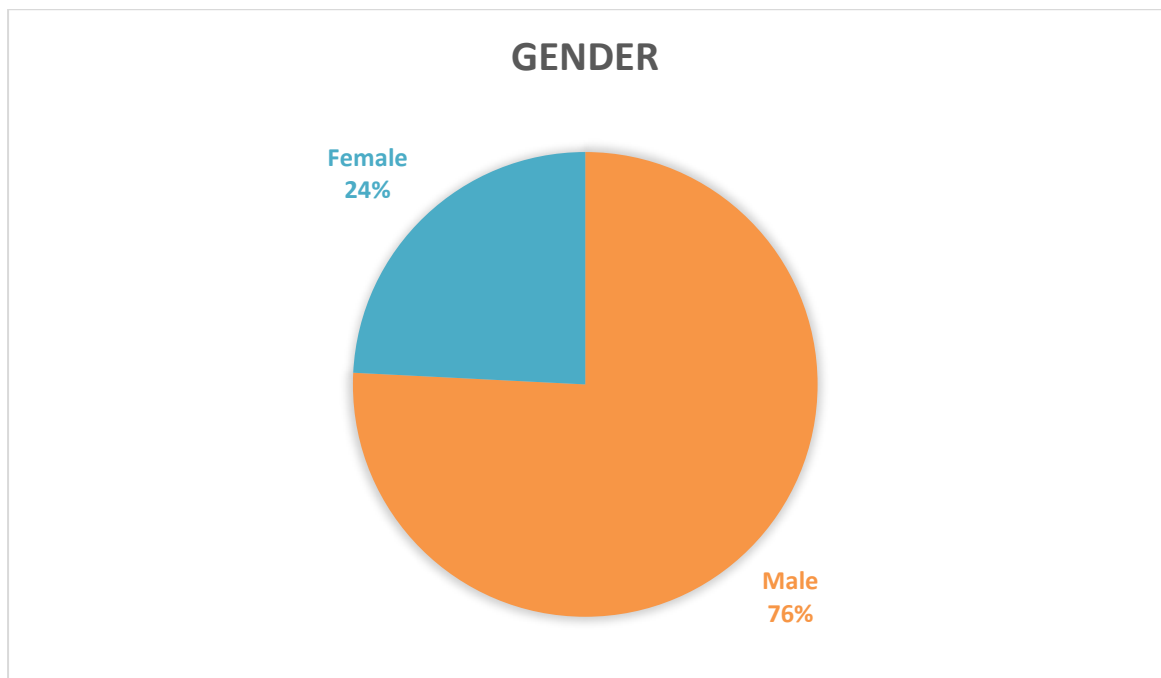


Figure 5.2: Respondent distribution by gender

Based on table 5.2 and figure 5.2, the number of respondents by gender in the eight concessionaires was affected. The highest proportion of genders was from male respondents, which was 76% with 135 respondents. Meanwhile, the number of female genders showed a low percentage of 24% compared to only 43 respondents.

Respondents' age-related data were also collected to determine the respondent's age range for each concessionaire involved in this study.

Table 5.3: The total number of respondents by age

Age	Total Respondent	Percentage (%)
16 - 25	16	9.0
26 - 35	95	53.4
36 - 45	55	30.9
46 Upward	12	6.7

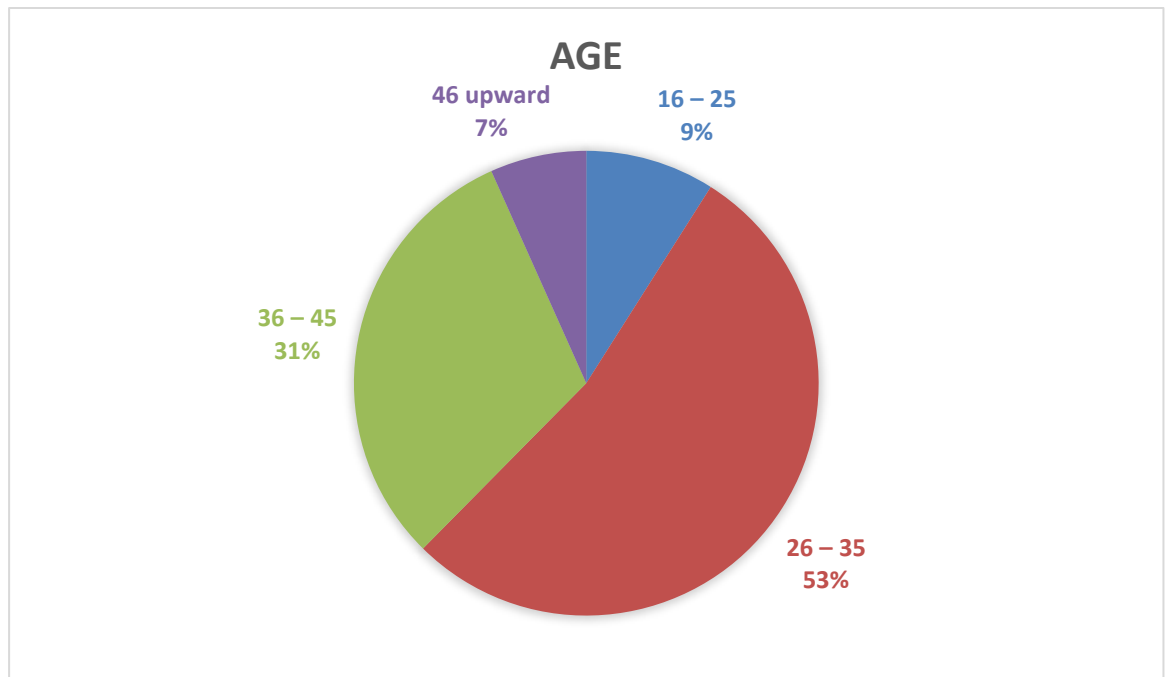


Figure 5.3: Respondent distribution by age

Based on the table and figure 5.3, the researcher can identify the distribution of respondents by age at each stage for the concessionaire involved. Leading the highest percentage was 26 - 35 years old with 53% involving 95 respondents. Meanwhile, the age group of 36 - 45 has a moderate rule of 31% involving 55 respondents. Furthermore, the ages of 16 - 25 and 46 upward represented a low percentage of 9% for 16 respondents for the age group of 16 - 25 years, and 7% for 12 respondents for the 46 upward age group.

Data on the duration of the work experience was also used to facilitate the researcher to determine the average work experience of each respondent for each concession company.

Table 5.4: The total number of respondents by service period

Service Period	Total Respondent	Percentage (%)
Less Than 1 Year	14	7.9
1 - 2 Year	46	25.8
3 - 4 Year	74	41.6
5 Year Upward	44	24.7

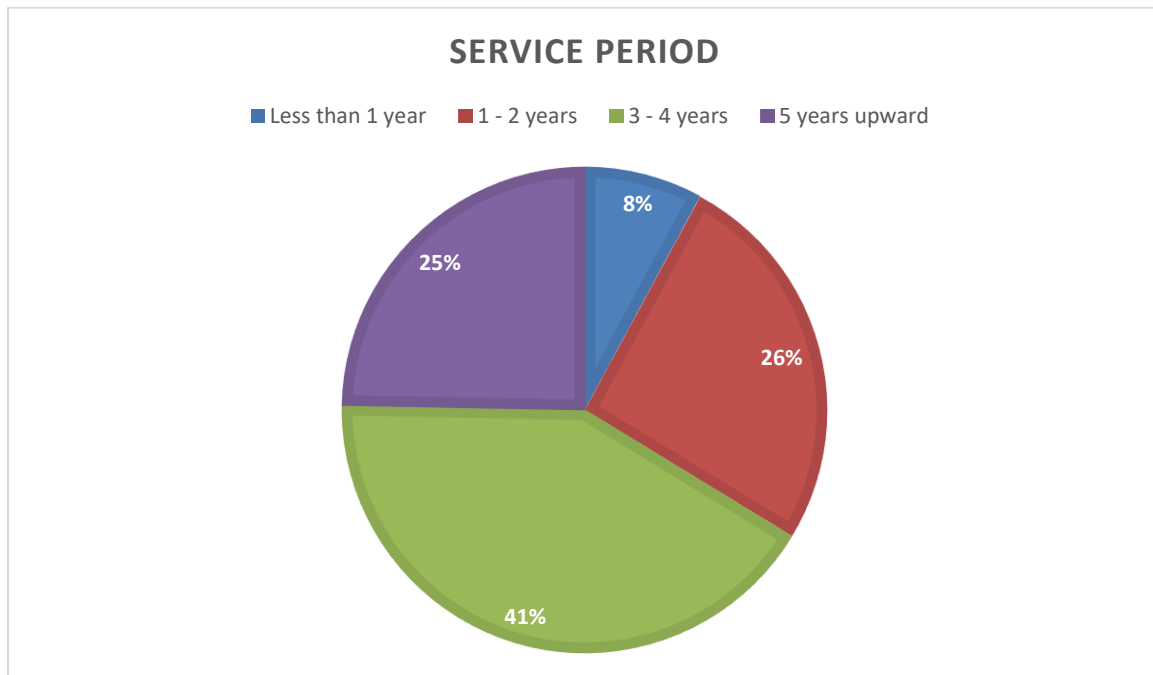


Figure 5.4: Respondent distribution by service period

The service period is broken down into four options. This is to facilitate the researcher to analyze the data more precisely with the option given less than 1 year, 1 - 2 years, 3 - 4 years, and 5 years upward. For the first option, less than 1 year was obtained for 8% for 14 respondents, while for 1 - 2 years it was 26% for 46 respondents. Furthermore, the third choice of 3 - 4 years was 41% for 74 respondents, and lastly 5 years upward had a percentage of 25% for 44 respondents. Based on the work experience data obtained and analyzed, the researcher can conclude that the majority of work experience for respondents of this concession company is 3 - 4 years.

Data on the scope of work was also taken to facilitate the researcher to determine the scope of work for each respondent for each concession company.

Table 5.5: The total number of respondents by scope of work

Scope of Work	Total Respondent	Percentage (%)
Top Management	77	43.3
Waste Management	101	56.7

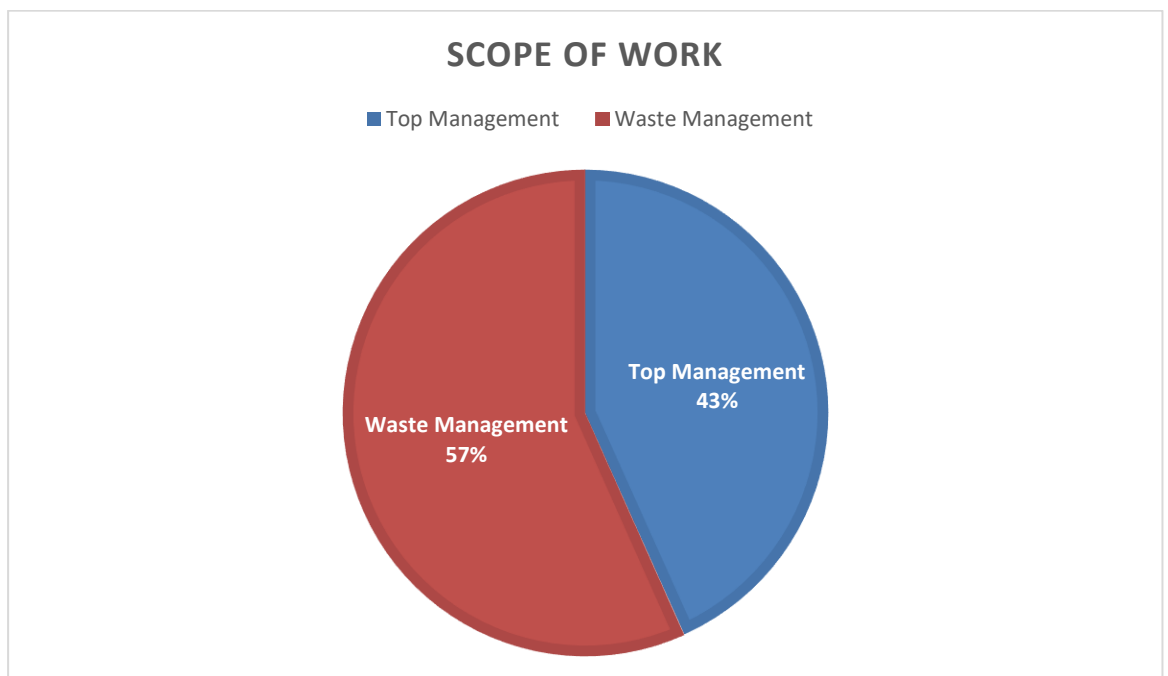


Figure 5.5: Respondent distribution by scope of work

Based on table 5.5 and figure 5.5, the number of respondents by category for the eight concessionaires showed that scope in waste management had the highest percentage compared to top management by 57% with 101 workers. Meanwhile, top management followed 43% with 77 top employees.

5.3. THE FINDINGS OF THE RESEARCH FOR THE FIRST OBJECTIVE

This section aims to analyze the data to achieve the first objective that is to identify a factor that influences the effectiveness of solid waste collection and transportation. The method used to achieve the first objective is by reading the previous study, the researcher can identify the construct.

Besides, to achieve this objective the researcher has obtained information through the questionnaire form which has been distributed to the respondents of the study. The questionnaire was also constructed based on a conceptual framework that includes financial, information, the standard of the procedure, trip distance, and lastly schedule of work.

Next, to identify factors that influence the effectiveness of solid waste collection and transportation, the data already collected from the eight study areas will be analyzed concurrently based on the study constructs using Cronbach's Alpha method.

5.3.1 Realibility Analysis

To analyze how strong the items in the set of variables if they can correlate with each other, reliability analysis was done. The Alpha coefficient range and also the strength association from the Cronbach's Alpha reliability testing been shown in the table 5.6 below:

Table 5.6: Cronbach's Alpha

Alpha Coefficient Range	Internal Consistency
<0.6	Poor
0.6 to <0.7	Moderate
0.7 to <0.8	Good
0.8 to <0.9	Very Good
0.9	Excellent

5.3.2 Actual Test

Researchers have distributed 240 questionnaires to eight concessionaires in each zone in *Pulau Pinang*. To identify the distribution method of the questionnaire, the stratified random sampling was chosen beforehand. The researcher has distributed 30 questionnaires to Cahaya Delima Enterprise Sdn. Bhd., Era Bumiway, Firwan Merican Sdn. Bhd., Hayara Sdn. Bhd., *Majlis Perbandaran Pulau Pinang*, Paper Plane Sdn Bhd, RT Jaya Sdn. Bhd., SP Maju Sdn. Bhd. Besides that, the researcher will only require 28 respondents for each company according to stratified random sampling. However, to ensure the return of the questionnaire received within the numbers of the respondents which were 178 respondents from eight companies, the researcher had distributed more than that.

Table 5.7: Cronbach's Alpha of Constructs

Construct	Cronbach's Alpha	N of Items
Financial	0.833	3
Information	0.644	3
Standard of procedure	0.876	3
Trip distance	0.856	3
Schedule of work	0.830	3

5.3.2.1,5.3.2.2,5.3.2.3,5.3.2.4, and 5.3.2.5 refers to table 5.7

Based on table 5.7 as shown above has shown the results of the actual test of reliability analysis. From this analysis made, it has been proved that all items in each variable are reliable. All the variables each of them has a very good internal consistency which is include financial, information, standard of procedure, trip distance and schedule of work.

5.3.2.1 Financial

Based on table 5.7, the value of Cronbach's Alpha for financial is 0.833 which can be interpreted as a very good internal reliability that surpasses the 0.60 and is eventually considered as reliable. In this variable, there are 3 items and the internal consistency is very good.

5.3.2.2 Information

Information variable has 3 items in it and the value of Cronbach's Alpha is 0.644. However, it narrowly surpasses the value of 0.60 and the 3 items in it are considered as reliable even for this research and the internal consistency is moderate.

5.3.2.3 Standard of Procedure

In this variable, standard of procedure has also 3 items in it and the value for Cronbach's Alpha is stated more than 0.60 which is 0.876. This eventually can be proved that these 3 items are reliable for the research and it also has a very good internal consistency.

5.3.2.4 Trip Distance

The value of Cronbach's Alpha for schedule of work is 0.856 which has a very good internal reliability that surpasses the 0.60 and is eventually considered as reliable. In this variable, there are 3 items and the internal consistency is very good.

5.3.2.5 Schedule of Work

Based on table 5.7, the value of Cronbach's Alpha for schedule of work is 0.830 which is can be interpreted as a very good internal surpasses the 0.60 and its eventually considered as reliable. In this variable consists of 3 items and the internal consistency is very good.

5.4. THE FINDINGS OF THE RESEARCH FOR THE SECOND OBJECTIVE

This section aims to analyze data aimed at achieving the second objective to analyze the level of effectiveness of solid waste collection and transportation. To achieve the objective, a questionnaire has been distributed to workers conducting waste management activities at eight companies that are Cahaya Delima Enterprise Sdn. Bhd., Era Bumiway, Firwan Merican Sdn. Bhd., Hayara Sdn. Bhd., *Majlis Perbandaran Pulau Pinang*, Paper Plane Sdn Bhd, RT Jaya Sdn. Bhd., SP Maju Sdn. Bhd. as an instrument used to obtain data and to identify problems and any deficiencies that exist around the study site during the work of waste management. The questions made are based on previous studies that have been researched as discussed in chapter two of the literature review.

Next, to identify factors that influence the effectiveness of solid waste collection and transportation, the data already collected from the eight study areas will be analyzed concurrently based on the study constructs using the mean score and percentage method.

5.4.1 Data Analysis for Factor Financial

As already stated, this section is designed to know the financial factors. Based on table 5.8, a four-point scale was set for each questionnaire presented in chapter four. The results of the respondents are as shown in the table and figure 5.8.

Table 5.8: Analysis score mean and std. deviation for factor financial

NO.	ITEM	SCALE LIKENESS (%) N=178				STD. DEVIATION	MEAN
		1	2	3	4		
C1.1	I found that high operating costs affect the effectiveness of waste collection, management and transportation processes.	2.2	3.4	46.6	47.8	.667	3.40
C1.2	I found that relevant employee salaries affect the workload of collection, collection and transportation of waste.	1.7	4.5	68.0	25.8	.583	3.18
C1.3	I found that overtime incentive payments affect the quality of work collected and solid waste transport.	1.1	1.1	33.1	64.6	.574	3.61
AVERAGE MEAN							3.397

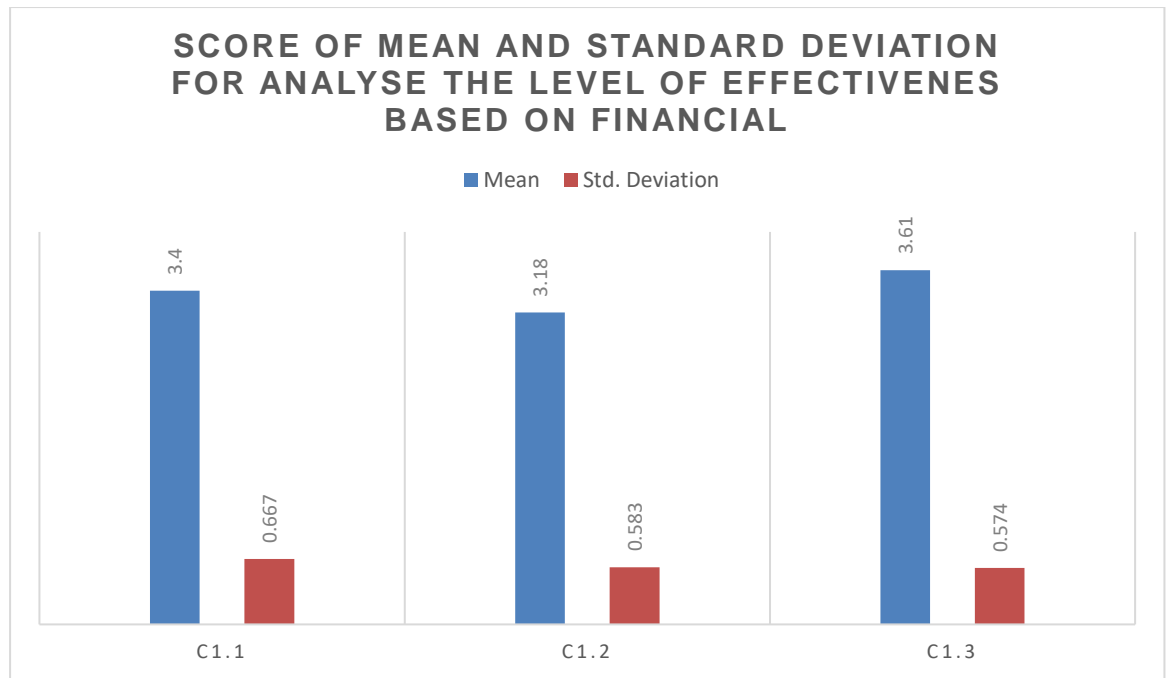


Figure 5.8: Mean and std. deviation score chart for factor financial

Referring to the respondent questionnaire for the first construct on financial factors, the researcher found that most respondents generally agreed and half disagreed with the questions asked by the researcher. It also shows that the level of effectiveness of solid waste collection and transportation in eight concessionaires is very much given attention to the importance of financial factors related to solid waste management.

Referring to table 5.8 and figure 5.8, there are several items that the respondents disagree with. Table and figure 5.8 show the mean value of each item in the financial factor construct. In this build, there are three items in it. For item c1.3 the highest mean value among the three items was 3.61. whereas for item c1.1 it only has a mean value of 3.40 and the lowest mean value among all three items is 3.18 for item c1.2.

As for standard deviation for each construct on financial factors been stated. For each construct, the highest standard deviation value is 0.667 for item C1.1. Meanwhile, for item C1.2 and C1.3 each has the same standard deviation value as 0.583 for C1.2 and 0.574 for C1.3.

As a result of the analysis of the data provided, the researcher can conclude that the level of effectiveness of solid waste collection and transportation for factor financial overall, the mean of the financial factors for all three items was 3.397.

5.4.2 Data Analysis for Information

This section has been designed to identify activity for factor information. Based on table 5.9, a four-point scale was set for each questionnaire presented in chapter four. The results of the respondents are as shown in table and figure 5.9.

Table 5.9: Analysis score mean and std. deviation for factor information

NO.	ITEM	SCALE LIKENESS				STD. DEVIATION	MEAN
		(% N=178)					
		1	2	3	4		
C2.1	I found that cleaning work after collection affects the effectiveness of collection and transportation of solid waste	0	1.7	57.9	40.4	.522	3.39
C2.2	I found that employees need to be knowledgeable about the process of collecting and transporting solid waste	0	0	34.8	65.2	.478	3.65
C2.3	I found that effective communication	0	0.6	55.6	43.8	.508	3.43

	between workers and employers affects the quality of work collected and transportation of solid waste.						
AVERAGE MEAN							3.491

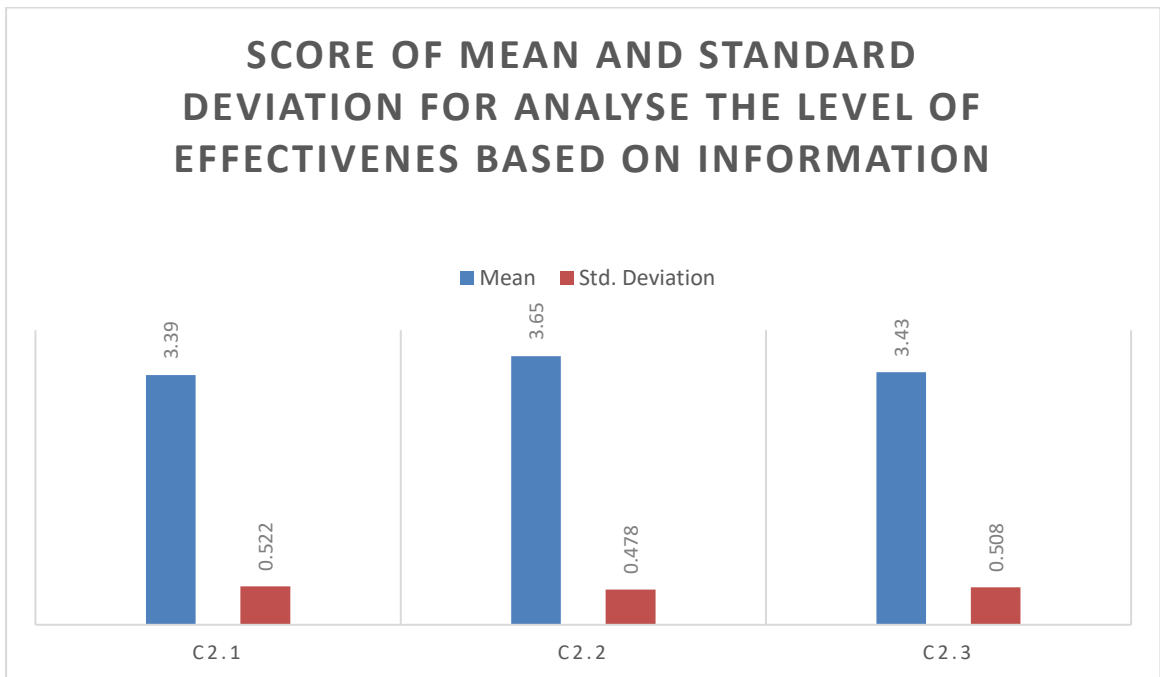


Figure 5.9: Mean and std. deviation score chart for factor information

Referring to the questionnaire respondent for the second construct which is about factor information, the researcher has found that most average respondents agree with the questions given by the researcher. It also shows that the level of effectiveness of solid waste collection and transportation in eight concessionaires is very important to the importance of knowing solid waste management.

Refer to table 5.9 and figure 5.9, showing the mean value of each item in the construct for factor information. In this construction, there are three items related to factor information in solid waste collection and transportation. For item, c2.2 shows the highest mean value among the

three items is 3.65. whereas, for items c2.1 and c2.3, respectively, the mean value was 3.43 for item c2.3 and the mean value between the three items was 3.39 for item c2.1.

As for standard deviation for each construct on factors information been stated. For each construct, the standard deviation value is 0.522 for item C2.1. Meanwhile, for item C2.2 and C2.3 each has the moderate standard deviation value as 0.478 for C2.2 and 0.508 for C2.3.

As a result of the analysis of the data provided, the researcher can conclude that the level of effectiveness of solid waste collection and transportation for factor information overall, the mean of the financial factors for all three items was 3.397 which is moderate.

The conclusion that can be made based on the three items built into the construct is that it shows that the level of worker effectiveness can be improved if the aspect information is known and prioritized in solid waste collection and transportation activities.

5.4.3 Data Analysis for Standard of Procedure

This section has been designed to identify activity for the standard factor of procedure. Based on table 5.10, a four-point scale was set for each questionnaire presented in chapter four. The results of the respondents are as shown in table and figure 5.10.

Table 5.10: Analysis score mean and std. deviation for factor standard of procedure

NO.	ITEM	SCALE LIKENESS (%) N=178				STD. DEVIATION	MEAN
		1	2	3	4		
C3.1	I found the guidelines set to facilitate the collection and transportation of solid waste	0	2.8	31.5	65.7	.540	3.63
C3.2	I found that the company adheres to the guidelines regarding the process of collecting and transporting solid waste.	0	0.6	34.3	65.2	.491	3.65
C3.3	I found the Solid Waste Act 672 to be used affects the quality of solid waste collection and transportation.	0	0.6	32.6	66.9	.486	3.66
AVERAGE MEAN							3.646

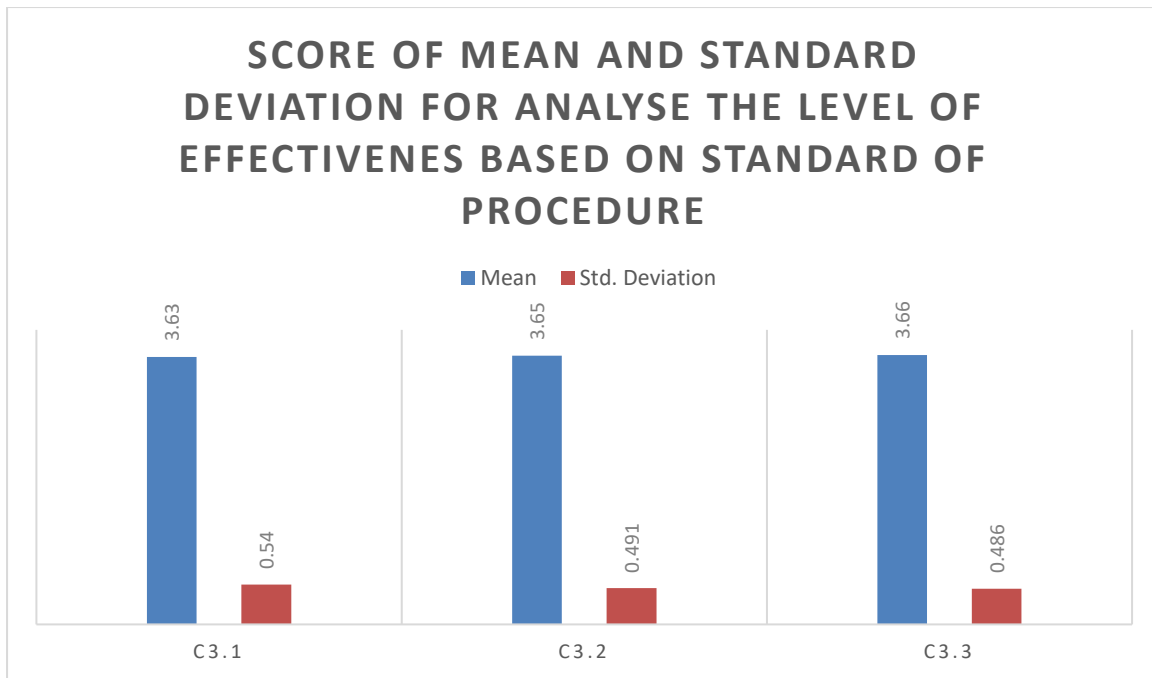


Figure 5.10: Mean and std. deviation score chart for factor standard of procedure

For this construct, the researcher has three items of the standard factor of procedure in solid waste collection and transportation. Referring to the questionnaire given on the standard of the procedure, the researcher found that most of the average respondents agreed with the questions given by the researcher. It also shows that the level of effectiveness of solid waste collection and transportation in eight concessionaires is very much given attention to the importance of the standard of procedure about solid waste management.

Referring to table 5.10 and figure 5.10, showing the mean value of each item in the construct for the standard factor of procedure. In this construction, there are three items related to the standard factor of procedure in solid waste collection and transportation. For item c3.3 the highest mean value among the three items was 3.66. whereas for items c3.1 and c3.2, respectively, the mean value was 3.65 for item c3.2, and the mean value among the three items was 3.63 for item c3.1. overall, the mean of the standard factor of procedure for all three items was moderate to 3.646.

As for standard deviation for each construct on standard of procedure factors been stated. For each construct, the standard deviation value is shown 0.540 for item C3.1. Meanwhile, for item C3.2 and C3.3 each has the same standard deviation value as 0.491 for C3.2 and 0.486 for C3.3.

The conclusion that can be drawn from the three items built into the construct is that the level of worker effectiveness can be improved if the standard aspect of the procedure is known and prioritized in solid waste collection and transportation activities.

5.4.4 Data Analysis for Factor Trip Distance

This section has been designed to identify activity for the standard factor of procedure. Based on Table 5.11, a four-point scale was set for each questionnaire presented in chapter four. The results of the respondents are as shown in table and figure 5.11.

Table 5.11: Analysis score mean and std. deviation for factor trip distance

NO.	ITEM	SCALE LIKENESS (%) N=178				STD. DEVIATION	MEAN
		1	2	3	4		
C4.1	I found that workers are having a hard time moving garbage from the barrels to the trucks because the public garbage can take a long time to clear.	0	0.6	40.4	59.0	.506	3.58

C4.2	I found that irrelevant routes and long delivery times to landfills as well as lack of transfer stations have impacted the solid waste collection and transport process.	0	0.6	39.9	59.6	.505	3.59
C4.3	I found that the location of the landfill located far from the collection area affected the collection and transportation of solid waste.	0	0.6	39.3	60.1	.504	3.60
AVERAGE MEAN							3.590

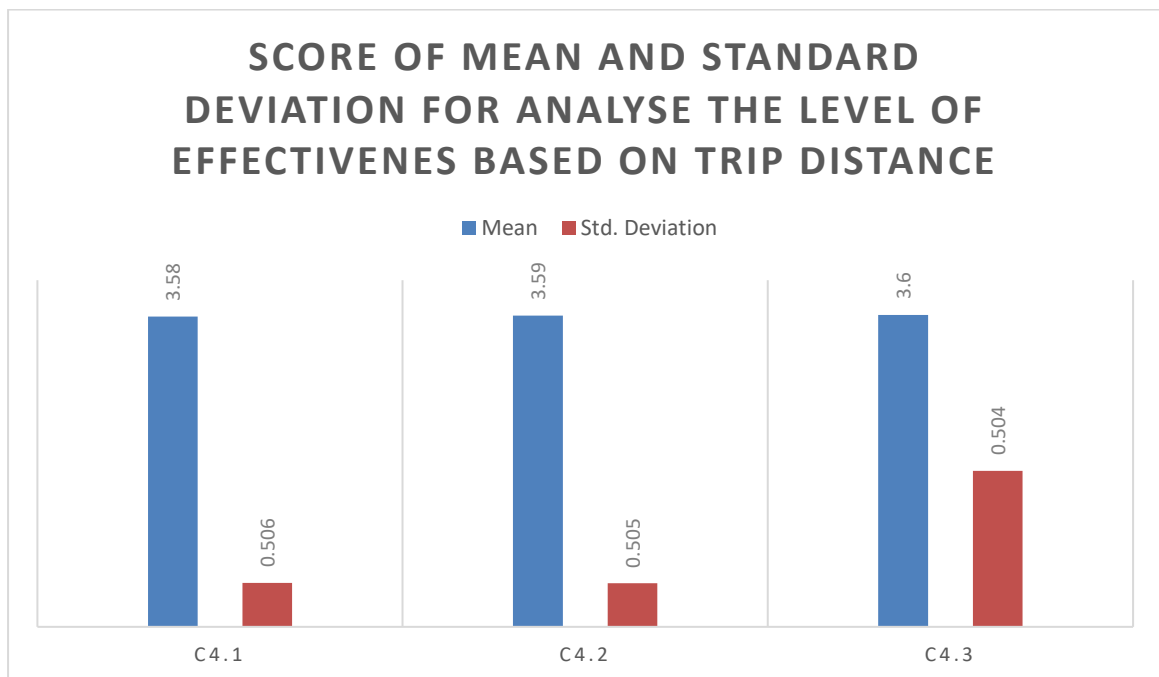


Figure 5.11: Mean and std. deviation score chart for factor trip distance

Referring to table 5.11 and figure 5.11, showing the mean value of each item in the construct for factor trip distance. In this construction, there are three items related to factor trip distance in solid waste collection and transportation. For item c4.3 the highest mean value among the three items was 3.60. meanwhile, for items c4.1 and c4.2 respectively, the mean value was 3.59 for item c4.2 and the lowest mean value among the three items was 3.58 for item c4.1. Overall, the mean of the factor information for the three items is moderate to 3.590.

As for standard deviation for each construct on factor trip distance has been shown. For each construct, the standard deviation value is 0.506 for item C4.1. Meanwhile, for item each has the same standard deviation value as 0.505 for C4.2 and 0.504 for C4.3.

The conclusion that can be made based on the three items built into the construct is that it shows that the level of worker effectiveness can be improved if the aspect of trip distance is improved and prioritized in solid waste collection and transportation activities.

5.4.5 data Analysis for Factor Work Schedule

This section has been designed to identify activity for the standard factor of procedure. Based on Table 5.12, a four-point scale was set for each questionnaire presented in chapter four. The results of the respondents are as shown in table and figure 5.12.

Table 5.12: Analysis score mean and std. deviation for factor schedule of work

NO.	ITEM	SCALE LIKENESS (%)				STD. DEVIATION	MEAN
		N=178					
		1	2	3	4		
C5.1	I found that failure to adhere to the	0	0	53.9	46.1	.500	3.46

	scheduled collection schedule affects the effectiveness of collection and transportation of solid waste						
C5.2	I found that flexible working hours and breaks affect the quality of work collection and transportation of solid waste	0	1.1	34.3	64.6	.506	3.63
C5.3	I found that fewer workers interfere with the effectiveness of solid waste collection and transportation scheduling	0	0.6	41.6	57.9	.507	3.57
AVERAGE MEAN							3.556

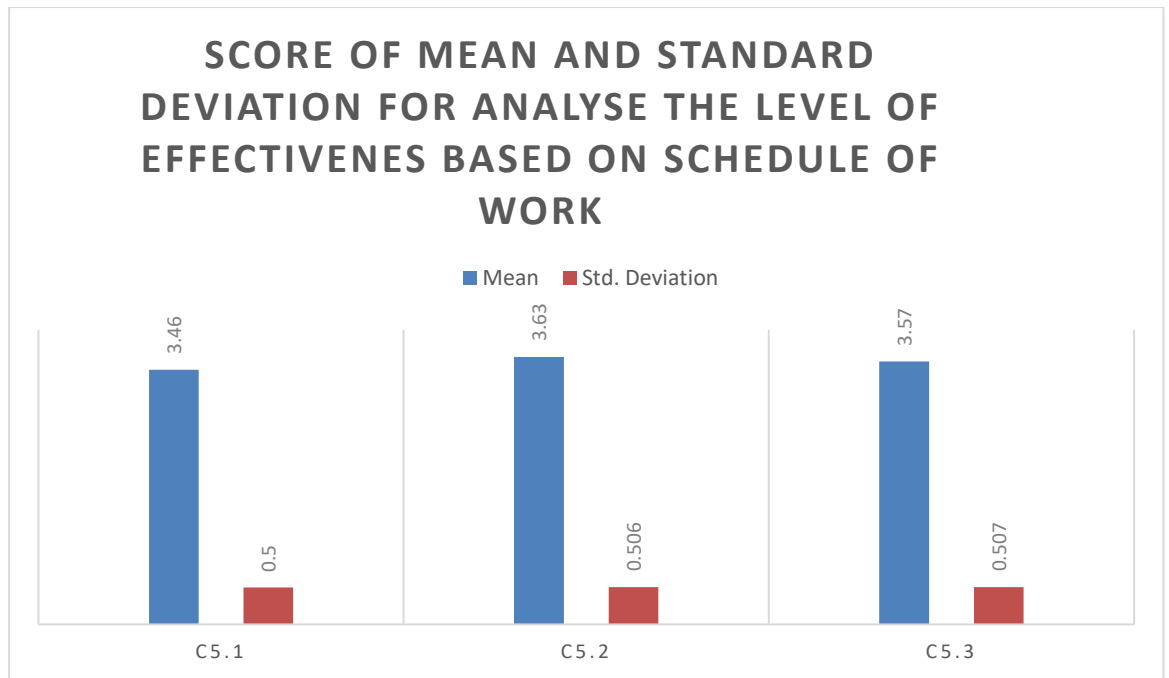


Figure 5.12: Mean and std. deviation score chart for factor schedule of work

For this construct, the researcher has three items for the factor schedule of work in solid waste collection and transportation. Referring to the questionnaire given on the schedule of work, the researcher found that most of the average respondents agreed with the questions given by the researcher. It also shows that the level of effectiveness of solid waste collection and transportation in eight concessionaires is very much given attention to the importance of schedule of work to workers about solid waste management.

Referring to table 5.12 and figure 5.12, showing the mean value of each item in the construct for factor schedule of work. In this construction, there are three items related to the factor schedule of work in solid waste collection and transportation. For item c5.2 the highest mean value among the three items was 3.63. meanwhile, for items c5.1 and c5.3, each had a mean value of 3.57 for item c5.3 and the lowest mean value among all three items was 3.46 for item c5.1. overall, the mean of the factor information for all three items was 3,556.

As for standard deviation for each construct on factors schedule of work been stated. For each construct, the highest standard deviation value is 0.500 for item C5.1. Meanwhile, for item C5.2 and C5.3 each

has the same standard deviation value as 0.506 for C5.2 and 0.507 for C5.3.

The conclusions that can be drawn from the three items constructed in the construct can show that the level of worker effectiveness can be improved if the aspect of the work schedule is enhanced in solid waste collection and transportation activities.

5.5. THE FINDINGS OF THE RESEARCH FOR THE THIRD OBJECTIVE

The findings of the research for the third objective have been done to suggest an improvement to enhance the solid waste collection and transportation in *Pulau Pinang*. The method used to achieve this third objective is to use the semi-structured interview method. The researcher also has conducted a semi-structured interview with the three parties as outlined in the sub-topic research design about validity in chapter three to get their views, suggestions, and any support provided to achieve the third objective.

Table 5.13: Respondent's profile

RESPONDENT	NAME	POSITION / COMPANY
A	Encik Anif Bin Jaafar	Supervisor HWMS Hospital Sungai Petani
B	Puan Rosinah Binti Md Hassan	Supervisor HWMS Hospital Pulau Pinang
C	Encik Abd Majid B. Bajuri	Assistant facility manager Hospital Pulau Pinang

There are several suggestions and improvements that can be made to improve the effectiveness of solid waste collection and transportation in *Pulau Pinang*.

Table 5.14: Questions and suggestions

Interview Question	Suggestions and Improvements
<p>1 In terms of finances, what needs to be done to improve the efficiency and collection of solid waste?</p>	<ul style="list-style-type: none"> • The management of the company should make improvements by minimizing risk by reducing the frequency of waste collection by operators in the waste production areas in Pulau Pinang. • Through automation to reduce manpower consumption and increase machine/machinery usage. • In the case of replacement if the bin citation or bin in the user part is damaged or rusty
<p>2 Does the level of knowledge of workers affect the effectiveness of solid waste collection and transportation?</p>	<ul style="list-style-type: none"> • All workers and management must at least require a high level of knowledge in waste management in terms of efficiency or skills, safety in collection and transportation management, cost management, compliance with guidelines and regulations, and customer satisfaction. • Solid waste operator should be given widely exposure relating to safe management of the waste, on behalf of

		<p>employees operating and managing.</p> <ul style="list-style-type: none"> • Yes, as each residual movement starts from the point of production to the combustion centre (incineration) subject to strict laws, must be tagged and the complete consignment note
3	<p>Do the existing guidelines assist in collection and transportation management in increasing the efficiency of collection and transportation of solid waste?</p>	<ul style="list-style-type: none"> • Are very helpful in carrying out the work with management must be clear and well-informed of the job objective, definition, procedure, and role. • Existing guidelines can help with the way of handling, to be done as soon as possible according to the SOP provided. • Guidelines are clearly defined and added with posters. The description also uses foreign language through experienced employees
4	<p>In addressing issues related to travel distance collection and transportation of solid waste, what should be done in improving the efficiency of collection and transportation of solid waste?</p>	<ul style="list-style-type: none"> • The provision of a secure route for collection of waste as well as adherence to the designated collection schedule should be given attention • Place a transit point with a roof, so that the rest of the

		<p>solid can be placed while the place is closed and clean, while waiting for lorry quote.</p> <ul style="list-style-type: none"> • There needs to be a backup vehicle transport because residual quantity is sometimes soaring. If vehicle backups are not available, the cool room to keep the rest must always be in good condition.
5	<p>Although the work schedule has been created, there is still a shortage in the process of collecting and transporting solid waste. What can be suggested to address this issue.</p>	<ul style="list-style-type: none"> • Management needs to come with the solution needed that are using alternative routes or as planned in the contingency plan as specified in the risk management for the company. • Reduce manpower and require the use of machine for collection process as well as upgrade the covered area when making the collection is available. • It is necessary to provide sufficient time for the staff to discharge their duties properly. Moreover, these activities are carried out by different foreign languages and education levels.

As for the question of financial factors, the three respondent A, B and C agreed that the financial is a very important aspect in increasing the

effectiveness of the collection and transportation of solid waste. In according to perspective respondents, A says that the high cost of the waste management process has little to no effect on job performance. Therefore, the management of the company should make improvements by minimizing risk by reducing the frequency of waste collection by operators in the waste production areas in Pulau Pinang. Meanwhile, respondent B stated that to improve the efficiency collection and transportation are through process automation. It is said can easily reduce manpower consumption and increase machine/machinery usage. According to respondent C, financial is a very important factor in the management of solid waste. This is due to in the case of replacement if the bin citation or bin in the user part is damaged or rusty. As such, it can greatly reduce complaints from the residents of housing in Pulau Pinang.

Subsequently, the second question of this interview was to know does the level of knowledge of workers affect the effectiveness of solid waste collection and transportation. Referring to the three-respondent stated that aside on having knowledge regarding waste management for citizen, worker and management was surely needed through the growing era of globalization, this is to reduce the problems that will arise throughout the solid waste management. By view respondent A, all workers and management must at least require a high level of knowledge in waste management in terms of efficiency or skills, safety in collection and transportation management, cost management, compliance with guidelines and regulations, and customer satisfaction. Meanwhile respondent B also stated solid waste operator should be given widely exposure relating to safe management of the waste and also on behalf of employees operating and managing. It is because all workers and management must at least require a high level of knowledge in waste management in terms of efficiency or skills, safety in collection and transportation management, cost management, compliance with guidelines and regulations, and customer satisfaction. Besides that, respondent C also state that the level of knowledge is important when working. This is because, as each residual movement starts from the point of production to the combustion center

(incineration) subject to strict laws, must be tagged and the complete consignment note.

For third question, do the existing guidelines assist in collection and transportation management in increasing the efficiency of collection and transportation of solid waste. are very helpful in carrying out the work with management must be clear and well-informed of the job objective, definition, procedure, and role. According to respondent A, all of this aspect is important in driving the worker to meet the specifications required and also its aim is to provide a more integrated, planned, managed, efficient, cost-effective and transportation Waste Management system in addition to fulfilling the social responsibility in enhancing and providing a clean environment. Respondent B also argued existing guidelines can help with the way of handling, to be done as soon as possible according to the SOP provided. The diversity of problems and approaches has been implemented but residual improvements still do not reach the expected satisfaction. To prevent this issue from happening, therefore the implementation of work under the standard of the procedure needs to be followed up frequently and updated every year. According to respondent C, guidelines are clearly defined and added with posters and the description also uses foreign language through experienced employees. All of this also showing that by following these guidelines in waste management collection and transportation process are very helpful in carrying out the work with management must be clear and well-informed of the job objective, definition, procedure, and role. All of this aspect is important in driving the worker to meet the specifications required and also its aim is to provide a more integrated, planned, managed, efficient, cost-effective and transportation Waste Management system in addition to fulfilling the social responsibility in enhancing and providing a clean environment. Therefore, the existing guidelines are very helpful in collection and transportation management.

Referring to the fourth question, in solid waste management, to avoid handling trip issue for collection a transportation, a suggestion on a proper route optimization has been proposed. Therefore, according to respondent

A, the provision of a secure route for collection of waste as well as adherence to the designated collection schedule should be given attention by management to avoid this issue from happening and the reason was it is because transportation been recognized as one of the important elements in solid waste management. Besides that, a new optimized route which provides specified time, crew and vehicles for collection of recyclables can be provide via application of Geographical Information System (GIS) in order to meet the above mentioned objective, management need to make sure that there's no problem occur on each stage of the waste treatment from its collection up to its final disposal. Aside from that, respondent B said management must place a transit point with a roof, so that the rest of the solid can be placed while the place is closed and clean, while waiting for lorry quote. Respondent C also state that there needs to be a backup vehicle transport because residual quantity is sometimes soaring. If vehicle backups are not available, the cool room to keep the rest must always be in good condition. Therefore, it is crucial for local authorities to create optimal collection routing plan with waste collection schedule.

For fifth question, in waste management every job and action must be follows up by schedule made by management to smooth out the task collection and transporting the waste to landfill. All three respondent agree that the schedule of work is an important aspect in enhancing effectiveness collection and transportation. According to respondent A, to overcome this issue regarding the schedule of work, management needs to come with the solution needed that are using alternative routes or as planned in the contingency plan as specified in the risk management for the company. By doing that, it can greatly increase the effectiveness of solid waste in collection and transportations in future later. In additions according to respondent B, management need to reduce manpower and require the use of machine for collection process as well as upgrade the covered area when making the collection is available. Besides that, respondent C said and suggest that it is necessary to provide sufficient time for the staff to discharge their duties properly and management is also required to prepare the schedule of proper waste collection and the preparation of bins for

waste isolation is necessary to ensure that waste management can be reduced without any problems arising from the surrounding and the local community. Moreover, these activities are carried out by different foreign languages and education levels.

5.6. CONCLUSION

As a conclusion, based on some of the research results that have been analyzed by the researcher through questionnaire and semi-structured interview have been described very carefully, clearly, and analyzed. All data were collected and processed using the SPSS program. The results of this study have already been discussed using the help of a table and figure made using Microsoft word. A comparison of the mean score and percentage was done according to item satisfaction for each construct. Based on the findings of the study, the researcher has obtained the desired answers to the three objectives for this research.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 INTRODUCTION

This chapter discusses the summary of a comprehensive review of the effectiveness of solid waste collection and transportation in Penang. All data from this discovery has been divided into three matters, which is to summarize the first objective to identify the factor that influence effectiveness of solid waste collection and transportation, formulate the second objective to analyze the level of effectiveness of solid waste collection and transportation and lastly to formulate the third objective to suggest an improvement to enhance the solid waste collection and transportation which is also involved in the scope of research.

Findings from the reference of Chapter one, chapter two, and Chapter 3 have submitted several factors that influenced the effectiveness of solid waste collection and transportation. Meanwhile of data analysis and information obtained in Chapter Five has produced a summary for the findings for each research objective.

Evaluation of the effectiveness of solid waste collection and transportation in Penang is based on the results of the analysis of survey forms and semi-interview questions that have been filled by the study respondents. For scoring the survey form refers to the Likert scale which strongly disagrees, disagree, agree, and strongly agree. The findings from the semi-interview method are to get suggestions and improvements to increase the effectiveness of solid waste collection and transportation involved.

6.2 SUMMARY OF RESULT FOR RESEARCH QUESTION

This study was conducted to study the effectiveness of solid waste collection and transportation. The study found in Chapter 5 will be discussed in greater depth to link the objectives to be achieved in this study. This study has been conducted to:

- i. To identify the factor that influences the effectiveness of solid waste collection and transportation
- ii. To analyze the level of effectiveness of solid waste collection and transportation
- iii. To suggest an improvement to enhance the solid waste collection and transportation

To ensure all the objectives are achieved, the method used is to use survey form methods and semi-structured interviews. All respondent is involved in managing staff and waste management personnel from Majlis Perbandaran Pulau Pinang (MBPP) under the Unit of Solid Waste Management department and the rest of subcontractor were Cahaya Delima Enterprise Sdn. Bhd., Paper Plane Sdn.Bhd, Hayara Sdn.Bhd, RT Jaya Sdn.Bhd, Firwan Merican Sdn.Bhd., Era Bumiway, and lastly SP Maju Sdn.Bhd.

6.2.1 Research Question 1

The findings gained by researchers in achieving the first questions of the study were obtained. As a result of this first question will be built objective to identify the factor that influences the effectiveness of solid waste collection and transportations.

- a) What is the factor that influences the effectiveness of solid waste collection and transportations?

Based on the analysis of several discussions in Chapter 2 of the References and survey forms distributed to the respondent are involved. Several factors have been identified and have also

attained the objective of the first study. The findings of the analysis for objective made in Chapter 5 found that several factors could influence the effectiveness of solid waste collection and transportation. Some of the factors that were successfully identified were factor financial, information, the standard of the procedure, trip distance, and lastly factor schedule of work.

It is effective as the management recognizes and knows that by reducing the frequency of waste collection by the operator can reduce one of the contributors ' factors to the cost of the workforce. Therefore, it is very much helpful to assist staff in solid waste handling if any problems occur. For the standard of the procedure, employees must always adhere to the guidelines solid waste handling properly every time doing work. Besides, in terms of factor trip distance, the management must provide a specific, safe, and permissible route for waste collection and to meet the required collection schedule. Lastly, in terms of the schedule of work, employees must take an initiative to use the route alternative or follow plan contingency as set out in the management without disrupting the operation of collection and transportation.

The results for all 5 elements shown that most of the respondents do aware and notice the solid waste collection and transportations. It is then given a positive view of the researcher regarding these issues. Supported through the interview, these results are positive feedback to eight companies. It is due to the eight-company approach has given a positive view of important solid waste collection and transportation towards the surrounding. It is also very important and give a positive impact on the company.

6.2.2 Research Question 2

For research question 2, is derived from objective 2.

b) How to analyze the level of effectiveness based on factors that influence of solid waste collection and transportation?

Based on the second objective of the study, data analysis was performed using mean and standard deviation score analysis in statistical package software for social science (SPSS). The second question of this study has been discussed in more detail in chapter 5 and indirectly the results of data analysis in studying the effectiveness of solid waste collection and transportation can be known more clearly.

Several elements have been used for the effectiveness of solid waste collection and transportation in Pulau Pinang that are financial, information, the standard of the procedure, trip distance, schedule of work.

6.2.3 Research Question 3

The third question of the study researchers wants to know whether how to enhance the effectiveness of solid waste collection and transportation can be implemented.

c. How to enhance the effectiveness of solid waste collection and transportation?

Based on the third objective of the study, the results of the analysis for Chapter 5 were discussed in the form of proposals and improvements to the factors that have been analyzed. Overall, the management of the waste company must ensure that all aspects of solid waste management can be carried out

properly to enhance the effectiveness of solid waste collection and transportation.

Among the several reserves given are with the cost of collection and transportation operations, always send workers to the exercise of waste control, always alerts and adhere to the standard of procedures provided, providing a special route that can deliver the time of waste delivery to the disposal and end sites once always ensure that workers comply with the schedule of work so that there is no problem. In the end, the management must ensure that the solid waste collection and transportation process goes smoothly without any problems arising later.

6.3 IMPLICATION OF RESEARCH

Concerning the framework in Chapter 2, the results of the study showed that it could help in various aspects. Based on several pieces of evidence that have been found and discussed in more detail in this study and the findings of the analysis have been able to produce some suggestions and improvements that can also be used as a reference by solid waste management. Apart from that, some proposals were also provided to overcome any existing problems and deficiencies based on the number of factors previously mentioned. Medications researchers are hopeful that the proposed improvement will be focused and can be used as a reference to all management and employees.

6.4 RESEARCH LIMITATION

Throughout the study conducted, the reviewer had faced some difficulties in obtaining data in terms of obtaining information to analyze data from the respondent involved in this study.

To obtain the study data, the researcher faced the Covid-19 pandemic problem that has hit Malaysia. However, due to this, the distribution of survey forms had to be postponed for two months due to the threat factor Covid-19, and also any work matters had to be postponed until the situation began to improve. This caused the researcher to have to wait longer for the respondent to start completing the survey form.

Besides, the researcher also faced some problems in conducting interview sessions with respondents at the study site. The total number of respondents involved with this interview method was three people. There are only two respondents who have time constraints for researchers to conduct interviews. Therefore, to arrange a suitable time to conduct the interview, to get feedback, the researcher had to add time for a week to get feedback.

Besides that, the researcher also faced some problems regarding time constrain to conduct the research. It is due to the process of permission by Majlis Perbandaran Pulau Pinang (MBPP) that taken too long than expected. Besides that, the researcher also needs to spend more time wisely to ensure that the analysis from the three types of data collection is more sufficient enough to record in the report.

6.5 RECOMMENDATION AND SCOPE OF FURTHER STUDY

This study may be a preliminary study that only involved a number of the parties involved during this study that's comprised of management staff and waste management employees from the Penang Municipal Council (MBPP) under Unit of Solid Waste Management department and therefore the remainder of subcontractor were Cahaya Delima Enterprise Sdn. Bhd., Paper Plane Sdn.Bhd, Hayara Sdn.Bhd, RT Jaya Sdn.Bhd, Firwan Merican Sdn.Bhd., Era Bumiway, and lastly SP Maju Sdn. Bhd. from the results of the study that has been implemented, the researcher has found some problems and therefore the researcher

would really like to offer some suggestions that are expected to unravel the matter. Among them are:

- 1) The value factor is extremely influential within the success of excellent solid waste management. Therefore, management should find an initiative in addressing the difficulty of capital constraints to further improve the standard of services to the community.
- 2) If any additional maintenance workers are done by the management must include them with Management training on collection and transportation also as exposing them to the right way of working.
- 3) All work administered must be guided by the quality of the procedure began within the company quality and environmental manual. for instance, complaints received concerning non-clean and dirty environments showing waste collection and public cleansing services aren't properly performed. This shows that employees must make sure that whenever the waste collection process is completed, the environment must be cleaned.
- 4) Issues associated with routing also are highlighted. Therefore, to avoid that, planning each route in each collection round by taking account of the space traveled, traffic levels, and safety to the general public and also the waste collectors to form sure that when directly transport the solid waste collection to the landfills there'll be no problem occur ahead.
- 5) Apart from the work schedule that has been prepared, but there are still issues that occur from the area people. Therefore, management should check the way and work schedule of employees by holding meetings and discussing if any problems occur.

6.6 CONCLUSION

In conclusion, the research aimed to spot the challenges that impede the effectiveness of solid waste collection and transportation. The research and analysis show that waste management and lots of issues associated with this are related to lots of challenges for Pulau Pinang. Increasing the notice of the citizens for the importance of maintaining a clean-living environment is of crucial importance. To positively contribute toward a well-maintained environment, must by improving the gathering and transportation of solid waste. However, achieving these improvements isn't easily possible, especially considering the financial difficulties that responsible institutions encounter.

The study also found that the bulk of the solid waste generated reception was largely from food debris and plastics, which were mainly stored in uncovered plastic containers and disposed of with none separation do. Some community members practiced crude dumping in any available space, including gutters, holes, streets, and bushes Although waste was disposed of appropriately at communal sites. All levels in solid waste management should provide good cooperation in doing all the work that has been given to make sure that the effectiveness of solid waste collection and transportation are often improved and achieved.

With that, in achieving the effective solid waste collection and transportation, with a touch push, support, and education to enhance people's practices and perceptions regarding waste management, a number of the challenges confronting municipalities within the area of waste management are often minimized.

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APPENDICES



QUESTIONNAIRE FORM

A STUDY ON THE EFFECTIVENESS OF SOLID WASTE COLLECTION AND TRANSPORTATION IN PULAU PINANG

This questionnaire is used to make a survey on the effectiveness of solid waste collection and transportation in Pulau Pinang related to solid waste management in terms of collection and transportation.

All information provided is CONFIDENTIAL and is for review purposes only.

There are 3 sections in this questionnaire:

Section A: Respondents' Demographics

Section B: Identifying Factor That Influence Effectiveness of Solid Waste Collection and Transportation

Section C: To Analyses the Level of Effectiveness of Solid Waste Collection and Transportation

Your cooperation is greatly appreciated and we thank you in advance

SECTION A: RESPONDENTS' DEMOGRAPHICS

Instructions: This section is a survey of your background. Please tick (/) in the space provided.

1. Company's name

Company's name	TICK (✓)
Cahaya Delima Enterprise Sdn. Bhd.	
Paper Plane Sdn Bhd	
Hayara Sdn. Bhd.	
RT Jaya Sdn. Bhd.	
Firwan Merican Sdn. Bhd.	
Era Bumiway	
SP Maju Sdn. Bhd.	
Majlis Bandaraya Pulau Pinang	

2. Gender

Men

Women

5. Scope of work

Top management

Waste management

3. Age

a) 16 – 25

b) 26 – 35

c) 36 – 45

d) 46 upward

4. Service Period

a) Less than 6 months

b) 6 months – 2 year

c) 3 year – 5 year

d) 6 year – 8 year

e) 9 year upward

Section B: Identifying Factor That Influence Effectiveness of Solid Waste Collection and Transportation

Instructions: This section is based on your experience and knowledge. Please mark (/) on a scale of 1-5.

Rating Level	Strongly Disagree	Do Not Agree	Agree	Strongly Agree
	1	2	3	4

B1 . FINANCIAL		1	2	3	4
B1.1	High operating costs affect the effectiveness of waste collection, management and transportation processes.				
B1.2	Relevant workers' salaries affect the performance of the collection, collection and transportation of waste.				
B1.3	Payment of overtime incentives affects the quality of work of workers collected and transportation of solid waste.				

B2. INFORMATION					
B2.1	Performing cleaning work after collection affects the effectiveness of collection and transportation of solid waste				
B2.2	Workers need to be knowledgeable about the process of collecting and transporting solid waste				
B2.3	Effective communication between workers and employers affects the quality of solid waste collection and transportation.				
B3. STANDARD OF PROCEDURE					
B3.1	The guidelines set out facilitate the collection and transportation of solid waste				
B3.2	The company adheres to guidelines regarding the process of collection and transportation of solid waste.				
B3.3	The Solid Waste Act 672 applies to the quality of solid waste collection and transportation work.				

B4. TRIP DISTANCE				
B4.1	Workers are having a hard time moving garbage from the barrels to the trucks because the public garbage can take a long time to clear.			
B4.2	Irrational routes and long delivery times to landfills and lack of transfer stations affect the process of solid waste collection and transportation.			
B5.3	The location of the landfill located far from the collection site affects the process of collecting and transporting solid waste.			
B5. WORK SCHEDULE				
B5.1	Failure to adhere to the planned collection schedule affects the effectiveness of collection and transportation of solid waste			
B5.2	Flexible working hours and breaks affect the quality of work collected and transportation of solid waste			
B5.3	The low number of workers interferes with the effectiveness of work scheduling and transportation of solid waste			

Section C: To Analyse the Level of Effectiveness of Solid Waste Collection and Transportation

		1	2	3	4
C1. FINANCIAL					
C1.1	I find that high operating costs affect the effectiveness of waste collection, management and transportation processes.				
C1.2	I have found that relevant employee salaries affect the workload of collection, collection and transportation of waste.				
C1.3	I have found that overtime incentive payments affect the quality of work collected and solid waste transport.				
C2. INFORMATION					
C2.1	I have found that cleaning work after collection affects the effectiveness of collection and transportation of solid waste				

C2.2	I find that employees need to be knowledgeable about the process of collecting and transporting solid waste				
C2.3	I have found that effective communication between workers and employers affects the quality of work collected and transportation of solid waste.				
C3. STANDARD OF PROCEDURE					
C3.1	I find the guidelines set to facilitate the collection and transportation of solid waste				
C3.2	I find that the company adheres to the guidelines regarding the process of collecting and transporting solid waste.				
C3.3	I find the Solid Waste Act 672 to be used affects the quality of solid waste collection and transportation.				
C4. TRIP DISTANCE					
C4.1	I find that workers are having a hard time moving garbage from the barrels to the trucks because the public garbage can take a long time to clear.				
C4.2	I have found that irrelevant routes and long delivery times to landfills as well as lack of transfer stations have impacted the solid waste collection and transport process.				
C4.3	I found that the location of the landfill located far from the collection area affected the collection and transportation of solid waste.				
C5. WORK SCHEDULE					

C5.1	I have found that failure to adhere to the scheduled collection schedule affects the effectiveness of collection and transportation of solid waste				
C5.2	I have found that flexible working hours and breaks affect the quality of work collection and transportation of solid waste				
C5.3	I have found that fewer workers interfere with the effectiveness of solid waste collection and transportation scheduling				



INTERVIEW FORM

A STUDY ON THE EFFECTIVENESS OF SOLID WASTE COLLECTION AND TRANSPORTATION IN PULAU PINANG

This interview form is used to conduct a survey on the effectiveness of solid waste collection and transportation in Pulau Pinang related to solid waste management in terms of collection and transportation. All information provided is CONFIDENTIAL and is for review purposes only.

1. In terms of finances, what needs to be done to improve the efficiency and collection of solid waste?
2. Does the level of knowledge of workers affect the effectiveness of solid waste collection and transportation?
3. Do the existing guidelines assist in collection and transportation management in increasing the efficiency of collection and transportation of solid waste?
4. In addressing issues related to travel distance collection and transportation of solid waste, what should be done in improving the efficiency of collection and transportation of solid waste?
5. Although the work schedule has been created, there is still a shortage in the process of collecting and transporting solid waste. What can be suggested to address this issue.