



PONDOK'S COMMUNITY PARTICIPATION ON SUSTAINABLE SOLID WASTE MANAGEMENT

by

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A report submitted in fulfilment of the requirements for the
degree of Bachelor of Applied Science (Sustainable Science)
with Honours

**FACULTY EARTH SCIENCE
UNIVERSITI MALAYSIA KELANTAN**

2021

THESIS DECLARATION

I hereby declare that the work embodied in this report is the result of the original research and has not been submitted for higher degrees to any universities or institutions.

.....

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I certify that the Report of this final year project entitled 'Pondok's Community Participation in Sustainable Solid Waste Management by Nur Athirah bt Barudin, matric number E17A0040 has been examined and all correction recommended by examiners have been done for degree of Bachelor of Applied Science (Sustainable Science) with Honours Faculty of Earth Science, University Malaysia of Kelantan.

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ACKNOWLEDGEMENT

Firstly, I pay my gratefulness to the Almighty Allah for giving me the ability to work on this Final Year Project successfully until the end.

I would like to express my gratitude and respect to my supervisor Dr. Muhammad Azahar bin Abas who had been constant guidance and always giving pieces of advices that really help me a lot in finishing my final year project on Pondok's Community Participation in Sustainable Solid Waste Management especially in data analysis. He had shared his knowledge that was crucial in doing this research as flawless as possible and help me recognizing my mistake during thesis writing. Special thanks to Dr. Nor Shahirul Umirah bt Idris, as final year project coordinator who had been giving clear instructions and reminder so that I submit the thesis paper on time.

I also appoint my thank to respondents who willing to spare their time filling up the survey questions. I would also like to express my gratefulness to my fellow classmates who had always been positive and always encourage me to keep doing my best. Finally, my sincere gratitude to my parents and family members for their words of support, encouragement and prayers for me to complete this final year project report.

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Pondok's Community Participation on Sustainable Solid Waste Management

ABSTRACT

A rapid increase in population growth and urbanization leads to increasing waste generated by the community and decreasing land availability to provide a solid waste disposal site. Waste reduction practices by the community such as recycling and composting are important to reduce waste disposal into landfills as the local residents will learn how to manage their wastes and eventually practice it in their daily lives. This study is focuses on a community of *pondok* institution to know the level of awareness and knowledge of *pondok's* community so that the sustainable solid waste programmes will be long-lasting and effective in addressing the solid waste management issues at *pondok*. The study showed an overview of the *pondok's* community awareness and knowledge on solid waste management. It also showed an overview relationship between knowledge and awareness to barriers and participation of *pondok's* community in sustainable solid waste management. By acknowledging these factors, the responsible party or the top management of *pondok* Institution can figure out programs to increase the *pondok's* community awareness and knowledge. This study used stratified sampling technique and had collect data from 99 respondents. This study used Google form to collect information from respondents. After that, the data was processed SPSS software with various analyses such as descriptive analysis, t-test, ANOVA, and correlation analysis. The result showed that the level of knowledge and awareness of *pondok's* community is high, however the barriers and participation level was moderate. The result of this study showed different result compare to other studies where there is weak relationship between knowledge, awareness with barriers in Sustainable Solid Waste Management (SSWM). However, there is strong relationship between knowledge, awareness, and barriers with participation in SSWM.

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Penyertaan Komuniti Pondok Dalam Pengurusan Sisa Pepejal Lestari

ABSTRAK

Peningkatan populasi dan pembangunan pesat mendorong kepada peningkatan sisa pepejal yang dihasilkan oleh komuniti dan pengurangan tanah lapang yang boleh dijadikan kawasan pembuangan sisa pepejal. Amalan pengurangan sampah oleh masyarakat seperti kitar semula dan kompos adalah penting bagi mengurangkan pembuangan sisa pepejal ke tempat pembuangan. Amalan ini juga dapat memberi pengetahuan kepada komuniti untuk menguruskan sisa pepejal dengan betul dalam kehidupan seharian mereka. Kajian ini befokus kepada komuniti Institusi Pondok dimana untuk mengetahui tahap pengetahuan dan kesedaran masyarakat pondok supaya program berkaitan sisa pepejal akan bertahan lama dan akan berkesan dalam menangani masalah pengurusan sisa pepejal di pondok. Kajian ini memberi gambaran mengenai kesedaran dan pengetahuan masyarakat pondok mengenai pengurusan sisa pepejal. Ia juga memberi gambaran mengenai hubungan antara pengetahuan, kesedaran, halangan dan penyertaan komuniti pondok dalam pengurusan sisa pepejal lestari. Dengan faktor-faktor ini, pihak yang bertanggungjawab atau pihak pengurusan tinggi Pondok dapat menyediakan program sesuai yang dapat meningkatkan pengetahuan dan kesedaran masyarakat pondok. Kajian ini menggunakan *stratified sampling* dan telah menggumpul data dari 99 orang responden. Kajian ini menggunakan Google form untuk mengumpulkan maklumat daripada responden. Setelah itu, data akan diprocess dengan software SPSS dengan pelbagai analisis seperti analisis deskriptif, *t-test*, ANOVA, dan *correlation analysis*. Hasil daripada kajian ini menunjukkan tahap pengetahuan dan kesedaran masyarakat penduduk pondok adalah tinggi, namun tahap halangan dan penyertaan berada di tahap sederhana. walaupun berbeza dengan kajian lain, kajian ini menunjukkan bahawa terdapat hubungan yang lemah antara pengetahuan, kesedaran dengan halangan, namun terdapat hubungan yang kuat antara pengetahuan, kesedaran, halangan dengan penyertaan dalam pengurusan sisa pepejal lestari.

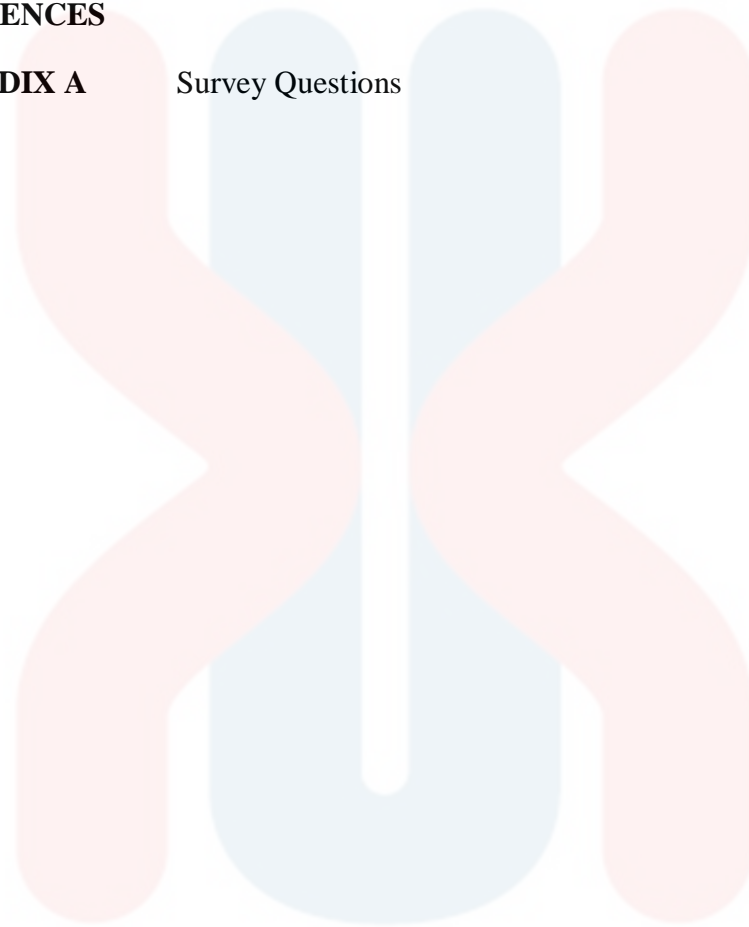
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LIST OF ABBREVIATIONS

YPPM	Yayasan Pembangunan Pondok Malaysia
SSWM	Sustainable Solid Waste Management
WMAM	Waste Management Association for Malaysia
SSI	Separation Source Initiative

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LIST OF SYMBOLS

%	Percentage
\geq	Equal and more than
x	Multiply
n	Frequency



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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Exponential human population growth combined with increased industrialization and urbanization has caused massive waste production (Das et al., 2019). World's cities generated 2.01 billion tonnes of solid waste in 2016. With the increasing pace of population and urbanization, it is estimated that the annual waste generation to increase by 70% from 2016 levels to 3.40 billion tonnes in 2050 (The World Bank, 2019). Equally concerning is the situation in rural areas where scientific waste management methods are in dearth. A rapid increase in population growth and urbanization leads to increasing waste generated by the community and decreasing land availability to provide a solid waste disposal (Moh & Manaf, 2014). Wastes acquire land for its disposal and can lead to environmental concerns due to limited spaces and limited sources.

Solid waste management is the activities that were done to handle the wastes from its origin to its final disposal. The activities include collection, transport, treatment, disposal of waste, monitoring and regulation of the waste management

process. In Malaysia, the amount of solid waste that was disposed into landfills is 95% according to Ministry of Urban Well-Being, Housing and Local Government (MHLG, 2012). If this continues, there will be not enough land to support all the solid wastes. This is why it is essential to have waste reduction techniques such as recycling and composting to reduce waste disposal into landfills. According to the Ministry of Urban Wellbeing, Housing and Local Government (MHLG, 2013), even after recycling program launched in 1993, the present recycling rate in Malaysia is approximately 15.4 %. Solid waste management must be efficient to avoid unwanted environmental problems because of illegal dumping by the local community. Therefore, solid waste management must include all people, including the local community and not only the garbage collector. Engaging residents in solid waste management is highly encouraged because the residents will learn how to manage their wastes and eventually practice it in their daily life. This will improve their environmental knowledge, behaviour and awareness. In the previous solid waste management programs, the local community engagement is lower. A recycling program that was done by Penang government by 2001 meet an end when the provided recycling bins were misused where the recycling bins contain at least 40 – 60 % non-recyclable material (Clean Malaysia Team, 2015). A study shows that recyclable products are not entirely recovered and recycled, as recycling activity is not widely practiced among Malaysia residents (Fauziah & Agamuthu, 2012). Another reason for lower public participation is insincerity in undergoing the programs as they do not get involved in the earlier stages. The challenge in waste separation and recycling activity is the public attitude in making it a habit. The mentality of Malaysia residents towards cleanliness, responsibility to manage waste properly, and concerns toward environmental is still lacking (Omran et al., 2009).

These attitudes can be seen in the cases of increasing illegal dumping and open dumping.

The emergence of solid waste management programs such as recycling, reuse, reduce and composting program is encouraged because such programs will educate the community regarding managing waste properly. Rather than throwing away their waste, they can either recycle or reuse it again. They can also turn their solid waste especially their food waste into organic compost using the right techniques taught by this solid waste management program.

The Traditional Islamic Education Institution (referred as “*Pondok*”) has been known as part of the formal traditional religious educational system in Malaysia. The *pondok* institution is well accepted by most Malay Muslim all level of ages. Traditionally the *pondok* institution was conveyed at surau, masjid or in home of the ‘Imam’, however within time *pondok* Institution is more into a modern rational institution with its own building to learn Islamic studies and memorizing Al-Quran (Ozay, 2011). The *pondok* education was getting more popular in Malaysia as Yayasan Pembangunan Pondok Malaysia (YPMM) state that, there were 242 *pondok* institutions in Malaysia and 62 of the list situated in Kelantan. According to Fazial & Bahari (2018) *pondok* administration faced various issues regarding management and administration such as lack or shortage of trained staff and expert in the management of institutions and finance. Such issues can lead to mismanagement of finance in managing solid waste at *pondok* institution thus will cause improper disposal of waste among *pondok*’s community.

1.2 Problem Statement

There are various solid waste management programs held by the government and non-governmental agencies at education institution like *pondok* institution involving the community. Still, none of the programs long-lasting as there is lower participation of the education institution community in the program which is due to lack of adequate organization, mobilization and coordination of local resources and community empowerment in the solid waste management program.

According to Sinthumule & Mkumbuzi (2019), insufficient knowledge on the importance of separating waste at source cause the participation, attitudes and behaviour of local residents to be lacking even though the people know that there are sustainable waste management programs in the local area. Other than that, top-down approaches also one of the reasons why the program held not long-lasting. The approach creates passive citizens that solely depend on the local authorities to manage and solve the solid waste with the basis of paying taxes to the local municipalities (Moh, 2017). Even though there is a lot of money allocated to solid waste programs in developing countries, the awareness of sustainable solid waste management is still low. This is probably due to bureaucratic interference or “top-down” approaches where the interests and desires of community are not considered (Maiyaki, Marzuki & Mustafa, 2018). Top-down approaches is typically implemented without public participation in the decision-making process on its implementation, such as types of products that they are willing to recycle, the type of collection method that convenient for them or the type of economic resources to help maintaining these recycling programs (Keramitsoglou & Tsagarakis, 2013). It can be concluded that the low participation of the community in solid waste management programs is due to a lack of awareness, attitude and knowledge on the importance of

these programs. Lack of participation in local residents is showed by littering habits, lack of cooperation in taking care of the environment and poor interest in waste management.

Due to lack of expert in managing financial in *pondok* institution, it will lead to a greater problem; the mismanagement of solid waste disposal by *pondok* institution. The former stereotype of *pondok* (especially the old one) was seedy, squalid, and dirty due to reason of isolated location, limited land, and limited funding. Therefore, it negatively affects the health of traditional Islamic boarding school community (Abu-Hola, 2009). As community participation is important in managing the solid waste, it is important to include all *pondok's* community to involve in counter this issue. In order to know the suitable programmes to be implemented in the *pondok* institution, it is best to know the level of awareness and knowledge of *pondok's* community so that the programmes will be long-lasting and effective in addressing the sustainable solid waste management issues. Other than that, there are barriers that could prevent the implementation and success of sustainable solid waste management such as operational, institutional and educational factors. Therefore, the aim of this study is to measure the level of *pondok's* community participation in sustainable solid waste management.

1.5 Objectives

The objectives of this study are:

- i. To examine the awareness and knowledge of the *pondok's* community on sustainable solid waste management practice.
- ii. To analyse the barriers of sustainable solid waste management practices at *pondok* institution.

- iii. To analyse the participation of *pondok's* community towards solid waste management programs.

1.6 Scope of Study

The study was conducted at the *pondok* institutions in Kelantan area. The study identified the awareness, knowledge and participation of the *pondok's* community. This study also identified the barriers of sustainable solid waste management at *pondok* institution. The data was acquired by online survey using Google form. The data was analysed by using descriptive and inferential analysis.

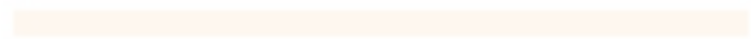
1.7 Significant of Study

Sustainable solid waste management can help in reducing solid waste generation as it prioritizes reducing wastes at source in the first place. After that, separating wastes by using various recycling and composting techniques in lessening their waste in a dumping site. The study will give an overview of the *pondok's* community awareness and knowledge on solid waste management. Other than that, the study will also examine the attitude of *pondok's* community in managing waste and their attitude towards environment. By acknowledging these factors, the responsible party or the top management of *pondok* institution can figure out programs to increase the awareness and knowledge of the *pondok's* community. By increasing the awareness and knowledge, the attitude of the *pondok's* community might also change towards more environmentally friendly attitude. As this study will also identify the barriers of sustainable solid waste management, the data can be used in reducing and preventing the barriers. The result of this study can be used by stakeholders such as *pondok* administration in addressing suitable solid waste

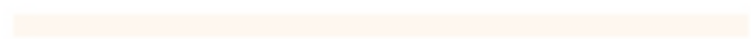
management programme or practices that will suit the level of awareness and knowledge of the *pondok* community.



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CHAPTER 2

LITERATURE REVIEW

2.1 Solid Waste Management

The increasing volume of solid waste has become a big issue where it will pose severe risks to the environmental ecosystem and human health. There are 11.2 billion tonnes of solid waste collected every year and the amount of solid waste generated will increase rapidly if the waste generated is not reduced and appropriately managed (UN Human Settlements Programme, 2010). There are several components of managing solid waste, including collection, handling and separating the waste, storage and processing at the source, segregation, processing and transformation of solid waste, transfer and transport the wastes, disposal, reusing, landfills, and energy generation by incineration. Waste reduction; recycling and reuse are important function of municipal solid waste (Almasi et al., 2017). European Union introduces five-step waste hierarchy which showed in Figure 2.1 state that prevention is the best option, followed by re-use, recycling, recovery, and the last option is disposal (European Commision, 2010).

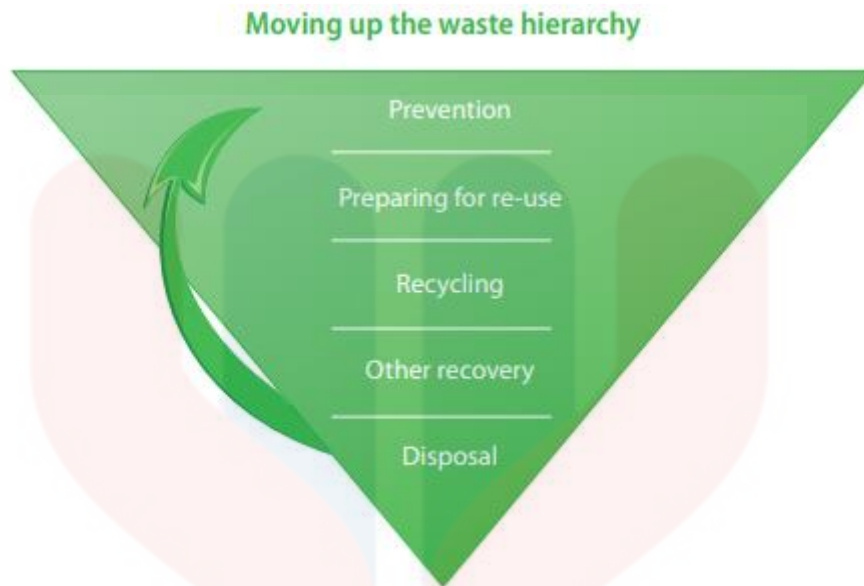


Figure 2.1: Waste hierarchy. From “Being Wise with Waste: The EU’s Approach to Waste Management”, by European Commission. Environment Directorate-General. (2010).

As for Malaysia, a developing country, the traditional municipal solid waste practice is conventional landfilling disposal (Kadir et al., 2013). In the existing management system for controlling wastes in Malaysia, the end-of-pipe approach was practiced (Kojima & Damanhuri, 2009). According to Behzad et al. (2011), approximately 95 to 97 % of solid wastes were sent without proper process to landfill for disposal. With the current issues of increasing solid waste, the Malaysian government has proposed alternative method for the solid waste management to reduce reliance on landfill system (Tan et al., 2015). In the Tenth Malaysia Plan, the government considered using alternative methods such as waste-to-energy, composting, non-organic waste recycling and inert landfill solution to minimise the dependency on the conventional collection and unsanitary disposal in landfill (Fazeli et al., 2016).

2.2 Sustainable Solid Waste Management (SSWM)

There are many concepts and approaches to sustainable solid waste management. Waste minimisation is one of sustainable solid waste management practices. The minimization of waste typically involves knowledge about the production process, cradle-to-grave analysis and thorough knowledge of waste composition (Sreenivasa et al., 2012). The cradle-to-grave approach, also known as Life Cycle Assessment (LCA), is a holistic approach that quantifies all environmental burdens and environmental impacts over the product's entire life cycle or processes (Rebitzer et al., 2004). This approach will ensure that all waste generators handle the wastes from the time wastes are created, transported, recycled, treated and finally disposed with care. In connection to cradle-to-grave, this approach aims for waste-free production methods where products are designed to the principles of a circular economy. Cradle-to-cradle focused on putting product's input into use. This approach has two cycles; biological cycle where materials are returned in the form of nutrients or compost, and technical cycle where materials can be reprocessed and reused in a new product. Other than that, 3R's approach can reduce paper and plastics waste to the disposal site. 3R's consists of reduce, reuse and recycle. It also included in waste minimisation hierarchy. Reduce refers to decreasing the production and consumption in the maximum rate. Meanwhile reuse refers to finding creative ways to reuse items such as plastic container, glass jars, and newspapers instead of disposing of them. Recycle refers to the transformation of a product into reusable material that can be used as raw materials. To implement the 3R culture in the community, awareness programme regarding 3R practices is important to train people on importance of waste minimization (Sreenivasan et al., 2012). Sustainable solid waste management can bring benefits in economic sector.

Economic benefits can be achieved if the wastes are seen as resources such as getting incentives if wastes are correctly disposed. For example, organic wastes can be converted into useful manure using vermicomposting process (Bhat et al., 2018).

In 2007, Solid Waste Management and Public Cleansing Act (Act 672) was established and it was applicable to Peninsular Malaysia and the territories of Putrajaya and Labuan. Under this act, Head Director will be the responsible person for the management part. The important function of Head Director is to define requirements, specifications and codes of practice in compliance with Act 672. The Head Director will conduct Act 672 and provide licenses and approvals to corporation that handle wastes such as SWCorp and Alam Flora Sdn. Bhd. Other than that, Malaysia also establishes The Waste Management Association for Malaysia (WMAM) in March 2015. WMAM plays an important role in monitoring the Malaysia waste management services in order to maintain the quality of waste management. MWAM is a non-profit organization which provides a technical and educational forum and serves as platform to address waste management issues. The WMAM will keep up with problems regarding solid waste management and provide suggestions and information on practical of solid waste management services. Malaysia has taken a serious action in managing the waste by launching the Solid Waste and Public Cleanliness Management Act 2007 (Act 672) Separation at Source Initiative (SSI), which started by September 2015. This act aims at separating waste in residents and retailers. All household are obliged to separate waste in their home before putting it at the edge of the dustbin for the local authority to collect the garbage. However only six states implemented the SSI policy which are Kuala Lumpur, Putrajaya, Pahang, Johor, Melaka, Negeri Sembilan, Kedah and Perlis as only three major private concessionaires which are E-Idaman Sdn. Bhd, SWM Env

Sdn. Bhd, and Alam Flora Sdn. Bhd. that agreed on the SSI programs (Razali & Wai, 2019). This practice is helpful in reducing waste at source and total waste delivered to landfills (NSWMD, 2015).

2.3 Barriers in Sustainable Solid Waste Management System

Sustainable solid waste management is facing several barriers preventing the full success of reducing and minimizing solid waste generation. According to Ezeah & Roberts (2012), Sustainable Solid Waste Management (SSWM) face four main categories of barriers; institutional/regulatory barriers, natural/physical barriers, operational barriers, and socio-economic barriers. The study area residents agree that the low level of public education is the main barrier that constraint SSWM in Abuja. Other than that, waste samples from Abuja that tend to be denser and higher in moisture content were also among barriers in sustainable solid waste management in Abuja, Nigeria. This is because, globally available waste management solutions are not designed to accommodate and manage such solid wastes variations. Operational constraint includes unavailable basic materials for solid waste collection such as black bin bags, limited waste handling vehicles, high cost in equipment and maintenance, and chances for sustainable training in methods of solid waste management are hardly available for operational staff. Socio-economic realities become major block especially the people that have an economic struggle. Other than that, problems such as limited funding available to waste management authorities not applied wisely is one of the barriers that block the success of SSWM. Sometimes, politically expedient but ad-hoc solutions are adopted at the expense of well-articulated programmes aimed at waste minimization.

Based on Fuzzy Delphi method, which identifies seven aspects and 146 proposed barriers, four important barriers that can prevent sustainable solid waste management which are technical difficulties, information sharing and knowledge problems, limitations of human resources and financial/economic problems (Bui, Tsai, Tseng, & Ali, 2020). The study also identified particular 44 of 146 barriers as major barriers, including household hazardous waste, insufficient funding for SWM research, local architecture, lack of staff capability and a lack of a standard process of data collection and analysis process are defined as the top significant SSWM barriers.

In Malaysia, a Separation Source Initiative (SSI) was launched with the aim to make waste separation at source as a practice among Malaysian. However, there are still some people that resists in practising the waste separation. One main reason that can be behind this issue is the lack of awareness by residents toward the significance of waste separation and recycling activity (Razali & Wai, 2019). Local authorities also should consider making a policy regarding solid waste management that favour the environment, economic and public concerns (Fauziah and Agamuthu, 2012). In addition, the lack and inconsistency in supporting the existing regulations could be one of the reasons for low community participation in waste management (Razali & Wai, 2019).

2.4 Factors that influence the community participation in Sustainable Solid Waste Management

In order to cope with environmental problems issues, it is crucial that sustainable solid waste approaches are introduced and must include local residents' participation so that the implementation of sustainable solid waste management

meets its goal in reducing and minimizing solid waste management generation. As most waste is generated by the community especially household, it is important to involve the community in waste management as the main goal is to reduce waste at the source. Suppose solid waste management program involves the community. In that case, the community participation will promote success. People that are involved will have a sense of ownership of the project and will lead to more consistent commitment, effort, time on task and increased task mastery. It will give the community involved a collective interest and perhaps compels the group to do anything possible to ensure the solid waste management project success. Thus, community participation can reduce the household waste burden on landfills (Xiao, Zhang & Lin, 2017). To study the participation of public, it is important to understand their knowledge, attitude and general opinions toward solid waste management and recycling (Ghanbari et al., 2015). The effective solid waste management requires participation and awareness from the public, strict laws and regulation implementation at the local body and government level, and scientific solutions. According to a study in Brazil, cooperation between public participation, private sector and local communities lead to good sanitation in drinking water, sewage and SW management (Guérin et al., 2018).

There are several factors influencing community participation in solid waste management which are awareness level, household income, educational level and gender (Banga, 2011). This is confirmed by Maryati et al., (2018) that undergoes a study on waste bank management (WBM) in Malang, Indonesia. Most participants that join WBM consisted of people with low education and income. The main reason the people joining the WBM is economic profit. The residents can increase their income by gaining extra money from the project. Nevertheless, there were also

people with higher education and income joining the program with motivation related to environmental concerns.

Even community participation is encouraged in reducing the generation of solid wastes; some issues become as obstruction to the successfulness of solid waste management program such as low participation of households, management problems, financial difficulties and lack of municipal cooperation that will hinder the success of community participation in solid waste management (Rigasa et al., 2017). The community's lower participation in solid waste management was caused by lack of knowledge in waste management among the community (Maryati et al., 2018). Other than that, a study by Yusof et al., (2019) regarding challenges such as lack of proper facilities to recycle waste, limited time to carry out waste segregation, requiring high cost to buy a plastic for recycling purposes and far from recycling facility are causing difficulties in managing waste in Malacca.

A study by Afroz, Rahman, Masud, & Akhtar (2017) analysed the knowledge, awareness, and attitude toward plastic waste found coefficients of attitude and knowledge are positive and essential. This means respondents that are more informed and knowledgeable in plastic waste have a more positive attitude toward recycling. Personal attitude had the most significant effect on the waste separation (Nguyen, Zhu, & Le, 2015). A positive attitude will lead to participation in reducing pollution and domestic value (Zhang, Huang, Yin, & Gong, 2015). The study also examines the impact of socioeconomic variables on the household's behaviour for plastics recycling. The researcher found that the older, higher educated, and high-income groups were more likely to engage in 'no plastic bag' campaign. Knowledge about recycling was identified as both barriers and a difference between recyclers and non-recyclers (McDonald & Oates, 2003). This is

why education and publicity such as media campaigns and recycling strategies from government and non-governmental organizations are successful for creating novel behaviour patterns and changing preconceived ideas where it can help in shaping a person and societal attitudes, beliefs, awareness and create more environmentally responsible behaviour (Sun, Yang, Huisingh, Wang, & Wang, 2015). However study by Wang et al. (2020), stated that people with higher educational attainment are generally more knowledgeable about solid waste management recycling but with less recycling behaviour and less willingness to involve in solid waste management campaign.

Involvement of local residents in solid waste management will reduce the raise more resources and achieve better results. Education is one of the main tools in bringing behavioural change, particularly on cultural beliefs in improving individual and community awareness on solid waste management practices at home (Rangeti et al., 2018). Awareness can help the community understand the important challenge, cause and effect of proper solid waste management and therefore, improve the sense of responsibilities inside the local community. Other than that, another factor in influencing community participation in solid waste management is local community's motivation. According to (Azizan, Zulkefli, & Azizan, 2020) who conducted a study in understanding participation of community toward recycle program in Langkawi, found that a higher percentage of local's motivation expressed through recycle programmes followed by convenience recycle facilities and environmental concern of conserving natural resources as well as avoiding negative long-term impacts of landfill. The study also state that economic incentives are also one of the factors motivate community to join recycling activities. Others were motivated by charitable non-profit instinct and influenced by family and friends. In

addition, marital status also influences community participation in solid waste management. According to Mukama et al. (2016), married people had a higher willingness to participate in composting than single people because they have a higher sense of responsibility. Individual's belief can become a factor in community participation in solid waste management. Belief is related to individual subjective judgements of the surrounding world, personal understanding of themselves and the individual's surroundings, done by connecting certain behaviours with various benefits or losses that might be obtained if individuals do or do not do it. Belief can strengthen the individual's behaviour and attitudes toward something more positive (Ajzen, 2005).

2.4.1 Knowledge influence Community Participation

Knowledge is regarded as an element that gradually alters personal, organizational and social intelligent performance (Wiig, 1993). Knowledge is the consciousness, recognition, and application of it to the development of the humankind. Knowledge was created in the minds of human and increases as individuals are involved in its acquisition and distribution. Previous knowledge therefore strengthens the formation of advanced and established knowledge (Nasimi et al., 2013). This can be prove by a study from Nurul Azita et al. (2020) that study on knowledge and practices of sustainable solid waste management among rural people in Malaysia where the researches state that the existing knowledge and practices among the community is low, however was increased after briefing and demonstration on sustainable solid waste management practice which is composting. Acquisition of information is important to increase the knowledge. By gathering meaning and deciding what action should be taken, a person can turn information

into knowledge (Gill, 2000). For problem solving and decision making, knowledge is important as with knowledge, someone can interpret the gathered information and make an action out of it (Davenport, 1997). This knowledge concept is applicable in any circumstances as well as in sustainable solid waste management concept. To implement the sustainable solid waste management, knowledge on the matter is important in order to make sure the implementation will fully satisfy the requirement of sustainable solid waste management. People tend to avoid situations where the people are lacking in knowledge regarding the matter (Kearney, & De Young, 1995). A study by Haron, Paim, & Yahaya (2005) state that, lack of knowledge was the reason why people choose not to adopt sustainable solid waste management practices such as recycling activities as they feel like they did not have enough knowledge about recycling. Knowledge is important as it can give impact on decision making process. For example, knowledge can influence personal environmental awareness and behaviours. Othman et al. (2004) stated that the overall knowledge levels of Malaysian teenagers are low, especially those studying in arts stream compared to science stream.

2.4.2 Awareness Influence Community Participation

Awareness means knowing, realizing or wanting to know about something or knowing that something is important. Learning knowledge regarding proper solid waste practices can awaken awareness regarding the crucial matter, however mere awareness does not contain any form of knowledge. It can be developed merely by a person's sensitivity to protect the environment from pollution (Gafoor, 2012). A study regarding awareness on sustainable solid waste management among Malaysian by (Sreenivasan et al., 2012) show that despite the Malaysian government's support

for public information campaigns, public awareness regarding waste minimisation practices are low. The Action Plan for Beautiful and Clean (ABC) Malaysia was launched in 1988 but had only modest answer from general public. The similar study also states that, even the awareness is high among the community, but only small amount of people practicing the proper waste management. Similar statement stated by (Sin et al., 2013) where it state that awareness among Malaysian was lacking even though there are many strategies established. The people does not understand the value of implementing solid waste management based on the hierarchy of waste management, which prioritizes waste reduction by 3R, intermediate treatment and final disposal. (Ci, Beleya, & Wen, 2019) state that effective solid waste management had been failed probably due to those facing awareness shortage as these people are more likely to have inadequate planning and practices. Example given is the people that lack with awareness believes that there will not be any bad consequences by feeding the surplus to livestock merely composting the waste on the ground (Graham-Rowe, Jessop, & Sparks, 2014).

CHAPTER 3

METHODOLOGY

3.1 Study area

The study will be conducted at any Pondok institutions in Kelantan. Pondok Institution is an Islamic teaching-based school that focused on memorizing and recites Al-Quran. According to Figure 3.1, there are several *pondok* that were involved in this study.

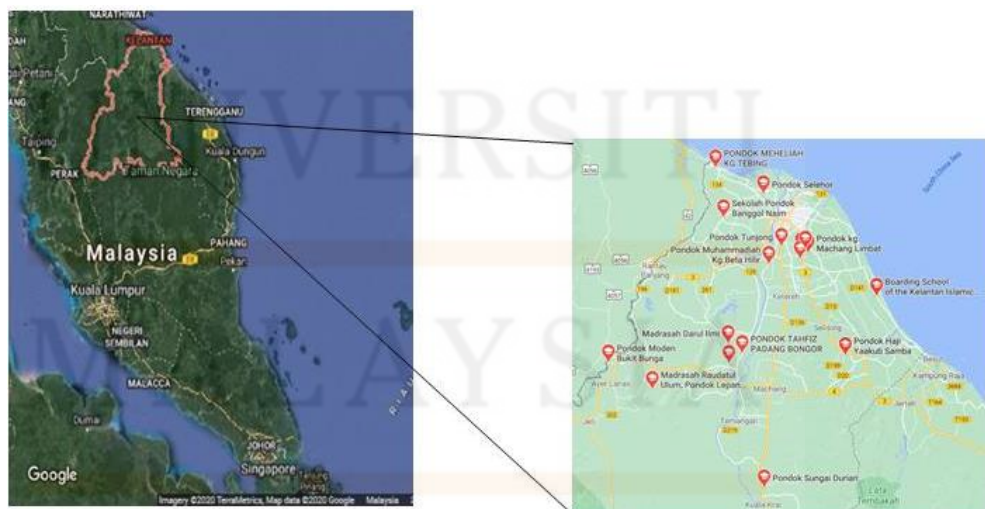


Figure 3.1: Location of *pondok* institution in Kelantan. Retrieved from Google Map

Pondok institutions have been selected as a study area in this study is because of several issues surrounding *pondok* institution and one of the issues is a low waste management system. The issues occurred because of little administrative knowledge among *mudir* (the head of school). With the increasing number of students, the waste generated by the *pondok* is also increasing. Improper solid waste management will harm the health, safety and performance of students and staff. Even with these issues, religious schools such as *pondok* can produce civilized, responsible and virtuous people because of its teachings. These traits must continue to the next generation through more systematic modern *pondok* institutions and current advanced technology and sustainable school practices. Some programs or syllabus can be added such as environmental education to produce more relevant citizens.

3.2 Data collection

3.2.1 Research Instrument

The data collection instrument that was used in this study is a questionnaire. There were four sections of the instrument where section A asked on respondents' socio-demographic, section B was about awareness and knowledge regarding solid waste management, section C was about barriers of sustainable solid waste management and section D was about participation of *pondok* community in solid waste management.

The validity test was conducted to review the questionnaire that was distributed to respondents. This is essential in order to ensure that it contains all the necessary items and excludes unnecessary items in the questionnaire (Boudreau et al., 2001). Steps in determining the validity of the survey started with literature

reviews then follow-ups with evaluation by expert judges or panel in the same field of the research study. The judges had assessed the items using three-point scales which are not necessary, useful but not essential and essential. Items that were not significant or suitable in the survey questions were eliminated.

Before the actual survey is carried out, a pilot survey was performed to test the viability and efficacy of the approaches and techniques chosen among the same area but in a different smaller sample. This study seeks to determine whether large-scale research can be carried out in a way that has been decided on or not. Pilot testing was designed to check the accuracy of the data that were obtained from the questions, check the feasibility of the project as a whole, and to coordinate the processes during the survey.

The pilot test was done by the distributing questionnaire to 30 respondents from any educational institution. The obtained data were analysed using the reliability test. The survey questions are reliable and feasible if reliability test provides stable and consist results. The most commonly used internal consistency measure is Cronbach Alpha coefficient (Taherdoost, 2016). There is no specific rule for internal consistencies, however most agree on a minimum internal consistency coefficient of 0.70 (Robinson, 2010). Reliability test will not work up if it not combined with validity. In order for a test to be reliable, it also needs to be valid (Jonathan, 2010).

The pilot test was conducted involving 31 respondents from any educational institutes. Reliability test was conducted by using the SPSS software. The Cronbach Alpha coefficient for all variables in Part B, C, and D are above 0.7. It is 0.829 and 0.934 for Part B (i) and Part B (ii) respectively. For part C, it is 0.922 and for part D, it is 0.852. This shows that the survey questions are suitable to use in this project.

Table 3.1: Result of Cronbach's Alpha

Reliability Statistics			
Part	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
B(i)	0.839	0.851	12
B(ii)	0.934	0.945	16
C	0.922	0.925	13
D	0.852	0.848	12

3.2.2 Sampling Technique

In this study, the non-probability sampling method was used. Non-probability sampling is drawing samples without random selection criteria. Subjective characteristics play a role in the sample collection because the researchers determined which unit of the population included in the survey. This means that not all members of the population had a chance of participating in the study. Stratified is one of the non-probability sampling techniques. Stratified sampling is a sampling method that will divide the total population into smaller groups/strata. The strata were different and not overlapping. The most common strata are age, gender, socioeconomic status and educational attainment. The survey was conducted on *pondok's* community which consist of administration staff, teachers, and students.

3.2.3 Sample size determination

In this study, sample size will be considered according to several factors such as time constraint and current issues. Due to study limitations, the available data for data analysis is only 99 respondents. The Google form was distributed to several pondok, however only 99 respondents that are able to answer the questionnaire. The sample size is still sufficient to achieve the study's desired and anticipated

achievement. According to Roscoe (1975), sample sizes greater than 30 and less than 500 are suitable for most research and the minimum sample size should be 30 % of the population. Thus the data available can be proceed to data analysis.

3.2.4 Study Limitation

This project has limitations such as limited transportation, time and the implementation of Movement Control Order (MCO). According to this project proposal, supposedly a total number of 169 respondents to be obtained, however due to some limitations that were faced during conducting the research, only 99 respondents were gained. Other than that, most pondok institution close during MCO, so there will be difficulty in contacting the pondok's community as some of them did not use the smartphone to answer the Google form.

3.3 Data Analysis

3.3.1. Normality Test

An evaluation of data normality is essential for many statistical analyses, as normal data is an underlying assumption in parametric testing. There are two main ways in assessing normality which is graphically and numerically. Statistical test have the advantage of making objective assessment of normality, but are disadvantageous as it may not being sensitive enough to smaller sample sizes or being overly sensitive to larger sample size. Some statisticians prefer using experience in making a subjective judgement of the plot/graph data. The graphical method has the advantage when one has good experience. It can be used in making a good judgement in a situation where numerical tests are over or under sensitivity. If

one does not have any experience in making judgement for graphical test, it is best to use numerical test. Normality test that was used in this study is Skewness and Kurtosis test by using SPSS (Pallant, 2013). This data will be considered normal when the skewness of the test is ranging from -2 to +2 (Hair et al., 2010; Byrne, 2010; Garson, 2012) meanwhile the kurtosis ranging from -7 to +7 (Hair et al., 2010; Byrne, 2010). According to Table 3.2, Table 3.3, Table 3.4 and Table 3.5, all section of the questionnaire, the value for skewness and kurtosis are within accepted range. Thus the data is normal.

Table 3.2 Normality test for knowledge

No	Questions	Skewness		Kurtosis	
		Stat.	Std. Error	Stat.	Std. Error
.					
4.	I know about the 3R practice – “Reduce, Reuse, Recycle”	-1.420	.243	1.638	.481
5.	I know the proper waste disposal practices	-.228	.243	-	.481 1.002
6.	I know that there are many types of waste (e.g. solid waste, organic waste, liquid waste, recyclable waste and hazardous waste)	-.664	.243	.068	.481
7.	I know there are different types of solid waste (e.g. plastic, paper, glass, metal)	-1.544	.243	1.977	.481
8.	I know there are different dustbin to dispose the solid waste	-1.205	.243	.696	.481
9.	Waste prevention is reducing the amount of waste we produce at source	-.459	.243	-	.481 1.295
10.	Waste segregation means dividing waste into dry (e.g. plastic, metal, glass) and wet (e.g. usually organic waste)	-1.002	.243	.130	.481
11.	Organic wastes can become a compost material	-1.073	.243	.535	.481
12.	Compost can become fertilizer	-1.120	.243	.838	.481
13.	Composting of organic wastes can help in reducing wet wastes in landfill	-.793	.243	-.389	.481

Table 3.3: Normality test for awareness

No.	Questions	Skewness		Kurtosis	
		Stat.	Std. Error	Stat.	Std. Error
1.	I am aware of solid waste management at <i>pondok</i> institution	-0.723	0.243	-0.113	0.481
2.	I am aware that most solid waste end up at landfill	-1.183	.243	1.905	.481
3.	I think it is important to practice waste separation	-1.557	.243	2.455	.481
4.	I think it is important to recycle solid waste	-1.934	.243	4.973	.481
5.	I think it is important to reuse things that can still be used	-1.372	.243	1.608	.481
6.	Segregating waste would do well for solid waste management at <i>pondok</i> institution	-1.338	.243	1.368	.481
7.	Waste prevention leads to better environment for the present and future, thereby leading to sustainable development	-1.748	.243	3.640	.481
8.	Solid waste is a major issues that needs to be addressed by <i>pondok</i> management	-1.809	.243	4.442	.481
9.	I think sustainable solid waste management practice should be developed in <i>pondok</i> institution	-1.906	.243	4.273	.481
10.	Waste prevention is beneficial for <i>pondok</i> society and environmental	-1.656	.243	3.102	.481
11.	I will spread the awareness regarding importance of solid waste management to family and peers	-.935	.243	.639	.481

Table 3.4: Normality test for barriers

No	Questions	Skewness		Kurtosis	
		Stat.	Std. Error	Stat.	Std. Error
1.	Lack of financial resources in solid waste management	-.601	.243	-.034	.481
2.	Lack of trained staff in managing solid waste management	-1.310	.243	2.035	.481
3.	Lack of equipment in solid waste management	-.610	.243	-.413	.481
4.	Poor response to waste minimization (reuse/recycling)	-.632	.243	-.270	.481
5.	Inadequate solid waste management service at <i>Pondok</i> institution	-.569	.243	.076	.481

Table 3.4 (continued)

6.	Lack of capability to maintain proper solid waste management	-.692	.243	.379	.481
7.	Lack of knowledge among Pondok community	-.775	.243	.257	.481
8.	Poor cooperation by Pondok community	-.296	.243	-.611	.481
9.	Poor solid waste management by Pondok administration	-.254	.243	-.811	.481
10.	Poor cooperation by Pondok administration	-.171	.243	-	.481
				1.087	
11.	Difficult to obtain basic material (e.g. bags for waste separation) in solid waste collection	-.307	.243	-.849	.481
12.	Dustbin placed too far from residential area.	-.327	.243	-.790	.481
13.	Lack of information regarding proper ways to manage waste at Pondok institution	-.782	.243	.447	.481

Table 3.5: Normality test for participation

No.	Questions	Skewness		Kurtosis	
		Stat.	Std. error	Stat.	Std. Error
1.	I separate wet and dry waste before throwing into the rubbish	-.634	.243	-.201	.481
2.	I throw solid waste (e.g. plastic, paper, glass) into recyclable dustbin	-.369	.243	-.694	.481
3.	I am willing to start composting at residential area using organic waste as compost material.	-.292	.243	-.659	.481
4.	I participate in sustainable solid waste management campaign held by Pondok institution	-.374	.243	-.549	.481
5.	I use things until it completely burn out	-.652	.243	.069	.481
6.	I reduce the waste before throwing it away	-.349	.243	-.536	.481
7.	If the Pondok institution set up a recycling programme, I would be willing to separate materials into separate bags for collection purpose	-.517	.243	-.757	.481

Table 3.5 (continued)

8.	I think that the quantity of waste sent for disposal should be minimised.	-1.115	.243	.721	.481
9.	I participate in sustainable solid waste practice if there is incentives offered	-.568	.243	-.278	.481
10.	I make time to separate waste into different bags before put it at the garbage	-.076	.243	-.799	.481
11.	I am willing to make time to learn about waste recycling, waste segregation, and waste prevention	-.333	.243	-.737	.481
12.	I involve my family and peers in solid waste management	-.168	.243	-1.092	.481

3.3.2. Descriptive analysis

Descriptive statistics is a tool used to summarize large amounts of data in a way easier to understand. It provides basic information regarding any quantitative data analysis and also to determine a distribution's normality. Data were analysed descriptively in terms of measures of central tendencies and measures of variability. Central tendency includes mean, median and mode while measures of variabilities include standard deviation and range. The descriptive analysis was used to measure the level of knowledge, awareness and participation in sustainable solid waste practices among *pondok's* community. From descriptive analysis, there was result regarding percentage, awareness, mean and standard deviation of each variable.

3.3.3 Inferential Analysis

Inferential analysis techniques used sample data to make conclusions about the populations from which samples were drawn. In this study, ANOVA (analysis of variance) and paired t-test analysis was used in analysing the data. Both paired t-test

and ANOVA used to compare mean between groups. ANOVA was used to determine whether there was a statistically significant difference between the means of three or more groups. A paired t-test was used in comparing the means of two related data. Another inferential analysis which is correlation analysis was used to measure the relationship between variables. It was used to measure the factors that influence barriers and participation among *pondok* communities in sustainable solid waste management. Both barriers and participation variables were the dependent variables in this study but it was depend on the objectives.

3.3.4 Determining the level for knowledge, awareness, barriers and participation

The level of awareness was determined by 5-point scale which are point 1-2 are low, point 3 is medium and point 4-5 are high (Arkkelin, 2014). This was used in understanding the level of knowledge and awareness of *pondok's* community toward sustainable solid waste management. There was a simple calculation done to determine the level for both knowledge and awareness as shown in Equation 1. After the calculation was done, it was determined by the category as stated in Table 3.7.

$$\frac{\text{mean of variable's items}}{\text{sum of items scale}} \times 5 \tag{3.1}$$

Table 3.6: Scale for level determination

1	Low
2	
3	Moderate
4	High
5	

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings of this study that were obtained from various analyses. This chapter will use descriptive statistics to discuss on demographic data, awareness data. Other than that, this chapter will use inferential analysis to find out the significance between variables which are socio-demographic, knowledge, awareness, barriers and participation. Correlation analysis will be done to determine the relationship between socio-demographic, knowledge and awareness with barriers in Sustainable Solid Waste Management. Other than that, correlation analysis will also determine the relationship between socio-demographic, knowledge awareness and barriers with participation in Sustainable Solid Waste Management.

4.2 Socio-Demographic

The respondents' demographic data is described in this section. A detailed overview for demographic profiles of respondents is presented in Table 4.1. Parameters that were used in socio-demographic section are gender, age, marital

status, residential area, job/position, education level, and years at *pondok* institution. The total number of respondents that was successfully obtained through Google form distribution was 99 respondents.

Based on Table 4.1, male respondents are outnumbered female respondents, accounting for 60 (60.6 %) and 39 (39.4 %). The numbers of married (10.1 %) respondents are lower than unmarried respondents (89.9 %). The age group of respondents are divided into four category which are early teenager (40.4 %), teenager (50.5 %), early adult (4.0 %) and adult (5.0 %).

Most of the respondents live at family’s house (85.9 %) followed by hostel (10.1 %) and *pondok* (4 %). Most respondents are students (86.9 %) followed by teacher (4.0 %) and staff (9.1 %). The educational level of the respondents varies from primary school (2.0 %), secondary school (48.5 %), diploma (16.2 %), bachelor (24.2 %), *pondok* (8.1 %) and master (1.0 %). Majority of the respondents have been or spent at the *pondok* for 1 year (32.3 %), followed by 4-5 years (29.3 %), 2-3 years (28.3 %), and more than 6 years (10.1 %).

Table 4.1: Socio-demographic of respondents

		Frequency, n	Percentage, %
Gender	Male	60	60.6
	Female	39	39.4
Marital status	Unmarried	89	89.9
	Married	10	10.1
Age group	Early teenager	40	40.4
	Teenager	50	50.5
	Early adult	4	4.0
	Adult	5	5.1
Residential area	Hostel	10	10.1
	Family’s house	85	85.9

Table 4.1 (continued)

	<i>Pondok</i>	4	4.0
Job/Position	Student	86	86.9
	Teacher	4	4.0
	Staff	9	9.1
Educational level	Primary school	2	2.0
	Secondary school	48	48.5
	Diploma	16	16.2
	Bachelor	24	24.2
	<i>Pondok</i>	8	8.1
	Master	1	1.0
Years in <i>pondok</i> institution	1 year	32	32.3
	2-3 year	28	28.3
	4-5 year	29	29.3
	More than 6 year	10	10.1
	Total	99	100.0

4.3 Knowledge of Sustainable Solid Waste Management

The respondents' knowledge of sustainable solid waste management is described in this section. The full overview is presented in Table 4.2 and Table 4.3.

There are 48 respondents (48.5 %) that know what is sustainable solid waste management, meanwhile 32 respondents (32.2 %) are not sure and 19 respondents (19.2 %) did not know about sustainable solid waste management. Majority respondents know/learn about sustainable solid waste management from school (48.5 %), followed by tv/social media (43.4 %), and only small number of respondents learn/know about sustainable solid waste management from family (2.0 %) and friend (2.0 %), also some of them do not know yet (4.0 %). Most of the respondents know about recycle and composting practice (52.5 %), followed by reduce and reuse practice (38.4%) and disposal to landfill practice (9.1 %)

Table 4.2: Knowledge on Sustainable Solid Waste Management (Q1 – Q3)

		Frequency , n	Percentage, %
1. Do you know what sustainable solid waste management is?	Yes	48	48.5
	No	19	19.2
	Not sure	32	32.3
2. From where/who did you know/learn about sustainable solid waste management?	Family	2	2.0
	School	48	48.5
	Tv/Social media	43	43.4
	Friend	2	2.0
	Do not know	4	4.0
	3. What solid waste management did you know?	Reduce and reuse	38
	Recycle/composting	52	52.5
	Disposal into landfill	9	9.1
Total		99	100

The means of 10 items for knowledge variable of Likert scale questions are presented in Table 4.3 and Table 4.4. All 10 statements have mean score above 3.00. This shows that the majority of the respondents agreed with the items' statement.

For the respondents' knowledge regarding sustainable solid waste management, majority of the respondents totally agree (60.6 %) that they know about 3R practices which are reduce, reuse and recycle. For question 5 regarding knowledge on proper waste disposal practices, 9 respondents (9.1 %) answer not agree, 30 respondents (30.3 %) answer neutral, 31 respondents (31.3 %) answer agree and 29 respondents (29.3 %) answer totally agree. There is almost same distribution for question 5 regarding knowledge on types of waste, where 30 respondents (30.3 %) answer neutral, 28 respondents (28.3 %) answer agree and 35 respondents (35.4 %) answer totally agree. Majority of the respondents answer

totally agree (56.6 %) about knowledge on different types of solid waste. Most of the respondents also responds totally agree (58.6 %) regarding differences of dustbin to throw away solid waste.

For question 9 regarding a statement ‘Waste prevention is reducing the amount of waste we produce at source’, 24 respondents (24.2 %) of answer agree and 47 respondents (47.5 %) of answer totally agree. Most of the respondents answer totally agree (51.5 %) to statement 10 which is ‘Waste segregation means dividing waste into dry and wet’. Majority of the respondents totally agree (52.5 %) to a statement which is ‘organic wastes can become a compost material’. There are 53 respondents (53.5 %) answer totally agree to a statement which is ‘compost can become fertilizer’ followed by 35 respondents (35.4 %) answer agree. For the last statement which is ‘composting of organic wastes can help in reducing wet wastes in landfill’, 33 respondents (33.3 %) answer agree and 53 respondents (53.5%) answer totally agree.

Table 4.3: Knowledge on sustainable solid waste management (Q4 – Q13)

Statement	Frequency (percentage %)					Mean	S.D
	1	2	3	4	5		
4. I know about the 3R practice – “Reduce, Reuse, Recycle”	1 (1.0)	2 (2.0)	14 (14.1)	22 (22.2)	60 (60.6)	4.39	0.879
5. I know the proper waste disposal practices	0 (0.0)	9 (9.1)	30 (30.3)	31 (31.3)	29 (29.3)	3.81	0.965
6. I know that there are many types of waste (e.g. solid waste, organic waste, liquid waste, recyclable waste and hazardous waste)	3 (3.0)	3 (3.0)	30 (30.3)	28 (28.3)	35 (35.4)	3.90	1.025
7. I know there are different types of solid waste (e.g. plastic, paper, glass, metal)	2 (2.0)	5 (5.1)	9 (9.1)	27 (27.3)	56 (56.6)	4.31	0.976
8. I know there are different dustbin to dispose the solid waste	0 (0.0)	2 (2.0)	11 (11.1)	28 (28.3)	58 (58.6)	4.43	0.771

Table 4.3 (continued)

9. Waste prevention is reducing the amount of waste we produce at source	0 (0.0)	1 (1.0)	27 (27.3)	24 (24.2)	47 (47.5)	4.18	0.873
10. Waste segregation means dividing waste into dry (e.g. plastic, metal, glass) and wet (e.g. usually organic waste)	0 (0.0)	4 (4.0)	14 (14.1)	30 (30.3)	51 (51.5)	4.29	0.860
11. Organic wastes can become a compost material	1 (1.0)	3 (3.0)	18 (18.2)	25 (25.3)	52 (52.5)	4.25	0.930
12. Compost can become fertilizer	0 (0.0)	2 (2.0)	9 (9.1)	35 (35.4)	53 (53.5)	4.40	0.741
13. Composting of organic wastes can help in reducing wet wastes in landfill	0 (0.0)	1 (1.0)	15 (15.2)	33 (33.3)	50 (50.5)	4.33	0.769

Reference: 1 = strongly disagree, 2 = disagree, 3 = natural, 4 = agree. 5 = strongly agree

4.3.1 Level of Knowledge on Sustainable Solid Waste Management

Based on the calculation done, the level of knowledge for *pondok's* community regarding sustainable solid waste management is 4.33. This can be concluded that the knowledge of *pondok's* community regarding sustainable solid waste management is high. According to scale level at Table 3.7, the knowledge of *pondok's* community on solid waste management is at category high.

The descriptive statistics show that both knowledge and awareness in sustainable solid waste management among community of *pondok* institution are high. This was proven by the mean score of all items in knowledge and awareness has a mean score of 3.00 and above. This result is in line with study by Omar, Hossain, & Parvin (2018) that conclude majority of the respondents have good knowledge towards solid waste management. According to Laor et al. (2018), there are three demographic elements that can influence the level of knowledge which are age, education level an occupation. Majority of the respondents are young persons that were divided into two groups which were early teenager (40.4%) and teenager (50.5%). Young people are likely to have more knowledge compare to elderly. Due

to their level of knowledge, young people are likely to have more positive attitude toward sustainable solid waste management (Smith, 2014). Other than that, people with high education have high knowledge and attitude toward solid waste compared to people that has lower education (Klein, 1999). The respondents are at least in secondary schools (48.5%) and higher education institute certificate (41.4%). For occupation, most respondents are students, which mean they are still in the learning process. The more the students learn, more knowledge will be obtained. This is why, introduction to solid waste management to students are important.

Table 4.4: Level of knowledge among *pondok*'s community

1	
2	
3	
4	Knowledge of sustainable solid waste management among pondok community
5	

4.4 Awareness of sustainable solid waste management

This section will discuss respondents' awareness of sustainable solid waste management. The full overview is presented in Table 4.4. All 11 statements have a mean score above 3.00. This shows that the majority of the respondents agreed with the items' statement.

For the first statement, which is 'I am aware of solid waste management at pondok institution', there are 39 respondents (39.4 %) that are totally agree with the statement. For statement 'I am aware that most solid waste end up at landfill', majority of the respondents agree, 36 respondents (36.4 %), and 44 respondents (44.4 %) are totally agree with the statement. For statement 'I think it is important to

practice waste separation, majority of the respondents, 62 respondents (62.6 %) are totally agree with the statement. There are 59 respondents (59.6 %) answer totally agree for statement 'I think it is important to recycle solid waste' and for statement 'I think it is important to reuse things that can still be used'.

For statement 'segregating waste would do well for solid waste management at pondok institution', there are 59 respondents (59.6 %) answer totally agree, 30 respondents (30.3 %) answer agree, the rest answer neutral and not agree with 8 respondents (8.1 %) and 2 respondents (2.0 %), respectively. For statement 'waste prevention leads to better environment for the present and future, thereby leading to sustainable development', there are 59 respondents (59.6 %) totally agree with the statement, 30 respondents (30.3 %) agree with the statement, 7.1 % answer neutral, 2.0 % answer not agree and 1.0 % answer totally not agree. Statement which is 'solid waste is a major issues that needs to be addressed by *pondok* management' has 56 respondents (56.6 %) answer totally agree, 32.3 % respondents answer agree. There are 65 respondents (65.7 %) totally agree with this statement which is 'I think sustainable solid was management practice should be developed in *pondok* institution'. There are also 61 respondents (61.6 %) totally agree with this statement which is 'waste prevention is beneficial for *pondok* institutions. There are 46.5 % respondents totally agree with statement 'I will spread the awareness regarding importance of solid waste management to family and peers', meanwhile there are 32.3 % respondents agree with the statement, 19.2 % respondents are neutral with the statement, and there is 1.0 % respondent answered for both not agree and totally not agree.

Table 4.5: Awareness on sustainable solid waste management (Q1 – Q11)

Statement	Frequency (percentage %)					Mean	S.D
	1	2	3	4	5		
1. I am aware of solid waste management at <i>pondok</i> institution	1 (1.0)	5 (5.1)	22 (22.2)	32 (32.3)	39 (39.4)	4.04	0.957
2. I am aware that most solid waste end up at landfill	2 (2.0)	0 (0.0)	17 (17.2)	36 (36.4)	44 (44.4)	4.21	0.872
3. I think it is important to practice waste separation	0 (0.0)	2 (2.0)	5 (5.1)	30 (30.3)	62 (62.6)	4.54	0.690
4. I think it is important to recycle solid waste	1 (1.0)	2 (2.0)	4 (4.0)	33 (33.3)	59 (59.6)	4.48	0.761
5. I think it is important to reuse things that can still be used	0 (0.0)	2 (2.0)	7 (7.1)	31 (31.3)	59 (59.6)	4.48	0.719
6. Segregating waste would do well for solid waste management at <i>pondok</i> institution	0 (0.0)	2 (2.0)	8 (8.1)	30 (30.3)	59 (59.6)	4.47	0.733
7. Waste prevention leads to better environment for the present and future, thereby leading to sustainable development	1 (1.0)	2 (2.0)	7 (7.1)	30 (30.3)	59 (59.6)	4.45	0.799
8. Solid waste is a major issues that needs to be addressed by <i>pondok</i> management	2 (2.0)	0 (0.0)	9 (9.1)	32 (32.3)	56 (56.6)	4.41	0.821
9. I think sustainable solid waste management practice should be developed in <i>pondok</i> institution	1 (1.0)	1 (1.0)	8 (8.1)	24 (24.2)	65 (65.7)	4.53	0.774
10. Waste prevention is beneficial for <i>pondok</i> society and environmental	1 (1.0)	1 (1.0)	10 (10.1)	26 (26.3)	61 (61.6)	4.46	0.799
11. I will spread the awareness regarding importance of solid waste management to family and peers	1 (1.0)	1 (1.0)	19 (19.2)	32 (32.3)	46 (46.5)	4.22	0.864

Reference: 1 = strongly disagree, 2 = disagree, 3 = natural, 4 = agree, 5 = strongly agree

4.4.1 Level of Awareness in Sustainable Solid Waste Management

The calculation to determine the level of awareness was done and the result shows that the level of awareness for *pondok's* community is 4.39. According to the

scale level at Table 3.7, the level of awareness on sustainable solid waste among *pondok's* community is at category high which in green colour.

This level of awareness in sustainable solid waste management among *pondok* community is in line with study by Bautista (2019). The study shows that students show high awareness regarding implementation of solid waste management, importance and advantages of solid waste management to the environment. This can be proven by seeing the mean for statement in the questionnaire which are 'segregating waste would do well for solid waste management at *pondok* institution' with mean of 4.47 (SD=0.733) and statement 'waste prevention is beneficial for *pondok* society and environment' with mean of 4.46 (SD=0.79). With this, it can be concluded that *pondok* society is aware with solid waste management.

Table 4.6: Level of awareness among *pondok's* community

1	
2	
3	
4	Awareness of sustainable solid waste
5	management among <i>pondok</i> community

4.5 Barriers to Sustainable Solid Waste Management

This section discuss on barriers of sustainable solid waste management. The full overview of descriptive statistics for barriers questions is presented in Table 4.5. All 11 statements have mean score above 3.00. This indicates that most respondents agree to the stated barriers at *pondok* institutitons.

For the statement 'lack of financial resources in solid waste management', majority of respondents, 40.4 % (40) agree and 29.3 % (29) answer totally agree. 44 respondents (44.4 %) agree with statement 'lack of trained staff in managing solid

waste management', meanwhile 39 respondents (39.4 %) totally agree with the statement. There are 39 respondents (39.4 %) agree with statement 'lack of equipment in solid waste management', meanwhile 35 respondents (35.4 %) totally agree. Shortage of facilities for waste operation is one of the challenges in solid waste management (6b). 36 respondents (36.4 %) and 26 respondents (26.3 %) are equally agree and totally agree with the statement 'poor response by *pondok's* community to waste minimization, but there are 11 respondents (11.1 %) not agree and 4 respondents (4.0 %) totally not agree with the statement. There are 39 respondents (39.4 %) agree and 31 respondents (31.3 %) totally agree with the statement 'inadequate solid waste management service at *pondok* institution. There is also 25 respondents (25.3 %) are neutral about this statement. There is 39 respondents (39.4 %) agree with statement 'lack of capability to maintain proper solid waste management, meanwhile 29.3 % (29) totally agree with the statement, 25.3 % (25) respondents are neutral with the statement and 4.0 % (4) and 2.0 % (2) of respondents are respectively not agree and totally not agree with the statement.

There are 35 respondents (35.4 %) totally agree with statement 'lack of knowledge among *pondok* community', and only 3 respondents (3.0 %) not agree and 4 respondents (4.0 %) totally not agree with the statement. There are 30 respondents (30.3 %) are neutral and 31 respondents (31.3 %) are agree with the statement 'poor cooperation by *pondok* community', but there are 14 respondents (14.1 %) not agree and 3 respondents (3.0 %) totally not agree with the statement. Majority respondents which are 30.3 % (30) are neutral with statement 'poor solid waste management by *pondok* administration, but there are 26.3% (26) of respondents agree and 25.3% (25) of respondents totally agree with the statement. There are same amount of respondents, 28.3 % (28) are totally agree and neutral with

statement ‘poor cooperation by *pondok* administration. 30 respondents (30.3 %) agree with statement ‘difficult to obtain basic material in solid waste collection, meanwhile 19 respondents (19.2 %) totally agree and 24 respondents (24.2 %) are neutral with the statement. Majority of the respondents, 31.3 % (31) are neutral with the statement ‘dustbin placed too far from residential area’, meanwhile 21 respondents (21.2 %) are agree and 28 respondents (28.3 %) are totally agree with the statement. There are huge number of respondents that answer agree which is 34 respondents (34.3 %) and 33 respondents (33.3 %) totally agree with statement ‘lack of information regarding proper ways to manage waste at *pondok* institution.

Table 4.7: Barriers on sustainable solid waste management (Q1-Q13)

Statement	Frequency (percentage %)					Mean	S.D
	1	2	3	4	5		
1. Lack of financial resources in solid waste management	1 (1.0)	6 (6.1)	23 (23.2)	40 (40.4)	29 (29.3)	3.91	.927
2. Lack of trained staff in managing solid waste management	2 (2.0)	4 (4.0)	10 (10.1)	44 (44.4)	39 (39.4)	4.15	.908
3. Lack of equipment in solid waste management	0 (0.0)	6 (6.1)	19 (19.2)	39 (39.4)	35 (35.4)	4.04	.891
4. Poor response by <i>pondok</i> 's community to waste minimization (reuse/recycling)	4 (4.0)	11 (11.1)	22 (22.2)	36 (36.4)	26 (26.3)	3.70	1.102
5. Inadequate solid waste management service at <i>Pondok</i> institution	1 (1.0)	3 (3.0)	25 (25.3)	39 (39.4)	31 (31.3)	3.97	.886
6. Lack of capability to maintain proper solid waste management	2 (2.0)	4 (4.0)	25 (25.3)	39 (39.4)	29 (29.3)	3.90	.942
7. Lack of knowledge among <i>Pondok</i> community	4 (4.0)	3 (3.0)	28 (28.3)	29 (29.3)	35 (35.4)	3.89	1.058
8. Poor cooperation by <i>Pondok</i> community	3 (3.0)	14 (14.1)	30 (30.3)	31 (31.3)	21 (21.2)	3.54	1.072
9. Poor solid waste management by <i>Pondok</i> administration	3 (3.0)	15 (15.2)	30 (30.3)	26 (26.3)	25 (25.3)	3.56	1.118
10. Poor cooperation by <i>Pondok</i> administration	7 (7.1)	19 (19.2)	28 (28.3)	17 (17.2)	28 (28.3)	3.40	1.277

Table 4.7 (continued)

11. Difficult to obtain basic material (e.g. bags for waste separation) in solid waste collection	8 (8.1)	18 (18.2)	24 (24.2)	30 (30.3)	19 (19.2)	3.34	1.214
12. Dustbin placed too far from residential area.	6 (6.1)	13 (13.1)	31 (31.3)	21 (21.2)	28 (28.3)	3.53	1.207
13. Lack of information regarding proper ways to manage waste at Pondok institution	3 (3.0)	3 (3.0)	26 (26.3)	34 (34.3)	33 (33.3)	3.92	.997

Reference: 1 = strongly disagree, 2 = disagree, 3 = natural, 4 = agree, 5 = strongly agree

4.5.1 Factor of socio-demographic, knowledge, awareness in influencing barriers in Sustainable Solid Waste Management

A one-way between subjects ANOVA was conducted to compare the effect of job/position on barriers of sustainable solid waste management in student, teacher and staff conditions. According to Table 4.6, there was not a significant effect of job/position on barriers of sustainable solid waste management at the $p < .05$ level for the three conditions [$F(2, 96) = 0.380, p = .69$].

Table 4.8: ANOVA of barriers of sustainable solid waste management based on job/position

Job/position	N	Mean	Std. Deviation	F	p-value	Significant or not
Student	86	3.73	0.73	0.38	0.69	Not significant
Teacher	4	3.90	0.80			
Staff	9	3.93	0.78			
Total	99	3.76	0.74			

Higher education comprises of respondents' education level of diploma, bachelor and master, meanwhile lower education comprises of respondents'

education level of primary school, secondary school, and *pondok*. According to Table 4.7, there was no significant effect for education category, $t(97) = -1.255$, $p = 0.282$, despite higher education ($M = 3.87$, $SD = 0.71$) attaining higher scores than lower education ($M = 3.68$, $p = 0.75$).

Table 4.9: T-test of barriers of sustainable solid waste management based on education category

Education category	N	Mean	Std. Deviation	F	p-value	
Lower education	58	3.68	0.75	1.168	0.282	Not significant
Higher education	41	3.87	0.71			

A one-way between subjects ANOVA was conducted to compare the effect of years spent at *pondok* on barriers of sustainable solid waste management in 1 year, 2-3 years, 4-5 years and more than 6 years conditions. According to Table 4.8, there was not a significant effect of barriers of sustainable solid waste management on years spent at *pondok* institution at the $p < .05$ level for the four conditions [$F(3, 95) = 1.601$, $P = 0.194$].

Table 4.10: ANOVA of barriers of SSWM based on years spent at *pondok*

Years spent at <i>pondok</i> institution	N	Mean	Std. Deviation	F	p-value	Significant or not
1 year	32	3.65	0.63	1.601	0.194	Not significant
2-3 years	28	3.61	0.93			
4-5 years	29	3.99	0.60			
≥ 6 years	10	3.82	0.75			
Total	99	3.76	0.74			

The descriptive statistics that were done on barriers of sustainable solid waste management shows the mean score of all items were above 3.0, which means the

respondents' answer tend to move toward agree. This show that majority of the *pondok* society agree that there are barriers to sustainable solid waste management. Factors that can influence the barriers of sustainable solid waste management were studied. There are three factors that were studied in this study which are socio-demographic, knowledge and awareness. The level of barriers in sustainable solid waste management at *pondok* institution according to Table 3.7 is moderate, after the level was calculated where the result is 3.76. Even though the awareness and knowledge level of *pondok* community are high, there nothing can be done if the barriers posed to sustainable solid waste management at *pondok* are technical factors.

Not all elements are studied in socio-demographic part such as gender. According to (Agwu, 2012), like other socio-demographic variables, gender was not a significant predictor on environmental issues. In this study, only job/position, education level, and years spent at *pondok* institution were analysed for socio-demographic factors that can influence barriers. The result shows that all three socio-demographic factors are not significant on barriers of sustainable solid waste management.

The Pearson's correlation for knowledge and awareness in sustainable solid waste management and barrier of sustainable solid waste management are used to examine the relationship between independent variable (IVs) and dependent variable (DVs). Pearson's correlation shows the result of correlation coefficient, r which provide a numerical overview of the strength of the relationship between IVs and DV. The size of absolute value provides data on the strength of the relationship.

The correlations between the independent variable (knowledge and awareness) and the dependent variable (barriers) are shown in Table 4.9. In testing relationship between variables, these scales was used where if the r -value is 0.70, it

means the relationship is strong, if the r-value is within 0.30 to 0.60, it means the relationship between variables is moderate and if the r-value is less than 0.30, it means the relationship between variables is weak.

The correlation between knowledge and barriers is $r = 0.307$, $n = 99$. Meanwhile the correlation between awareness and barriers is $r = 0.118$, $n = 99$. Both knowledge and awareness have moderate to low relationship with barriers. As the significant value is above 0.05, both variables has no significance relationship with barrier in sustainable solid waste management.

According to correlation result in Table 4.9, it can be concluded that there is positive but moderate correlation between knowledge and barriers of sustainable solid waste management with r-value of 0.307, $p > 0.01$. The result show that no significant relationships exist between the variables. This correlation indicates that knowledge does not affect barriers. Other than that, there is a positive but low correlation between awareness and barriers of sustainable solid waste management with r-value of 0.158 $p > 0.01$. The results show that there is no significant relationship between the variables. This correlation also indicates that awareness does not affect the barriers of sustainable solid waste management in *pondok* institution. However, this result contrast with previous study as prior study shows that knowledge and awareness does affect barrier. For example, a study from Madrigal & Oracion (2017), that hypothesized that students' awareness of the negative effects of indiscriminate waste disposal by students would favourably affect their attitude about how they can help solve the problem of waste that will subsequently manifest itself in their acts of properly managing their waste at home and in school. Another study concludes that lack of awareness regarding the consequences of solid waste management to health is one of the barriers to

implement sustainable solid waste management (Reyes & Furto, 2013). Other than that, educating people to manage waste will help them understand and allow them to act accordingly on the indiscriminate disposal of waste to the environment and human health (Chakraborti, Hussam & Alauddin, 2003). A study also shows that promotion of education regarding solid waste management is important to encourage residents to practice waste separation and recycling (United Nations Human Settlements Programme. (2010).

In conclusion, knowledge and awareness have weak relationship with barriers of sustainable solid waste management. This happen because the barriers are related more to technical problems rather than a personal problem. Technical problems such as lack in solid waste management services or lack in basic materials needed for proper solid waste management can only be solved by *pondok* management and administration. Improving these issues can reduce the barriers in sustainable solid waste management. However, knowledge and awareness are also important to keep the issues minimized.

Table 4.11: The correlation between knowledge and awareness on sustainable solid waste management and barriers of sustainable solid waste management

Factor	Dependent Variable	
		Sum of Barrier
Sum of Knowledge	Pearson Correlation	0.307**
	Sig. (2-tailed)	0.002
Sum of Awareness	Pearson Correlation	0.158
	Sig. (2-tailed)	0.118

N= 99

**Correlation is significant at the 0.01 level (2-tailed)

4.6 Participation in Sustainable Solid Waste Management

This section discuss on participation in sustainable solid waste management. The full overview is presented in Table 4.10. All 12 statements have mean score above 3.0.

There are 30 respondents (30.3 %) answer totally agree with statement 'I separate waste wet and dry before throwing into the rubbish', 31 respondents (31.3 %) agree with the statement. Majority of the respondents (35.4 %) are neutral about statement 'I throw solid waste into recyclable dustbin. There are also majority of respondents (34.3 %) are neutral about statement 'I am willing to start composting at residential area using organic waste as compost material. There are 32 respondents (32.3 %) agree with statement 'I participate in sustainable solid waste management campaign held by *pondok* institution'. Other than that, 37 respondents (37.4 %) are totally agree and 35 respondents (35.4 %) are agree with statement 'I use things until it completely burn out'. The statement 'I reduce the waste before throwing it away' has a neutral response from 35 respondents (35.4 %).

There are 39 respondents (39.4 %) totally agree with statement 'if the *pondok* institution set up a recycling program, I would be willing to separate materials into separate bags for collection purpose'. Majority of respondents (47.5%) totally agree with statement 'I think that the quantity of waste sent for disposal should be minimised. There are 32 respondents (32.3 %) are neutral for statement 'I participate in sustainable solid waste management practice if there is incentives offered. Majority of the respondents (40.4%) are neutral with statement 'I make time to separate waste into different bags before put it at the garbage'. There are about same number of respondents that totally agree which is 32 respondents (32.3%), agree, 27 respondents (27.3 %) and neutral, 32 respondents (32.3 %) for the statement 'I am willing to make time to learn about waste recycling, waste segregation, and waste prevention'. There are also about same number of respondents for statement 'I involve my family and peers in solid waste management' where 31 respondents (31.3

%) totally agree with the statement meanwhile 29 respondents (29.3 %) and 33 respondents (33.3 %) are agree and neutral with the statement, respectively.

Table 4.12: Participation in sustainable solid waste management (Q1-Q12)

Statement	Frequency (percentage %)					Mean	S.D
	1	2	3	4	5		
1. I separate wet and dry waste before throwing into the rubbish	4 (4.0)	8 (8.1)	26 (26.3)	31 (31.3)	30 (30.3)	3.76	1.098
2. I throw solid waste (e.g. plastic, paper, glass) into recyclable dustbin	3 (3.0)	8 (8.1)	35 (35.4)	19 (19.2)	34 (34.3)	3.74	1.112
3. I am willing to start composting at residential area using organic waste as compost material.	1 (1.0)	5 (5.1)	34 (34.3)	28 (28.3)	31 (31.3)	3.84	0.966
4. I participate in sustainable solid waste management campaign held by <i>pondok</i> institution	2 (2.0)	11 (11.1)	29 (29.3)	32 (32.3)	25 (25.3)	3.68	1.038
5. I use things until it completely burn out	1 (1.0)	2 (2.0)	24 (24.2)	35 (35.4)	37 (37.4)	4.06	0.890
6. I reduce the waste before throwing it away	2 (2.0)	6 (6.1)	35 (35.4)	25 (25.3)	31 (31.3)	3.78	1.026
7. If the <i>pondok</i> institution set up a recycling programme, I would be willing to separate materials into separate bags for collection purpose	0 (0.0)	4 (4.0)	23 (23.2)	33 (33.3)	39 (39.4)	4.08	0.888
8. I think that the quantity of waste sent for disposal should be minimised.	2 (2.0)	5 (5.1)	16 (16.2)	29 (29.3)	47 (47.5)	4.15	1.004
9. I participate in sustainable solid waste practice if there is incentives offered	6 (6.1)	6 (6.1)	32 (32.3)	25 (25.3)	30 (30.3)	3.68	1.150
10. I make time to separate waste into different bags before put it at the garbage	1 (1.0)	7 (7.1)	40 (40.4)	24 (24.2)	27 (27.3)	3.70	0.984
11. I am willing to make time to learn about waste recycling, waste segregation, and waste prevention	1 (1.0)	7 (7.1)	32 (32.3)	27 (27.3)	32 (32.3)	3.83	1.000

Table 4.12 (continued)

12. I involve my family and peers in solid waste management	0 (0.0)	6 (6.1)	33 (33.3)	29 (29.3)	31 (31.3)	3.86	0.937
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Reference: 1 = strongly disagree, 2 = disagree, 3 = natural, 4 = agree, 5 = strongly agree

4.6.1 Factors of socio-demographic, knowledge, awareness and barriers factors in influencing participation in Sustainable Solid Waste Management

A one-way subject ANOVA was conducted to compare the effect of job/position on participation in sustainable solid waste management in student, teacher and staff conditions. According to Table 4.11, there was not a significant of job/positions on participation in sustainable solid waste management at the $p < .05$ for the three conditions [$F(2, 96) = 1.904, p = 0.155$].

Table 4.13: ANOVA of participation in sustainable solid waste management based on job/position

Job/position	N	Mean	Std. Deviation	F	p-value	Significant or not
Student	86	3.81	0.65	1.904	0.155	Not significant
Teacher	4	4.44	0.52			
Staff	9	3.94	0.67			
Total	99	3.85	0.66			

According to Table 4.12, there was no significant effect for education category, $t(97) = -0.831, p = 0.155$, despite higher education ($M = 3.91, SD = 0.64$) has higher scores than lower education ($M = 3.80, p = 0.67$).

Table 4.14: T-test of participation in sustainable sold waste management based on education category

Education category	N	Mean	Std. Deviation	F	p-value	Significant or not
Lower education	58	3.80	0.67	0.308	0.580	Not significant
Higher education	41	3.91	0.64			

A one-way subject ANOVA was conducted to compare the effect of years spent at *pondok* institution on participation in sustainable solid waste management in 1 year, 2-3 years, 4-5 years and more than 6 years conditions. According to Table 4.13, there was no significant effect of years spent at *pondok* institutions on participation in sustainable solid waste management at $p < .05$ for the four conditions [F (3, 95) = 0.463, $p = 0.709$].

Table 4.15: ANOVA of participation in sustainable solid waste management based on years spent at *pondok* institution

Years spent at <i>pondok</i> institution	N	Mean	Std. Deviation	F	p-value	Significant or not
1 year	32	3.73	0.51	0.463	0.709	Not significant
2-3 years	28	3.92	0.74			
4-5 years	29	3.88	0.68			
More than 6 years	10	3.89	0.79			
Total	99	3.85	0.66			

Socio-demographic factors such as job/position, education level, and years spent at *pondok* institution were analysed to whether these factors will have effect on participation in sustainable solid waste management. The result obtained shows that all three factors are not significant to participation in sustainable solid waste

management which means it will not affect the participation of *pondok's* community in sustainable solid waste management.

The level of participation among *pondok* community in sustainable solid waste management according to Table 3.7 is moderate as the result calculated for level of participation is 3.85. The result come out moderate may due to barriers that prevent the sustainable solid waste management was also moderate even though the knowledge and awareness among *pondok* community regarding sustainable solid waste management was high.

This is the analysis of correlation between knowledge, awareness, barriers and participation. Table 4.14 shows knowledge has significant, moderate, and positive correlation with participation with correlation coefficient (r-value) of 0.563, $p < 0.01$. Other than that, awareness also has a significant, moderate and positive correlation with participation with r-value of 0.545, $p < 0.01$. The correlation between barriers and participation is significant, positive but moderate correlation with r-value of 0.381, $p < 0.01$.

Correlation result shows that knowledge has significant relationship to participation in sustainable solid waste management. This result is in line with a study by Adeolu , Enesi, & Adeolu (2014) that conclude students with some environmental education and expertise are more likely to take part in environmental programs and plan, thereby creating new ideas for solving environmental problems. The introduction or incorporation of the concepts of waste management through environmental education at all levels will not only increase the comprehension of waste management by students, but will also change the student's apparently unfriendly attitude and practices in waste management.

Other than that, correlation result between awareness and participation also significant. As suggested by Maddox et al., (2011), the awareness of students about environmental issues and solutions can be increased through education. This is why it is important to implement education on solid waste management as it will automatically increase the awareness inside the people. This result supports the findings of Hines, Hugerford and Tomera (1986) that the degree of consistency between attitudes and actions of the environment is influenced by the knowledge and awareness of an individual public, verbal interaction and their sense of responsibility.

Even there is moderate correlation, it is a significant relationship between barriers and participation in sustainable solid waste management. The barriers can be factors in preventing the participation of *pondok* community. For example, almost majority of respondents agree that inadequate solid waste management service is one of the barriers in sustainable solid waste management at *pondok*. This in line with study by Ezeah & Roberts (2012) that state operational constraints such as unavailable basic material for waste collection and limited waste handling vehicles are barriers in adopting sustainable management in solid waste in Nigeria.

Table 4.16: Correlation between knowledge, awareness and barriers with participation

Factors		Dependent Variable
		Participation
Knowledge	Pearson Correlation	0.563**
	Sig. (2-tailed)	0.000
Awareness	Pearson Correlation	0.545**
	Sig. (2-tailed)	0.000
Barriers	Pearson Correlation	0.381**
	Sig. (2-tailed)	0.000

**Correlation is significant at the 0.01 level (2-tailed)

CONCLUSION AND RECOMMENDATION

7.1 Conclusion

This study showed that *pondok's* community does have knowledge and awareness regarding sustainable solid waste management as the level of knowledge and awareness are 4.33 and 4.39 respectively, which means which mean the variables are high. This result is can be caused by age and education level of respondents as the majority of the respondents are young people. Young people are more exposed to knowledge and more aware about sustainable solid waste management as information regarding solid waste management is easily obtained for example, through social media. The finding of this study has achieved the objective of to examine knowledge and awareness in sustainable solid waste management among *pondok's* community.

In addition, this study showed that there is weak correlation between knowledge and awareness with barriers of sustainable solid waste management. This is due to low correlation coefficients value (r-value) between those variables. Other than that, socio-demographic factors such as job/position, education category and

years spent at *pondok* institution does not have effect on barriers of sustainable solid waste management. This result can be accepted as barriers that were focused on this study were technical and operational barriers. The finding of this study has achieved the objective of to analyse the barriers of sustainable solid waste management in *pondok* institution.

Other than that, participation in sustainable solid waste management is significant and has a strong relationship with knowledge, awareness and barriers. It is vital to know as it will also increase the awareness regarding solid waste management. When someone has studied that the improper solid waste management can caused adverse health effect, it will awaken them to take part in sustainable solid waste management. Knowledge and awareness can make people more concern about the environment. It is important to exposed young people to sustainable solid waste management as youngsters are more creative and come up with a new idea to improve the sustainable solid waste management practice. However, socio-demographic factors such as job/position, education category and years spent at *pondok* institution will not affect the participation in sustainable solid waste management. The finding of this study has achieved the objective of to analyse the participation in sustainable solid waste management among *pondok* community. People with higher knowledge and awareness regarding solid waste management tend to participate in sustainable solid waste management. This is because they are aware about improper solid waste management can be bad to environment. Other than that, higher knowledge regarding proper waste management make the people confident to practice sustainable solid waste management.

7.2 Recommendation

Based on the findings, there are several improvements that needed to be enhanced in order to make the sustainable solid waste management at *pondok* institution successful. Implementing environmental education at *pondok* institution is important in order to enhance the knowledge and awareness especially among older people at *pondok*. Other than theoretical learning, including field activity where the *pondok* community can practice hands-by-hands is also important so that they will clearly see how to manage waste properly. Even the knowledge and awareness among *pondok* community regarding sustainable solid waste management is high, it is important to implement physical practices for *pondok's* community. This need to be done in order to make sure that the knowledge learnt is being executed in a correct way. Higher in knowledge and awareness but false way of implementation will make no improvement in sustainable solid waste management. Other than that, *pondok* management and administration should discuss on how to reduce the technical issues in solid waste management at *pondok* institution.

To improve the study of sustainable solid waste management on *pondok* institutions, I would like to suggest future study to focus on household at *pondok* and include other socio-demographic parameter such as household income.

MALAYSIA

KELANTAN

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APPENDIX A

Survey Question

Section A: Demographic Information

Please provide the following demographic information for analysis purposes (Place an (√) on in the square to give your answer

1. Gender : Male Female
2. Marital status : Married Unmarried
3. Age group (years) : 10-20 21-30 31-40 41-50
>60
4. Residential Area : Hostel Warden's house
Others: _____
5. Position : Student Teacher Staff
Others: _____
6. Educational Level : Primary school
 Secondary school
 Diploma
 Degree
 Others:

Section B: Awareness and knowledge about solid waste management

Please answer according to your knowledge regarding solid waste management

Knowledge

1. Do you know what sustainable solid waste management is?

Yes No

2. Where/from who did you learnt about sustainable solid waste management?

Family

School

Television/mass media

3. What solid waste practice that you know?

Waste reduction and reuse

Recycling/composting

Disposal into landfill

Assessment Description:

1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

No.	Questions	1	2	3	4	5
4.	I know about the 3R practice – “Reduce, Reuse, Recycle”					
5.	I know the proper waste disposal practices					
6.	I know that there are many types of waste (e.g. solid waste, organic waste, liquid waste, recyclable waste and hazardous waste)					
7.	I know there are different types of solid waste (e.g. plastic, paper, glass, metal)					
8.	I know there are different dustbin to dispose the solid waste					
9.	Waste prevention is reducing the amount of waste we produce at source					
10.	Waste segregation means dividing waste into dry (e.g. plastic, metal, glass) and wet (e.g. usually organic waste)					
11.	Organic wastes can become a compost material					
12.	Compost can become fertilizer					
13.	Composting of organic wastes can help in reducing wet wastes in landfill					

Awareness

Assessment Description:

1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

No.	Questions	1	2	3	4	5
1.	I am aware of solid waste management at Pondok institution					
2.	I am aware that most solid waste end up at landfill					
3.	I think it is important to practice waste separation					
4.	I think it is important to recycle solid waste					
5.	I think it is important to reuse things that can still be used					
6.	Segregating waste would do well for solid waste management at Pondok institution					
7.	Waste prevention leads to better environment for the present and future, thereby leading to sustainable development					
8.	Solid waste is a major issues that needs to be addressed by Pondok management					
9.	I think sustainable solid waste management practice should be developed in Pondok institution					
10.	Waste prevention is beneficial for Pondok society and environmental					
11.	I will spread the awareness regarding importance of solid waste management to family and peers					

Section D: Barriers of Sustainable Solid Waste Management

Assessment Description:

1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

No	Questions	1	2	3	4	5
1.	Lack of financial resources in solid waste management					
2.	Lack of trained staff in managing solid waste management					
3.	Lack of equipment in solid waste management					
4.	Poor response to waste minimization (reuse/recycling)					

5.	Inadequate solid waste management service at Pondok institution					
6.	Lack of capability to maintain proper solid waste management					
7.	Lack of knowledge among Pondok community					
8.	Poor cooperation by Pondok community					
9.	Poor solid waste management by Pondok administration					
10.	Poor cooperation by Pondok administration					
11.	Difficult to obtain basic material (e.g. bags for waste separation) in solid waste collection					
12.	Dustbin placed too far from residential area.					
13.	Lack of information regarding proper ways to manage waste at Pondok institution					

Section D: Participation of community

Assessment Description:

1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

No.	Questions	1	2	3	4	5
1.	I separate wet and dry waste before throwing into the rubbish					
2.	I throw solid waste (e.g. plastic, paper, glass) into recyclable dustbin					
3.	I am willing to start composting at residential area using organic waste as compost material.					
4.	I participate in sustainable solid waste management campaign held by Pondok institution					
5.	I will use things until it completely burn out					
6.	I will make sure to reduce the waste before throwing it away					
7.	If the Pondok institution set up a recycling programme, I would be willing to separate materials into separate bags for collection purpose					
8.	I think that the quantity of waste sent for disposal should be minimised.					
9.	I will participate in sustainable solid waste practice if there is incentives offered					

10.	I will make time to separate waste into different bags before put it at the garbage					
11.	I am willing to make time to learn about waste recycling, waste segregation, and waste prevention					
12.	I will try to involve my family and peers in solid waste management					