ATTITUDE AND BEHAVIOUR OF CONTRACTOR IN MANAGING WASTE MANAGEMENT IN CONSTRUCTION

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Thesis submitted in fulfillment of the requirements
for the award of the
Bachelor Degree in Civil Engineering

Faculty of Civil Engineering and Earth Resources

UNIVERSITI MALAYSIA PAHANG

JUNE 2018

ACKNOWLEDGEMENTS

“Bismillahirrahmanirrahim”

“Dengan nama Allah Yang Maha Pemurah Lagi Maha Penyayang”

Firstly, thanks to Allah SWT with His permission I can complete this thesis. I would also like to thank both my parents who have given me a lot of encouragement in completing this research.

The highest appreciation to my supervisor, Mr Mohammad Syamsyul Hairi Bin Saad who has taught me a lot in preparing this thesis. The constant support I have added to my confidence is to complete this thesis successfully.

Thank you very much for helping colleagues who have helped many ideas to produce excellent and quality thesis to the community.

ABSTRAK

Di Malaysia, kajian mengenai sikap dan tingkah laku kontraktor terhadap masalah pembuangan sisa binaan adalah sangat sedikit. Cara yang terbaik adalah mungkin dengan Majlis Perbandaran menyediakan sebidang tanah untuk para kontraktor bagi membuang sisa binaan mereka secara sah di sisi undang-undang (The Star Online, 2016). Di dalam kajian ini terdapat 3 objektif. Objektif yang pertama sekali ialah untuk mengkaji sikap dan tingkah laku kontraktor dalam menguruskan sisa pembinaan. Objektif yang kedua ialah untuk mengetahui kesan sikap dan tingkah laku kontraktor dalam menguruskan sisa pembinaan. Objektif yang ketiga ialah untuk menganalisis dan mencadangkan penyelesaian terbaik untuk meminimumkan sisa pembinaan. Kajian ini menumpukan golongan kontraktor G7 dan sebanyak 56 responden telah berjaya menjawab borang kajian soal selidik tersebut. Tapak pembinaan yang dipilih ialah di sekitar Kuantan, Pahang kerana peningkatan arus pembangunan di bandar tersebut. Microsoft Excel merupakan sebuah program aplikasi yang telah digunakan untuk menafsirkan dan menunjukkan data seperti yang telah diperolehi dari borang kajian soal selidik. Kaedah Indeks Kepentingan Relatif (RII) telah digunakan untuk mengetahui jumlah kasar yang telah diperolehi dari borang kajian soal selidik. Kategori analisis data tertinggi untuk sikap kontraktor ialah kontraktor memberikan gaji yang rendah kepada pekerja manakala untuk kelakuan kontraktor pula adalah kontraktor mempraktikkan penyimpanan bahan-bahan binaan yang salah. Penyelesaian terbaik bagi hasil kajian ini ialah Sistem Bangunan Industri (IBS) iaitu sebagai cadangan berkesan bagi menyelesaikaan masalah ini. Lembaga Pembangunan Industri Pembinaan Malaysia (CIDB) mahu menjadikan Sistem Bangunan Industri (IBS) sebagai mandatori pada tahun 2020. Akhir sekali, penyelidikan masa depan kajian ini adalah untuk menggunakan Pemodelan Maklumat Bangunan atau Building Information Modeling (BIM). Kerajaan telah menguatkuasakan penggunaan Pemodelan Maklumat Bangunan (BIM) untuk pembinaan projek-projek awam yang bernilai RM100 juta ke atas menjelang 2019.

ABSTRACT

In Malaysia, there are very uncommon research have been done regarding the issue of attitude and behaviour of contractor in managing waste management in construction. A parcel of land may the proper way for local councils to be provided to contractors since they are lazy to dump their construction waste legally (The Star Online, 2016). There are three objectives in this research. Firstly, to study attitude and behaviour of contractor in managing construction waste. Secondly, to obtain the effect of contractor's attitude and behaviour in managing construction waste. Thirdly, to analyse the solution to minimize construction waste. Since, the study is related to contractor, the primary target group is the contractor G7 and 56 respondents successfully got the respond from questionnaire. Construction sites are chosen around Kuantan, Pahang because of the increasing development percentage in Kuantan, Pahang. Microsoft Excel software is used to interpret and demonstrated the data as indicated by information from the questionnaire. The Relative Importance Index method, (RII) methods empower to figure out the crude information accurately got from the questionnaire. Overall the highest data analysis for attitude of contractor is a contractor give low wages to workers while for behaviour of contractor is a wrong material storage category. The recommendation of this research is to implement Industrial Building System (IBS) in project. Construction Industry Development Board Malaysia (CIDB) wants to make the Industrialised Building System (IBS) mandatory by 2020. Lastly, future research of this study is to use Building Information Modelling (BIM). The government is set to enforce the Building Information Modelling (BIM) for construction of public projects above RM100 million by 2019.

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LIST OF ABBREVIATIONS

11MP	11th Malaysian Plan
GDP	Gross Domestic Product
TRX	Tun Razak Exchange
DOE	Department of Environment
CIDB	Construction Industry Development Board
IBS	Industrial Building System
C&D	Construction and Demolition
SEF	Services Export Fund
FTA	Free Trade Agreement
MRA	Mutual Recognition Agreement

CHAPTER 1

INTRODUCTION

1.1 Background of Study

According to 11th Malaysia Plan (11MP) it is important to setup new plan, new strategy in order to achieve various targets, achievements and figure out the requirement to further strengthen Malaysia's productivity planning for better result. Malaysia have identifies that there is chance to produce better achievement that will allow us to feel the pleasure that we are on the proper path in committing on higher production to accomplish our targets. Thus, the Government is permitting stronger attention to the priority of productivity as the major handler to boost economic production over the long term.

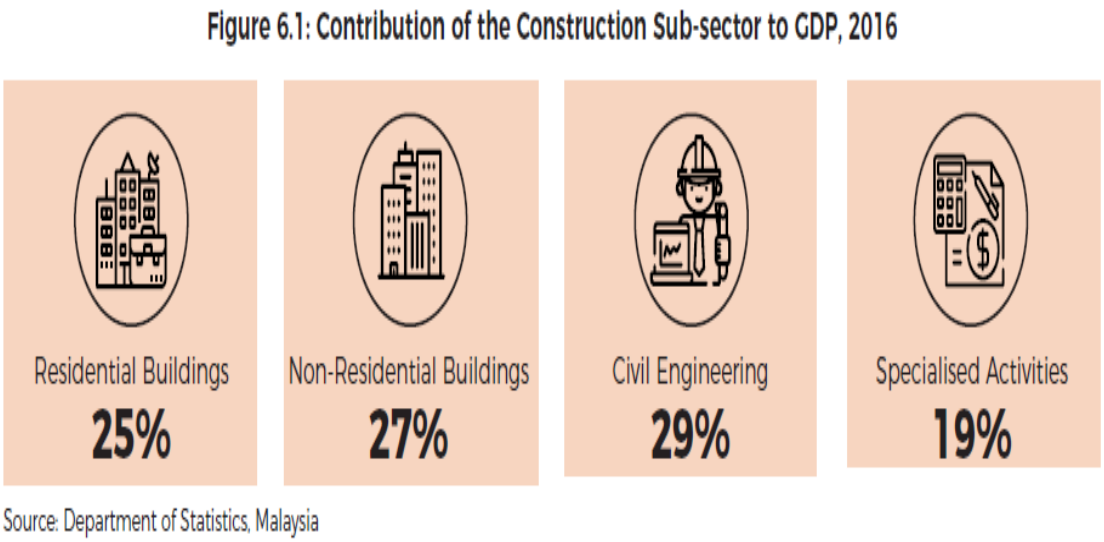

Figure 1-1: Contribution of the Construction Sub-sector to GDP, 2016.

In 2016, civil engineering topped the contribution of the construction sub-sector to Gross Domestic Product (GDP) which is at 29% followed by non-residential building activities (27%), residential buildings (25%), and specialised activities (19%)

(Productivity Report 2016/2017, 2017). The performance of various sub-sectors was driven by major construction projects such as the Klang Valley's Mass Rapid Transit (MRT), Tun Razak Exchange (TRX) in Kuala Lumpur and Petronas Refinery and Petrochemical Integrated Development (RAPID) project in Pengerang, Johor.

There are many construction that is ongoing around state of Malaysia in order to achieve "Malaysian Plan 2020". Unfortunately, there a lot of deadly, disastrous, destructive effects to ecosystem and environment when construction waste is being issued. Instead of Malaysia is being advanced in construction sector, managing waste management in construction have become a serious environmental issues. Traditional method of dumping waste still be used in Malaysia. People start to worry about this issue. The problem is not something new that we heard through mass media, still there are limited operation taken to regulate the waste construction. Bricks, wood, packaging, metal, soil and sand are common construction waste in Malaysia. A large chunk of it, some 66%, will be concrete and aggregate and at the moment, only 15% of this waste is picked up by contracted waste management companies. The rest, as much as 85%, is left uncollected (The Star Online, 2015). They may lack of understanding, realization, attention, responsibility and want to generate more income. In addition, the enormous, massive of construction waste is allowed by contractor to happen. The data about construction waste is very limited due to lacking research about this issue.

Every year there are many construction is ongoing in Malaysia, but attitude and behaviour of contractor in managing waste management in construction is not satisfied yet. There are many open burning and dumping in an open area which the contractor use as their dumping site. Actually, the cost of waste is a cost that client need to bear. That is why attitude and behaviour of contractor in managing waste construction is very important in order to develop productivity and performance of construction industry. This study shown how attitude and behaviour of contractor in managing waste construction.

1.2 Problem Statement

According to Malaysian Construction Industry Master Plan 2005-2015 stated that it was compulsory for changes in construction industry market. It is important to achieve

long term sustainability in industry. Financial affordability is the main part in construction industry especially towards clients, stakeholders in order provide long life term of a company. So, it is important for the company to identify attitude and behaviour of contractor in managing waste management in construction in order to overcome construction waste issues for beneficial financial of a company.

Nowadays, massive amounts of population growth have led to an increase in solid wastes in most developing countries. The wastes produced from a variety of human activities includes industrial and domestic. This situation can give negative impacts toward our health, environment and ecosystem. A parcel of land may the proper way for local councils to be provided to contractors since they are lazy to dump their construction waste legally (The Star Online, 2016). The explanation above is obvious that long term unpleasant environmental have social impacts toward nearby neighbourhood and environment. This situation would result a bit of cost in clearing construction waste especially when involve air pollution due to sand and lorry exhaust around the construction site.

Majority of contractors would blame others and did not take this problem as a serious issue. The main priority for contractor is timing, so they did not spend time to manage construction waste at their site. They just think about their completing of project rather than environment and health people around. So, attitude and behaviour of contractor in managing waste management in construction is need to be discuss in order to reduce construction waste issues in Malaysia.

1.3 Research Objective

The objectives of this research are:

1. To study attitude and behavior of contractor in managing construction waste.
2. To obtain the effect of contractor's attitude and behavior in managing construction waste.
3. To analyze the solution to minimize construction waste.

1.4 Scope of Research

The scope of research is to focus on effect and analyze the attitude and behavior of contractor in managing waste management in construction. This study would targeted toward Malaysian contractors in order to reduce waste construction. Then, waste construction issues is identified. Since, the study is related to contractor, the primary target group is the contractor G7. This research would highlight the current issues of waste construction which is practiced by contractor while at construction site. G7 contractor is focus on contractors who are registered in the Pahang state. Construction sites are chosen around Kuantan, Pahang because of the increasing development percentage in Kuantan city. Some of the agencies such as Solid Waste Public Cleansing Management Corporation, Department of Environment (DOE) and Construction Industry Development Board (CIDB) are necessary in figure out waste construction issues in Kuantan, Pahang, Malaysia. Questionnaire would be distributed to those who have significant role in reducing and managing waste construction at site.

1.5 Significant of Study

In Malaysia, there are very uncommon research have been done regarding the issue of attitude and behavior of contractor in managing waste management in construction. Firstly, the priority of this study is to focus about the attitude and behavior of contractor in managing waste management in construction. Secondly, is to analyze the effects' attitude and behavior of contractor in managing waste management in construction. It is because we need to point out the best solution of powerful sustainable implementation in order to reduce waste construction in our country. Furthermore, this subject or topic is not seriously discuss and taken up by others. So, data, information and research is necessary in order to overcome the problem and get the right result and action. This research may got attention to parties and development researchers.

1.6 Thesis Structure

This research involved of five chapters. The first chapter consists of introduction section. It states the background, problem statement, objectives of study, scope of study and significant of study. For chapter two, the key term in purpose for this research are described and also the literature review that related and suitable for this research. Chapter

three explains the research methodology for research data collected and the method of data analysis to be used. For chapter four, the results obtained from study area and year of study were presented and the analysis from the result was discussed. Finally, chapter five comprises the conclusion from the overall chapter and relates some recommendations for future work on research field.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the literature review of the research would be discussed as clear as possible. All information would be point out and reviewed by citing and referring to latest journal, research paper and current observation issue regarding construction waste to better understand regarding attitude and behavior of contractor in managing waste management in construction. Furthermore, we would go through the effect and analyze attitude and behavior of contractor in managing waste management in construction.

2.2 Construction Waste

Construction waste is a mixture of inert and non-inert materials arising from various construction activities like excavation, demolition, construction, renovation, and roadwork (Akhir, 2015). Based on all highlighted definitions, it should be understood that construction wastes is in the form of materials losses while the construction project was being carried out.

The Star daily publication in March 2014, Solid Wastes Management and Public Cleansing Corporation highlighted that in Kuala Lumpur generated 1.04 million metric tons of construction wastes per year and this amount is expected to increase to 1.34 million metric tons a year by 2020 (The Star Online, 2014). However, these wastes were not properly handled by the construction parties involved. Research studies have indicated that dumping of construction wastes in landfill is a common practice in Malaysia (Nagapan, 2013). In a study showed that 42% of the wastes were dumped illegally in the district of Johor Bahru Tengah, Johor. The study also found 46 illegal dumping sites in the district and most of them were located near the road side. A study in

the Klang Valley found only 20% of C&D wastes were disposed at legal landfills while others were disposed at illegal landfills or private lands (R.A Begum, 2004). There are also a number of contractors that disposed material wastes through open burning especially timber and packaging wastes, and also by burying concrete wastes (Ahmad Firman Masudi1*, 2011)**.**

Currently in duplicating the development industry has raised the issue of wastage of construction worldwide. The construction site in Malaysia currently presents a lot of waste at the construction site. Nowadays, the quantity of construction has drastically expanded with the ultimate goal of achieving the '2020 Malaysia Plan'. Unfortunately, due to the rapid development, many negative effects occur. Waste management in the construction industry in Malaysia has become a major issue in recent years. Populace development has prompted an expansion in strong waste age in Malaysia and it has turned into an essential issue to be settled.

Construction waste consists of debris generated during construction, renovation, and demolition of buildings, roads, bridges and all other work related to civil engineering. Construction waste materials comprise of the trash produced amid the construction, renovation, and demolition of buildings, roads, bridges and all other business related to civil engineering. Construction waste materials regularly contain bulky, heavy materials that incorporate concrete, wood, asphalt (from roads and roofing shingles), gypsum (the principle part of drywall), metals, bricks, glass, plastics, PVC, trees, stumps, earth, and rock from clearing sites (EPA, 2008).

Ordinarily, construction waste may contain risky material which may influence people and nature. The age of unsafe wastes normally done amid construction activities include paints, solvents, adhesives, caulks, pesticides, wood preservatives, oil, or stored materials (for example, solvents or pesticides) that have surpassed their time span of usability. Other regular cases of dangerous construction wastes are asbestos, polychlorinated biphenyls (PCBs) and heavy metals that can be discharged amid demolition or renovation of existing structures (EPA, 2008).

Construction is turning into a genuine ecological issue in numerous vast urban communities in the world. As per measurable information, construction and demolition (C&D) debris much of the time make up 10 to 30% of the waste got at numerous landfill destinations around the world (Fishbein, 2008).

Reasons for construction material waste can be partitioned into two general classes: non-site based and site based. Non-site-based waste mostly happens because of design errors, design changes and enormous requesting of materials. Great design, specifications and acquirement can decrease material wastage (Esin, 2007). By fitting the construction procedure and design plan, the majority of non-site-based waste can be decreased.

Site-based waste contains the genuine loss of materials amid site operations. Cautious transportation, reception, handling, storage and coordination can decrease site-based material wastage (Lu, 2011). Site-based material waste can be additionally separated into two classes: upstream and downstream. Upstream waste is created before the construction operation. Improper material handling and storage have been found to be the main causes of upstream waste revealed that the activities causing excessive upstream losses are incorrect unloading of materials, poor ground conditions causing losses amid transportation of materials, insufficient transportation equipment, unsuitable packaging; and losses during stacking. It is found that bricks and blocks, drywall, wall and floor screeds, wall and ceiling plastering and tiling and sanitary fittings were vulnerable to damage due to careless handling.

Downstream waste refers to waste created at the operation stage. The majority of studies have cited residue resulting from the cutting of materials as the main source of downstream waste. It is found that downstream waste can happen because of poor workmanship, as a result of unskilled workers, lacking tools and poor working conditions (Tam, 2007). Timber formwork, reinforcement, bricks, blocks and tiling are subjected to frequent cutting. It is also included pipes and wires to the above list. There are two essential fundamental purposes behind downstream waste first, workers' belief that waste is unavoidable and second, lack and absence of supervision.

2.3 Highlights Tenth Malaysia Plan, 2011-2015: Achievements

The development segment is evaluated to record a normal yearly development rate of 11.1% during the Tenth Plan. . The development is bolstered by extension in the civil engineering subsector, developing at 9.3% for each annum, trailed by residential subsector at 16.5% and non-residential at 9.1%. The area gave 1.2 million occupations, constituting 8.9% of total employment. From 2011 to 2014, an overall of 29,435 development ventures were granted, esteemed at RM470 billion. These were to a great extent private segment ventures totalling RM387 billion or 82% of total value, with remain an incentive around RM83 billion from public course projects.

Among the vast scale ventures executed were Regasification Terminal in Melaka, Central Spine Road from Kuala Lipis to Bentong, Kuala Lumpur International Airport 2 (KLIA2), Light Rail Transit (LRT) extension from Kelana Jaya and Sri Petaling to Putra Heights, Electrified Double-Track Railway from Ipoh to Padang Besar, Klang Valley Mass Rapid Transit (KVMRT) Line 1 from Sungai Buloh to Kajang. The usage of these activities mirrors the expanding utilization of innovation and present day rehearses in the development part ideal from the plan stage through to execution and maintenance.

The utilization of innovation and present day development strategies, for example, building data demonstrating (BIM) and industrialized building framework (IBS) were significant in enhancing the effectiveness of construction project. BIM was utilized as a part of tasks, for example, the National Cancer Institute in Putrajaya – the first government venture that utilized the technology, and in the construction of the organization complex of the Malaysian Anti-Corruption Commission in Shah Alam.

2.4 Highlights Eleventh Malaysia Plan, 2016-2020: Transforming Construction

The construction industry is winding up more essential because of higher interest for present day and proficient infrastructure in accordance with the point of turning into an advanced country. The construction industry is relied upon to develop at 10.3% for every annum with a commitment of RM327 billion or 5.5% to Gross Domestic Product (GDP) by 2020. The Government will present the Construction Industry Transformation Program (CITP), 2016-2020, to drive the business forward and take care of market

demand. In the Eleventh Plan, efforts to change the construction segment depend on four fundamental systems, to be specific:

1) Strategy D1: Enhancing information content by expanding human capital quality, quickening limit and ability working of Small and Medium Enterprises (SMEs) and Bumiputera contractors and diminishing the bungle between labour demand and supply.
2) Strategy D2: Driving productivity by expanding technology selection and modernizing construction strategies.
3) Strategy D3: Encouraging sustainable practices in the construction esteem chain and creating enactment that backings economical construction activities.
4) Strategy D4: Expanding internationalization by building limit and size of firms to send out and tending to issues through transactions at government-to-government level and also using the Services Export Fund.

Strategy D1: Enhancing knowledge content

The techniques to upgrade learning content in the construction industry incorporate expanding the nature of human capital, quickening limit and ability building of Small and Medium Enterprises (SMEs) and Bumiputera contractors, and minimize the confusing between labour demand and supply. Key activities incorporate cultivating more noteworthy coordinated effort between Construction Industry Development Board (CIDB), the particular professional boards and training institutions to develop industry-relevant training modules. An organized talented exchange apprenticeship program for particular courses, for example, safety supervisors and crane administrators will likewise be acquainted with create a highly skilled workforce. SME capabilities will be improved, especially Bumiputera contractors, with the help of key partners. Regular manpower planning will be embraced to diminish the mismatch between labour demand and supply. The skilled foreign labour will be expanded by streamlining section necessities and presenting another require framework.

Strategy D2: Driving productivity

The techniques to build efficiency in the construction industry will focus around expanding technology appropriation and modernisation of construction strategies and decreasing reliance on low-talented worker. The labour profitability of the division is focused to increment by around 1.6 times, from RM39,116 per worker in 2015 to RM61,939 per worker by 2020. Various activities will be acquainted with drive efficiency, including assisting the appropriation of the IBS by the business through the revision of the public procurement policy approach and Uniform Building by-Laws 1984 and enhancing existing directions to ease construction related business forms. This exertion, which began with Kuala Lumpur City Hall, will be extended to other local authorities. The utilization of ICT will be improved by giving a typical stage to utilize BIM on every construction company.

Strategy D3: Fostering sustainable practices

In accordance with the developing requirement for green development practices,, procedures will be equipped towards expanding the sustainability of constructed infrastructure. This will incorporate teaching green practices in the construction sector and supports sustainable construction activities. Three things to encourage ecological supportability in the division such as obey sustainable waste management practices EMS ISO 14001 certification, upgrading the present rating frameworks for structures and growing new standards for infrastructure to advance sustainability, upgrading the mindfulness and responsibility of health, safety and environment (HSE), where HSE great practices will be made mandatory.

Strategy D4: Increasing internationalisation

Expand the internationalization of firms will focus on around building capability and size of firms by urging high performing SME. Furthermore, firms will be urged to use Mutual Recognition Agreement (MRA)s, Free Trade Agreement (FTA)s and, give criticism to the Government on challenges confronted while wandering abroad to empower issues to be tended to at government-to-government level. The Services Export Fund (SEF), which covers exercises, for example, offering, negotiating, and conducting feasibility studies about for universal tasks and will assist construction firms to secure opportunities abroad.

2.5 Cause of Construction Waste

Construction wastes normally produce from the beginning of the project until the project is finish. The primary six reasons for waste are design, procurement, materials handling, operation, residual, and other. One of the real reasons for waste in construction site is late design change. This is because material might be purchased and not been use in latest design. Another factor that might be a noteworthy is inadequate or late data, poor material management, incompetent labor and damage during transportation are cases of C&D waste sources. Lately, a few examinations have shown the significance of the design stage and issue may lies with architect neglect to implement waste reduction measures amid design stage (Shant A. Dajadian1, 2014). Table underneath show list of source and reason for construction waste:

Table 2-1: Source and Cause of Construction Waste

Sources of waste	**Cause of waste**
Contractual	1. Errors in contract documents 2. Contract documents incomplete at commencement of construction
Design	1. Design changes 2. Design and construction detail errors 3. Unclear/unsuitable specification 4. Poor coordination and communication (late information, last minute client requirements, slow drawing revision and distribution)
Procurement	1. Ordering errors (i.e., ordering items not in compliance with specification) 2. Over allowances (i.e., difficulties to order small quantities) 3. Supplier errors
Transportation	1. Damage during transportation 2. Insufficient protection during unloading 3. Inefficient methods of unloading

On-site management and planning	1. Lack of on-site waste management plans 2. Improper planning for required quantities 3. Lack of on-site material control 4. Lack of supervision
Material storage	1. Inappropriate site storage space leading to damage or deterioration 2. Improper storing methods 3. Materials stored far away from point of application
Material handling	1. Materials supplied in loose form 2. On-site transportation methods from storage to the point of application 3. Inadequate material handling
Site operation	1. Accidents due to negligence 2. Equipment malfunction 3. Poor craftsmanship 4. Time pressure
Residual	1. Waste from application processes (i.e., over-preparation of mortar) 2. Packaging
Others	1. Weather 2. Vandalism

(Shant A. Dajadian1, 2014)

2.6 Attitude of Contractor in Managing Construction Waste

Attitude' is the positive or negative feeling towards a particular object and 'behaviour' is an action towards that object. Attitudes are generally based upon the positive or negative evaluation of the consequences of a given behaviour and on personal beliefs about those consequences (Wang, 2010). On the other hand, less positive {Bibliography}attitudes towards waste minimization, possibly as a result of lower

awareness of the impacts of construction waste amongst the workforce, misconception of the quality of recycled products, lower motivation linked to lower wages and less effective supervision (Majed I Al-Sari, 2011).

2.6.1 Education

The discoveries uncover that construction-related education among is a critical variable in deciding behaviours regarding waste management. This is predictable with the instructive level of subcontractors was an essential factor in reducing site wastage (John Saunders, 2004). The negative coefficient shows that contractors with highly educated employees indicate less acceptable practices behaviours regarding waste management. The reason might be that there are couple of contractors (only 6% of total respondents) that have representatives with post-graduate degrees in construction-related fields.

There are a few difficulties in accomplishing the idea of sustainability in waste management (al, L S Ng et, 2017). Firstly, insufficient technologies and facilities are the consistently expanding rate of waste generation has caused the present technologies for example landfilling unfit to adapt to. Besides, lack of a well recycling market, reusing requires forceful marketing find market and offers with higher cost. Absence of it will hinder the successful in actualizing waste reusing. Thirdly, Insufficient fund. As waste minimization requires higher cost in this way, numerous industry specialists are hesitant to apply the waste management strategy. An incentives or appropriate fund might be their inspiration to apply waste minimization as one of the waste management strategy. Insufficient regulations. Regulations are requires for the business specialists to take after and apply in their method of waste management. Be that as it may, it is a test to create a holistic solid waste management system integrated, cost effective, sustainable, and satisfactory to the community, with emphasis on environmental conservation and technology selection. Lastly, lacking of awareness. In spite of the fact that there are a few policies set up, a large portion of the industry practitioners do not understand the significance in executing solid waste management based on the waste management hierarchy that gives the priority to waste reduction through 3R, moderate treatment and final disposal. Through recognizable proof of the difficulties experienced by Malaysia waste management industry in accomplishing sustainability, it empowers both private

and government segments to give careful consideration in settling the issues to accomplish reasonable, sustainable waste management.

2.6.2 Less Motivation

Then, it is poor attitude worker. Bad attitudes of worker is also contribute to construction waste. For example, the worker did not clean the stuff that they have been used, they did not arrange the material at the right place, steal construction material for profit purpose, go back early and come late to work. They did not focus during completing a task. When the task is not perfect, then they need to redo the task. This situation would lead to increasing cost and wastage of material. The worker need to be guided by expert person in completing a job given in order to avoid increasing construction waste at the site. So this part contractor play as a main role to overcome this issue such as they ask an expert worker to lead a task from an ordinary worker. This situation would minimize damaged stuff and decreasing construction waste at site. Contractor should always remind their worker about handling stuff and material, cultivate good behavior and safety at the construction site in order to increase productivity and achievement of the company.

Secondly, it is poor material handling. Sometimes the contractor did not guide worker how to operate or handle some material even worse the worker did not have enough qualification do the job that did not match to them. The contractor just point out an order for them to complete a task. For example, there are several welding tasks that need to be completed. An ordinary worker would absolutely different from specifically welding worker. The welding worker absolutely sure how to differentiate Metal Inert Gas (MIG), Tungsten Inert Gas (TIG) and Shielded Metal Arc Welding (SMAW) machine and its usage. If the contractor just let ordinary worker to handle sophisticated task without guide them, it is such let a burden to their shoulder. The task would be handled in poor condition. The material would broke or become useless and cause construction waste. Furthermore, the contractor use low quality of material to cut off cost in order to gain more profit. There are many risks if they use low quality of products such as the manager need to to buy another material due to broken stuff. Thus, it would increase construction waste and usage of money at the site.

2.6.3 Less Effective Supervision

Lack of supervision is also one of the main reason attitude of contractor in managing waste management in construction. Supervision is also important to ensure everything is done under control at construction site. Contractor should always obey and alert about planning and schedule. Every task must be done according to plan. It is important to prevent delaying project from occur otherwise everyone would face problem in term of money, time and construction waste. Sometimes, there are contractors who are not alert about quantity of material needed, cost of quantity, calculation time for material arrive at construction site, worker issues and expectation tasks are being completed. For them, the main priority is completing the project as soon as possible, point out a lot of orders to worker and forced worker to complete task without proper supervision. This attitude and behaviour should be avoided by contractors in order to minimize construction waste at the site.

2.7 Behaviour of Contractor in Managing Construction Waste

Behavioural decisions are frequently in view of attitudes towards that object, regardless of whether consciously or not (Begum, 2009). However the connection between the two can be quite complex and the empirical research on the attitude-behaviour link has been yielding contradictory results.

2.7.1 Sort Construction Waste Onsite

Most importantly, it is about sort of construction waste onsite. The strategy for reusing, recycling construction waste can be classes into two, which are on-site recycling and off-site recycling. On-site recycling is characterized as the isolation of the construction waste for ensuing use as the crude materials in the construction project. Meanwhile, off-site recycling is the segregation of the construction waste which are then transported to different organizations or areas and the waste is utilized as crude materials (Franchetti, 2009). At that point, a great contractors would isolate between construction waste and demolition waste.

Construction waste is regularly joined with demolition waste and portrayed as "construction and demolition" (C&D). There are numerous definitions for C&D. For all intents and purposes each state has a marginally unique definition for C&D waste. The EPA's Characterization of Building-Related construction and Demolition Debris in the United States (EPA530-R-98-01O) involves a partial list of these varied state definitions. For the scope of this study, C&D waste is described as the waste produced from current construction, remodelling, or the demolition of a structure.

However there are a few contrasts between construction and demolition waste. Construction squander loads were generally transported to the disposal area in open top roll-off containers, dump trucks, or open trailers. The waste loads keep to be lighter, less weathered, more homogeneous (all wood, dry wall, etc.), and involved more cardboard boxes than the demolition waste loads. Much of the time it was moderately simple to outwardly separate between the construction and demolition loads. The most troublesome burdens to distinguish were from remodelling projects. These heaps contained some new material and some demolition materials. In those cases, the heap was analysed and the waste segments assigned percentages. For example a remodelling load may be evaluated to be 60% construction and 40% demolition. The materials inside every one of these parts were then evaluated.

Although most loads could be effortlessly distinguished outwardly, drivers were met when conceivable to figure out where the heap started. If a load was classified as construction waste, the percentage of each the level of every material inside easily estimated. Visual prediction were made in the middle of and after the load was discharged. After any load was dumped the project manager strolled around the loss to distinguish waste materials and allocate material rates. Ordinarily, the rates of the dominate material was assessed first (for example wood may be evaluated at 60% of the load) and secondary materials took after, (dry wall material may be 30%, and the staying 10% might be cardboard). Materials were assessed until the point that 100% of the load was allocated. Clearly this was a non-scientific analysis since all information was subjective. Be that as it may, materials were moderately simple to separate and a similar individual did every one of the assessments with a specific end goal to look after

consistency. The accompanying materials were watched and evaluated as a feature of the construction waste component:

Wood: Waste materials that are mostly new wood from new construction. This may incorporate plywood, chip wood, dimensional lumber (2x4's, etc.) shavings and sawdust.

Drywall: Gypsum wallboard is a waste item from new construction.

Masonry: Inert materials for example brick, concrete, rock, and dirt that produced and. The masonry material and "newer" than the demolition masonry materials.

Metal: Metallic materials that were a waste result of current construction. This material comprised of new metal studs and metal beams (pillars) and pipes (channels).

Plastic: Plastic squander materials utilized as a part of new construction. This included PVC plumbing pipe, PVC siding, Styrofoam insulation, and plastic sheet.

Cardboard: Cardboard boxes, box board, and cardboard pressing material.

Others: Any squander materials beginning from new construction which do not fit into the one of the classes above. These materials incorporate fiberglass protection, electrical wiring, paper, and MSW from job sites.

Demolition waste is regularly joined with construction waste and portrayed as "construction and demolition" (C&D). There are numerous definitions for C&D. Practically every state has a somewhat extraordinary definition for C&D waste. The EPA's Characterization of Building-Related construction and Demolition Debris in the

United States (EPA530-R-98-010) a fractional rundown of these fluctuated state definitions. For end goal of this study, C&D waste is characterized as the waste coming about because of new construction, remodelling, or the demolition of a structure.

The demolition part of C&D is very not the same as the construction component. Construction waste materials have a tendency to be more homogeneous (all new wood, or new drywall, and so forth.) and generally are simpler to partitioned, reuse and recycle. The demolition waste materials had a tendency to be blended with an assortment of materials and more difficult to separate and recover.

Demolition loads fit into two general classes remodelling and debris. The remodelling loads were frequently blended with new construction materials. Residential remodelling loads had a higher level of wood while business rebuilding ventures contained more metal. Most remodelling loads landed in open top roll-off containers or were self-pulled in pick-up or trailers.

Debris loads were essentially structures that were basically structures that were knocked down by heavy equipment and loaded onto dump trucks for transport to the landfill. Debris loads typically contained stone work materials (dirt, rock, concrete, and brick) that were blended with wood, roofing, carpet, drywall and little measures of metal. The materials were blended and typically destroyed, broken, and crushed. Therefore debris loads are significantly more difficult to recover materials. In many cases, a debris load comprised of dirt, rock, or masonry materials. These masonry loads were overwhelming and had a tendency to skew the overall numbers. The accompanying materials were watched and assessed as a major aspect of the demolition waste component:

Wood: Wood waste from the demolition or remodelling of a structure. The wood was normally weathered, painted, and much of the time attached to some other material.

Drywall: Gypsum wallboard, which has been expelled from a structure.

Roofing: Shingles that were tom off of existing roofs in anticipation of putting new shingles on the structure. In most cases these shingles were conveyed to the landfill in dump trucks or trailers not mixed with some other materials.

Masonry: Inert materials for example, brick, concrete, rock, and dirt that were expelled from a demolition site. These materials were regularly mixed with other demolition materials for example wood, drywall and so on.

Metal: Metallic items that were evacuated amid the remodelling or demolition of a structure.

Carpet: Carpeting that was evacuated and discarded amid the remodelling as well as demolition of a structure.

Other: Any different materials, not listed above that was evacuated and discarded amid the remodelling as well as demolition of a structure. These included insulation, roofing insulation board, plastics, and little measures of MSW or bulky items.

2.7.2 Disposal Sites Used

Malaysia like other developing nations are confronting issue of high construction waste generation due quickly development of construction industry. Landfill dumping is regular practices in taking care of construction waste in Malaysia. At much 70% to 80% recyclable materials can be found on landfills in Malaysia. This makes landfill achieve their full capacity early. Sustainable waste management is remains a low preference among larger part of contractors in Malaysia. The 3R practices in construction industry are limited since it is not an obligatory prerequisite for construction companies and roadside unlawful dumping is as yet an issue for the authorities. Mostly of contractors do not use source separation, reduction, reuse or recycling at construction sites in Malaysia.

Additionally, rule of reuse and recycling construction waste has always been ignored because most of the efforts were targeted around dealing with handling domestic waste. Municipal Council just gives disposal services at landfill yet does not prevent in construction waste management since it is the obligation of contractors to oversee construction waste at site. As of now, there is no efficient data record on the volume and sort of construction waste being produced, measure of raisings generated and disposed in Malaysia. Information on waste minimization and reusing gave by local authorities is generally mixed, not standardized, non-uniform, and inconsistent.

Nonetheless, expanding number of unlawful dumping has been accounted for demonstrates the weaknesses of construction waste management in Malaysian construction industry and impact to environment. The past analyst likewise specified that the weaknesses of the rule are not being authorized and translated as the strong legal instrument. Subsequently, contractor in Malaysian construction industry can choose to embrace their own company activities for construction waste minimization during construction activities it straightforwardly can add to the illicit dumping exercises. Therefore, respondents have discovered that new factors of illegal dumping activities and it were unequivocally demonstrated the elements have expanded the illegal dumping activities in Malaysia construction industry. Despite the fact that there are a few program handle by government help the construction parties to limit an illegal dumping activities for example campaign, meeting and others programs. At that point a large portion of the respondents specified that illegal dumping activities are from the renovation works.

From the issues has been talked about the unlawful dumping activities can impact to the unbalance ecology, environment pollution and others condition contamination. Hence, the awareness among all parties particularly in construction projects should to be more worried with a specific end goal in order to reduce these issues. Other than that, the collaboration between all parties is expected to accomplish successful construction waste management and decrease the illicit dumping activities. A few procedures for upgrading waste minimisation which are, all parties need to improve the level of awareness on the best way to limit the waste, then do an initiative to reduce, recycling and reused activities and strengthening the roles of government agencies to guarantee the policies are adequately executed.

Disposal activities are extremely constrained and the waste surface is assessed to be 38 m high over the mean sea level adjacent to the Jelutong landfill (al, 2017). With the deficiency of open territory in Penang Island, Penang experiences issues in finding new site for solid waste disposal since landfill are requires large area. Almost all construction wastes in Penang are sent to Jelutong landfill. Residents at a high rise condominium are up in arms over the worsening stench from the open burning at Jelutong landfill in Penang Island. They are infuriated by the delay of local authorities in relocating the landfill. The residents had complained to the authorities many times, but no action had been taken to relocate the landfill. Nearby residents want Jelutong Landfill be relocated due to the raging fire and the resulting smog which posed threat to health. They are worried as the landfill had been expanding and it is located a mere 500m from their condominium. The landfill has been getting bigger and moving closer to the sea. Fire has been spotted at the landfill especially during the hot and dry season.

2.7.3 Material Management

Firstly it is wrong material storage. All sorts of material would be kept at one place until the project is completed. Some company would have only one place that keep everything in the storage. The contractor just think everything would be fine as long the material is kept safe and construction is ongoing well. They are not take material storage as a serious issue. Usually the material storage did not allow large quantities materials and mixed with other materials. The material storage is not properly arranged and the workers would face difficulty in find material that they want to use. When the workers cannot find the stuff, they would inform to their manager that the material is lost. Then, they would spend some money to buy the new one. Would we imagine how much money flow out when involve expensive stuff? It is such a waste of money to company. Besides, the material storage is not specifically good for construction materials. Some company just have limited space, small, poor and narrow storage at their site. The stuff may got exhibited to weather such as rainy, hot, sunny day. Some steel stuff such as Circular Hollow Sections (CHS) and Rectangular Hollow Sections (RHS) should be kept properly otherwise would be useless. There are a lot of material and stuff need to be kept perfectly in order to prevent waste so much money to unnecessary thing and construction waste at the construction site.

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Furthermore, it is ordering error. Sometimes, during transportation the stuff is already damaged before arrived at construction site. During the transportation maybe the position of material is not in the right place. Maybe the stuff in the lorry is not properly tied and cause the stuff to broke. For example, when the lorry carry Circular Hollow Sections (CHS) and Rectangular Hollow Sections (RHS) stuff. They arranged the material did not based on their size. They need to arranged them accordingly to size which is more diameter is placed at the bottom while small diameter of the steel is on the top of it. Actually, this issue is not fully fault from contractor but it is from manufacture that is responsible for this kind of issue. The contractor should also remind the manufacture to be careful in delivering the stuff in order to prevent damaged and increase construction waste at the site.

Next, it is quantity surveys. As a contractor, they should know every kind of stuff and material that they are going to use while the construction is ongoing. They should know everything especially in term of quantity and cost of the materials. It is important in order to overcome from order twice of the stuff. Contractor must do specific calculation in every task that they are going to do. It is important because we need to know the exact amount of the stuff that they are going to use. In order to gain more profit, they must expert in the flow of money. It is because the larger the project, the massive amount of money is needed if mistake is happen. Then it will contribute to construction waste due to unused material or excessive order happen. If the material was ordered is correct but the usage is in the end of the project is also not the best solution. They should think wisely to order the material according to the exact time material's usage. It is important to save storage and prevent damaged to the material due to store the material in a long time. If the material is damaged and useless it would contribute to construction waste.

Lastly, contractor poor in managing waste management in construction. Most contractors would just focus on completing the project as soon as possible without consider about construction waste that they have been produced. They even did not have plan or strategy what is going on construction waste that they have produced. They used traditional method such as dispose construction waste by open burning or throw at

somewhere. They did not want to take them as a responsibility to them. Can you imagine what happen at the place they kept throwing construction waste? The place may become distributer dengue fever which is most prevalent infectious disease in Malaysia. Responding to Dr Tan Seng Giaw's (DAP-Kepong) question on the incidence of contagious diseases in the country and its prevention strategy, he said gotong-royong activity was periodically carried out at breeding grounds for aides mosquitoes, as well as a national level gotong royong of at least twice a year (Daily, 2017). From the newspaper above its showed dengue fever is avoided around neighbourhood area, so how about dumping area that contractor dump their construction waste? Who are going to clean up the whole area? Attitude and behaviour of contractor in term of lack of management in construction waste should be taken as a serious issue in minimizing construction waste.

2.8 Effect of Contractor's Attitude and Behaviour Ineffective Usage on Material

Generally, insufficient utilization on material or waste material quantifiable as any material reacted by human action and industry and has no esteem. Insufficient utilization on material likewise is material that is undesirable and should be disposed because has been used (Winkler, 2007). Inadequate use or waste likewise determinable as any loss created by action which produce direct or indirectly cost yet don't have any additional esteem. Waste expected in construction industry is completed project delay, expanding construction cost, absence of security, workings of transportation that is abundance or no need and decision or equipment management that inappropriate. Along these lines, construction waste reflect negative component to certain construction project. Insufficient use on material additionally can be characterized as the contrast between the estimation of materials conveyed and accepted on location and those properly used as determined and precisely estimated in the work, after deducting the cost saving of substituted materials exchanged somewhere else, in pointless cost and time might be acquired by materials waste age.

Firstly, construction waste would lead to bad image of construction industry. People would think badly about construction industry especially to nearby neighborhood who are live around construction site. It would create negativity rumor especially to parents, maybe they would not encourage their kids to involve in construction sector in

the future. This situation is absolutely not good in our development country. A total of 43, or nine per cent of rivers in the country, mostly in the urban areas are polluted, said Natural Resources and Environment Minister Wan Junaidi Tuanku Jaafar. Out of the 473 rivers monitored by the Department of Environment, he said 186 rivers, or 39%, were slightly polluted while 244 rivers or 52% were clean. "Most of the polluted rivers are in urban areas where the high pollution load originates from multiple sources, including wastewater plants, industries and commercial premises coupled with small base flow volume due to a large percentage of paved areas," he said in his keynote speech at the Seminar on Water Resources Security in the Context of Sustainable Development Goals here today (Digest, 2017). The construction industry is one of contributor to Malaysia economy but at the same time is the one of polluter to environment.

Secondly, construction industry lead to bad environment, pollution and health. On the other hand, as construction waste impacts the environment, it can also spoil the public health. Air pollution may cause various respiratory diseases such as asthma, heart cancer, and lung cancer especially to the children and senior citizen (Mohamed Marzouk, 2014). Construction waste have been identified as a main issue that have implications in environment and efficiency in construction industry. Issues of illegal dumping have swelled rapidly all over the country as reported (Yahaya, 2008). Furthermore, a study in Seberang Perai, Pulau Pinang also discovered more illegal dump site near along the road. Recent news had highlighted that almost 30 tons of construction wastes was dumped illegally in tropical mangrove swamp near Bandar Hilir, Malacca and construction debris problem near roadside at Section 17, Petaling Jaya, Selangor (The Star, 2011).

Construction waste become the serious environmental problems in many countries which large volumes of construction waste burdening the landfill capacities and also leads to environmental issues. The construction industry has a major impact on the environment and its environmental effects are directly relation to the quality of the waste generated. The ingredients of construction waste may cause the environmental pollution after dumped or disposal in landfill site. Under the impact of the rain water, the leakage water mixed with the construction waste will pollute the surrounding groundwater, surface water and soil (Jun Huang, 2013). The environmental impact of the construction industry is substantial in developing countries because of the fact of developing countries

are still under construction and increased a rapid urbanization and industrialization. Thus, its making the construction industry become one of the biggest factors impacting on the environmental. Therefore, construction industry in Malaysia plays a significant role in meeting the needs of its society and enhancing its quality of life (Begum and Pereira, 2011).

Building waste is such as metal, plastic, wood, glass and concrete. Nowadays, contractor is still use traditional method such as dumping construction waste at landfill and open burning. Material waste maybe produced during excavation process, handling process and storage process. The bad effects includes water cleanliness, heavy vehicles' dust, safety and health neighborhood nearby. The construction industry continues to face issues combatting their adverse effect on the environment as they produce 25-40% of the world's carbon emissions (Riddell, 2016). Making significant changes in carbon emissions require an entirely new project management approach focused on reducing energy emissions and water consumption. Taking care of the environment is a social obligation that the construction industry holds and must make steps to maintain.

Construction solid waste management is generally seen as a low priority when financial constraints are present. Most construction contractors only focus on short-term economic benefits and are unwilling to increase inputs on construction waste management (Chuen, 2011). The reasons behind this lack of practice of waste management applications were found such as profit, time and cost. On-site sorting needs substantial labor input which would increase the cost of construction project. The cost of processing recycled waste is higher than landfill cost which include the cost of the collection, sorting, and crushing. Besides that, recycled materials prices are higher than the original materials (Rotter S, Wei Z, 2008).

The cost of material waste made on building sites represent to avoidable cost in construction which can either be dispensed with or decreased. The extent to which waste can be averted in the construction industry has been a since a long time ago discussed issue. While it is difficult to totally wipe out all wastage, the concern should be how practices in the local industry can be figured out to minimize waste. The cost decreasing accomplished by keeping the generation of construction waste is equally of direct benefit

to all stakeholders on a construction project. The reasons for construction material waste can be estimated and assessed utilizing an extensive number of construction phase related factors for example design and documentation, materials procurement and management, operations, environmental conditions, site management practices and site supervision. Construction material contributes basically to the cost of construction project, in this way, material wastage has antagonistic impact on construction cost, contractor's profit margin, construction duration and can be a conceivable source of debate among parties to a project (Enshassi, A., Mohamed, S. and Abushaban, S., 2009).

Expanded cost of the project has coordinate connection with construction waste. At the point when materials land at site they are generally recorded however frequently there is no proper recording system for the task of materials to particular uses within the work due to which substantial amount of waste is being produced. As a result of this the cost of raw material required for project gets expanded, cost required for handling, storage, transportation and transfer cost including landfill tax get increased. This elements are in charge of expanding the cost of the project.

2.9 Solution to Minimize Construction Waste.

It refers to avoid or reduce producing waste, which is the best way to reduce the impact of waste on the environment and for better economic savings (Assem Al-Hajj, Karima Hamani, 2011).

In order to prevent or minimize the generation of construction waste, a proper construction waste management approach should be planned before site operations begin. Contractors have to prepare a waste management plan as part of the overall environmental management plan, and set out waste reduction targets and programs (Lu, W., & Tam, V. W. Y., 2013). They also are advised to set up a good house-keeping practice and a waste management monitoring and audit program, throughout the whole construction processes. They suggested four measures for efficient prevention of construction waste on site which are logistics management, supply chain management, modern construction method, and training and incentivizing (Al-Hajj, A., & Hamani, K., 2011).

In Malaysia, the implementation of prefabrication and Industrialized Building System (IBS) method in the construction industry was encouraged by the government as a solution to reduce the amount of waste generation (Abdullah, M. R., & Egbu, C. O., 2009). The adoption of this method can reduce construction waste generated by as much as 41% to 50%, which is a large amount of reduction (Hassan, S. H., Ahzahar, N., Fauzi, M. A., & Eman, J., 2012). Though preventing waste production on site is not possible, we can, however, reduce its amount.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This part gives a framework of the research methodology as a part of the examination of the attitude and behavior of contractor in managing waste management in construction. The part of this section is to talk about the strategies utilized in this issue. It is likewise a critical segment keeping in mind the end goal to accomplish the destinations of the choice unmistakably, precisely, and accurately. In this part, we can see the theoretical structure and the steps which for the most part received to distinguish how to gather investigation and translations of information. It covers parts of research configuration, look into process, populace and examining, outline of questionnaire, information accumulation strategy, and information examination.

3.2 Research Design

Research design is a guide or general arrangement on the best way to answer explore questions. Research configuration is a methodology utilized by specialists to recognize logical issues and solve it according to systematic plan (Kolbæk, Ditte, 2014). The methods to gather of data through questionnaires or meeting the individual in order to gain information is always be used. It demonstrates how all the fundamental part in the examination of such measures, tests or gatherings, seminar or projects are utilized together with a specific end goal to deal with look into questions.

The research design can be portrayed as the acknowledgment of rationale in a strategy to measure the legitimacy of the information utilized as a part of the research. Research design has three sorts of techniques for qualitative, quantitative. The qualitative

is investigating bits of knowledge and comprehension of an individual, the view of occasions by subjects, propensities and interpretative.

The quantitative is to test the hypothesis in goals or objectives by looking at the connection between factors. It likewise comprises of control and the outcome is affirmed by information of data and statistics. The questionnaire on this research is appropriate to accumulate data. Quantitative technique typically utilize simpler to get feedback from the respondents. The respondents that incorporates such as contractors, employee, project team and administration staff in the construction project.

The fundamental procedure of review research can be arranged in the following:

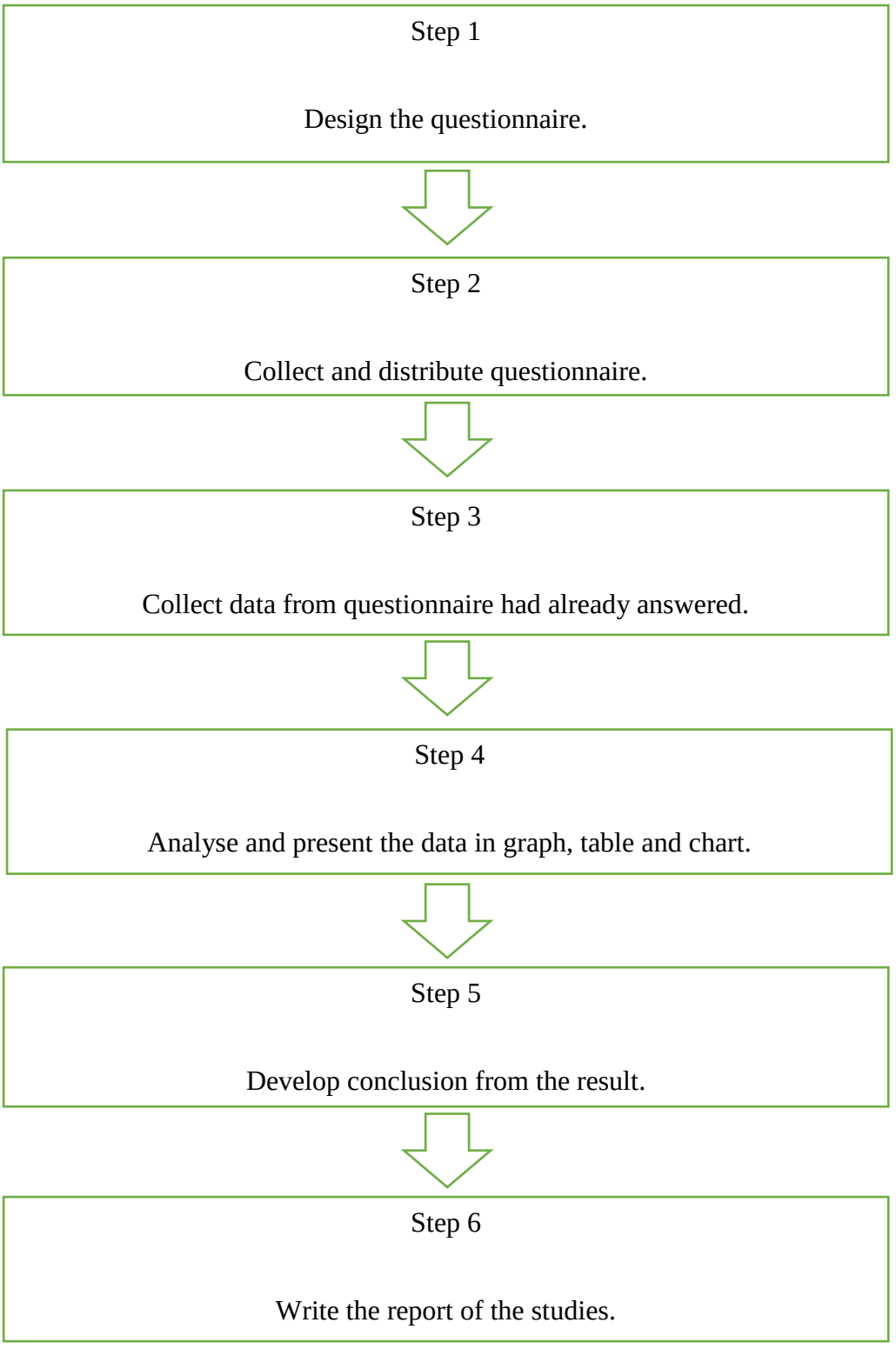

Figure 3-1: The Research Process

As shown in Figure 3.2, the exploration procedure have six stages which is design the questionnaire, collect and distribute questionnaire, collect data from questionnaire had already answered, analyse and present the data in graph, table and chart, develop conclusion from the result and write the report of the studies.

Step 1 is plan the questionnaire. In this progression, the questionnaire is partitioned into four areas which is Section A, Section B, Section C and Section D. Section A is incorporated statistic factors identified with profile of company. Section B is tested with attitude and behaviour of contractor in managing construction waste. Section C is about effect of contractors' attitude and behaviour in managing construction waste. Section D regarding of the solution to minimize construction waste. Step 2 is collect and distribute questionnaire to 56 respondents and the respondent will answer based on their experience in managing construction waste. Step 3 is collecting the data from questionnaire. Step 4 is analyse and present the data in graph, table and chart. We got the result by using Microsoft Excel. Step 5 is develop conclusion from the result. Lastly for step 6 which is write the report of the studies.

3.3 Population and Sampling

Population is the whole gathering of individuals, articles or occasions that viewed properties. Target populace in this study is that contractors engaged with construction projects in Kuantan, Pahang in Malaysia. Testing is a procedure, measures or strategies used to choose the suitable example or part of the populace to decide the characteristics or parameters of the overall population. The methodology utilized used by researchers to assemble individuals, questions or places in the study. It is the way toward choosing a person or object from the chose populace and contains delegate components of the attributes of the whole populace.

Testing can be partitioned into two classes, probability and non-probability sampling (Latham, 2007). Probability sampling is the random probability sampling and non-probability sampling known as non-random sampling. In this study, non-probability sampling which convenient sampling is utilize on account of nature in study and the surveys will accommodate review for grade A of contractor that has enrolled with the CIDB as a respondents. Amount of population contractor G7 in Kuantan is a 56 contractors from different organizations that vary.

3.4 Design of Questionnaire

The questionnaire design for this examination is closed ended which is for the most part including certain conceivable answer given which is respondents need to react to the question given. Closed ended is characterized as question where just need to tick the classification by respondents which conceivable answer are set out in the survey that best shows the respondent answer. The exploration survey plan in this investigation was contained by four sections to achieve the target of this examination which is Section A, Section B, Section C and Section D. Section A is incorporated statistic factors identified with individual company data. Section B is analyzed attitude and behavior of contractor in managing construction waste. Section C analyzed in view of effect of contractors' attitude and behavior in managing construction waste. Section D is analyzed the solution to minimize construction waste.

3.5 Data Collection Technique

Information is one of the imperative and essentials parts of any research studies. Each exploration depends on the information which is broke down and translated to get data. There are two sources of information have been utilized as a part of this research which is primary data and secondary data.

Primary data is the first information gathered for particular research goals. In this studies, primary data used to gather information. Information were gathered through quantitative techniques of survey questionnaires were delivered to respondents. The exploration will just spotlight on project team working in contractor firm at Kuantan, Pahang. The contractors are enlisted as a Grade 7 by Construction Industry Development Board (CIDB). The sample of research is centered just 56 contractors as a respondent. Questionnaires are dispersed to respondents with email, personnel and web overview (Google forms). The surveys that is conveyed by email can spare time and cash yet it must holding up the response from the respondents. The questionnaires that utilization by personally is easier to get a result because the respondents can reply shortly but it require go to the company. Survey issued to the project team who are specifically associated with on the principle resources wastages happened in construction site.

Secondary data is to get data from existing sources. A variety of information used to acquire information that journal, thesis, online article, case study, article and literature

review. Literature review also as a secondary data or an optional information, it is a content of past investigation that identified with this studies.

3.6 Data Analysis Method

This exploration measurably broke down information by the Microsoft Excel software. Microsoft Excel software can interpret, summarize and portray the amount of information accumulation. Microsoft Excel software demonstrated the data as indicated by information from the questionnaire. The relative importance index method, (RII) methods empower to figure out the crude information accurately got from the measuring instruments. The information investigation strategy can be interpreted according to objectives.

3.6.1 Analysis Stage

The relative importance index method (RII) method formula is such as below:

$$\text{RII} = \frac{\Sigma W}{A * N}$$

Where,

W = weighting given to each factor by the respondents (ranging from 1 to 5),

A = highest weight (i.e. 5 in this case),

N = total number of respondents.

In this case we have 1 to 5 rankings. 1 which is ‘Less Effect’ while 5 ranking with ‘Most Effect’. The rankings was used to compare the relative importance in section B which is attitude and behavior of contractor in managing construction waste, section C which is effect of contractors’ attitude and behavior in managing construction waste and section D that showed solution to minimize construction waste. In section A, profile of company just use percentage to interpret data. The indices (RII) were then used to determine the rank of each item.

The questionnaire survey would be analyzed using relative importance index method (RII) method. There are five point scale ranged:

a. 1 = Less Effect ($0.1 \leq RI < 0.2$)

b. 2 = Rarely Effect ($0.2 \leq RI < 0.4$)

c. 3 = Average Effect ($0.4 \leq RI < 0.6$)

d. 4 = More Effect ($0.6 \leq RI < 0.8$)

e. 5 = Most Effect ($0.8 \leq RI < 1.0$)

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The questionnaire statistic that were found for 56 respondents were classify by using Microsoft Excel. The data was analysed to know the mean and proportion of each group. This chapter is distributed in some parts since the goals of this research are to know the majority of the attitude and behaviour of contractor in managing construction waste. Besides this research is also want to identify the effect of attitude and behaviour of contractor in managing construction waste and to analyse the attitude and behaviour of contractor that can reduce construction waste.

This questionnaire can be classified by 4 section:

Section A: Profile of company.

Section B: Attitude and behaviour of contractor in managing construction waste.

Section C: Effect of contractors' attitude and behaviour in managing construction waste.

Section D: Solution to minimize construction waste.

4.2 Profile of Company

For the section A or part of the information demographic analysis was to classify gender, age, level of education, company standard, type of company, company specialty, working experience, current position and knowledge about construction waste.

4.2.1 Gender

According to the table 4.1, the respondent for female is less than male. For the respondent of female only 27.27% or 15 people from the amount of 56 respondents. Respondents of male is 72.73% or 40 people from the amount of 56 respondents. It is because the male have a more chance and potential in do the work at building site instead of female.

Table 4-1: Gender

Ages	Frequency	Percentages (%)
Male	40	72.73
Female	15	27.27
Sum	56	100

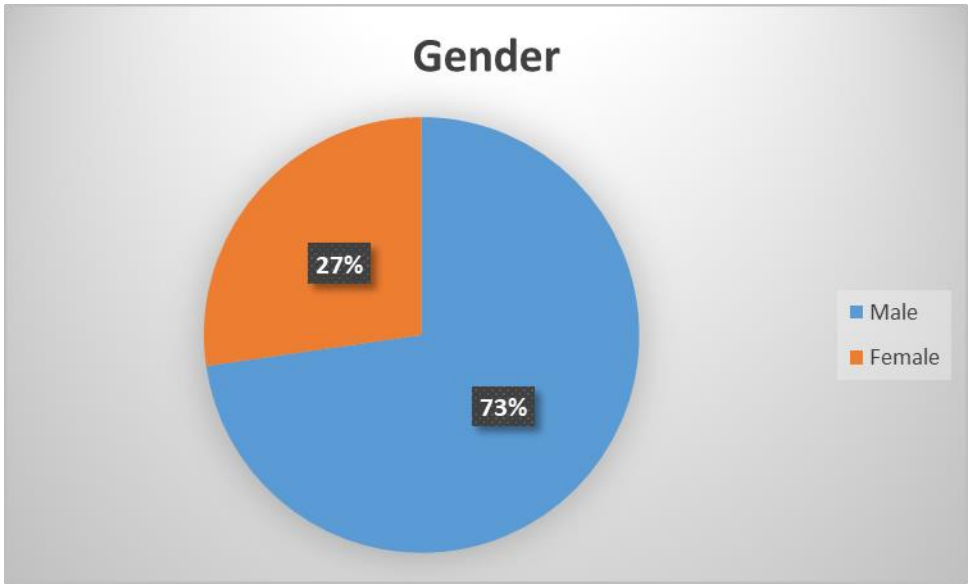

Figure 4-1: Percentage of Gender

4.2.2 Ages

According to the table 4.2 the most age of populations are in 41-50 years old with the highest respondent are 21 from the amount of 56 respondents or 37.50% from other category. It is also found that the respondents with age 51-60 years old with the lowest individuals just 4 from the 56 of respondents or lowermost rate at 7.14%. This situation could be because of the workers aged 51-60 years of age are resigned and supplant with the fresh workers.

Table 4-2: Ages

Ages	Frequency	Percentages (%)
21-30 years	14	25.00
31-40 years	17	30.36
41-50 years	21	37.50
51-60 years	4	7.14
Sum	56	100.00

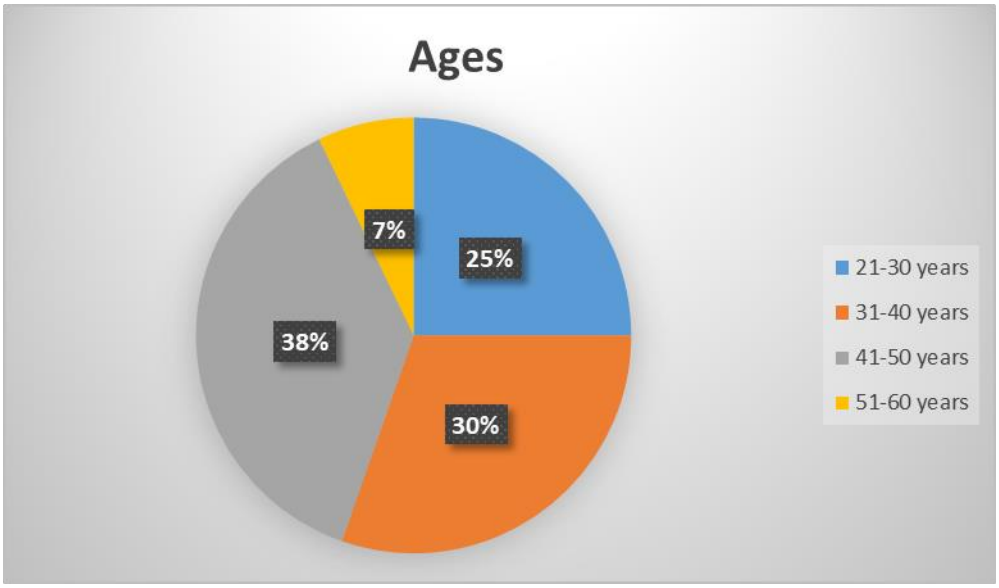

Figure 4-2: Percentages of Ages

4.2.3 Level of Education

Table 4.3 demonstrates that majority part of the level of education for respondents are from the diploma with the most noteworthy rate 39.29% or 22 from 56 of respondents. Level of education for respondents in PHD showed the lowest rate which is 1 individuals of 56 respondents and with 1.79%. For the master we have 11 respondents with 19.64%. 12 respondent from degree education with 21.43% and 10 respondent with SPM background with 17.86%.

Table 4-3: Level of Education

Level of Education	Frequency	Percentages (%)
PHD	1	1.79
Master	11	19.64
Degree	12	21.43
Diploma	22	39.29
SPM	10	17.86
Sum	56	100.00

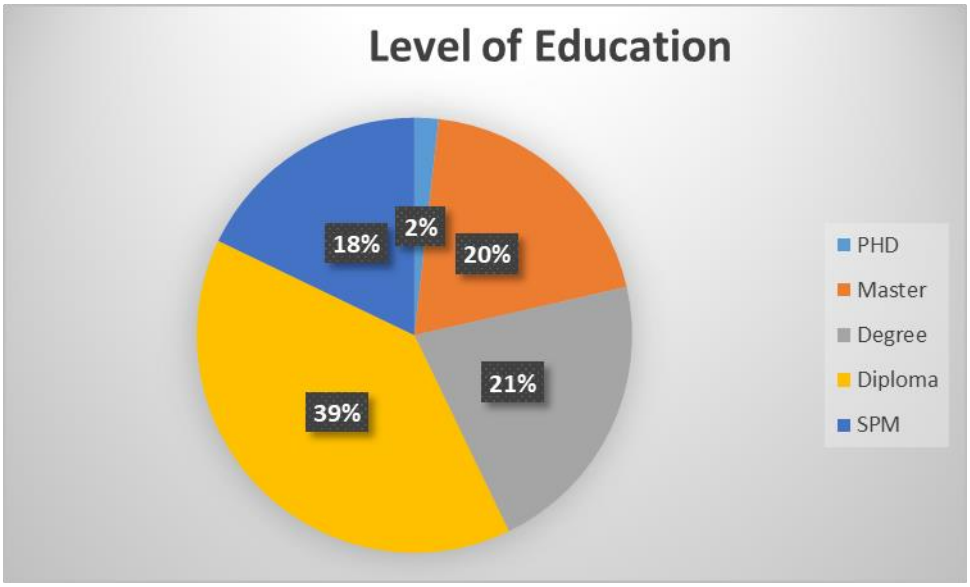

Figure 4-3: Percentage of Level Education

4.2.4 Company Standard

Based on the table 4.4, most of the respondents are in Bumiputera Company standard with 36 individual of 56 respondents with 65.45%. Non-Bumiputera Company with 19 people of 56 respondents with 34.55%. So it is quiet balance for the population of company around Kuantan, Pahang.

Table 4-4: Company Standard

Company Standard	Frequency	Percentages (%)
Bumiputera	36	65.45
Non-Bumiputera	19	34.55
Sum	55	100.00

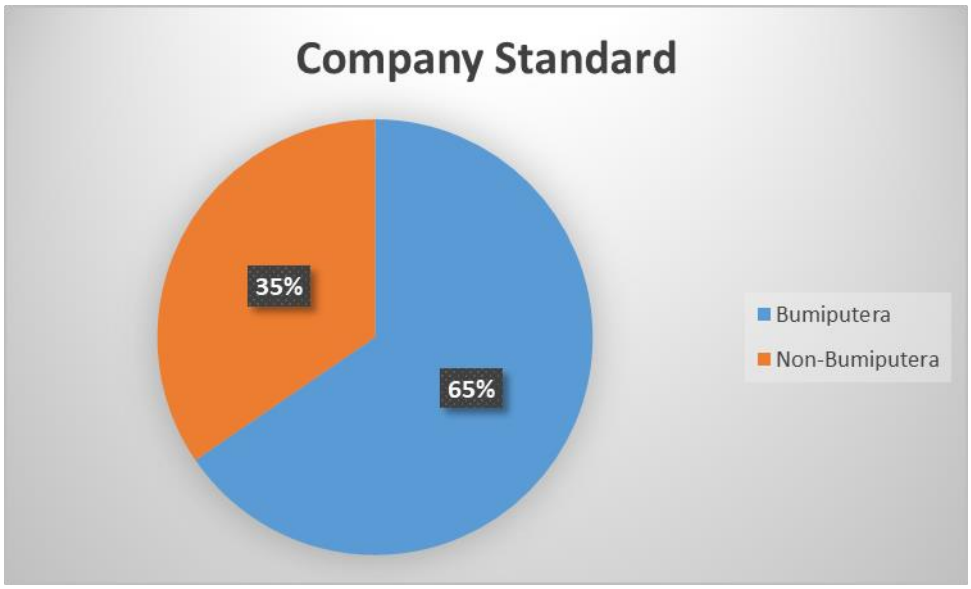

Figure 4-4: Percentage of Company Standard

4.2.5 Type of Company

In view of the information in the table 4.5 showed the highest person is in public company with 25 of 56 respondents with 44.64%. Private company with 19 of 56 respondents with 33.93% and both of type of company with 12 individuals with 21.43%.

Table 4-5: Type of Company

Type of Company	Frequency	Percentages (%)
Public	25	44.64
Private	19	33.93
Both	12	21.43
Sum	56	100.00

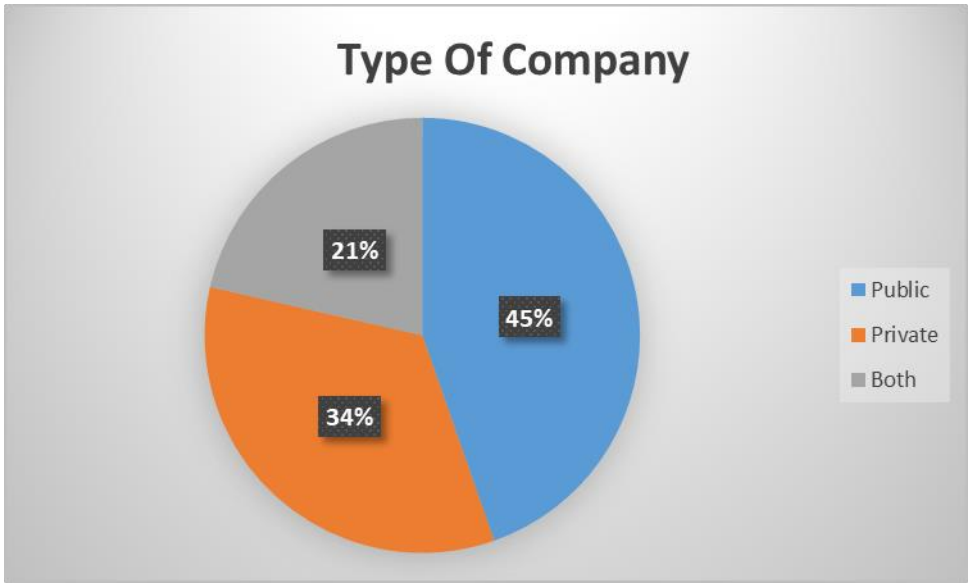

Figure 4-5: Percentage of Company Standard

4.2.6 Company Speciality in Building Construction

Table 4.6 demonstrated the respondents are from industrial building company 15 from 56 people with 26.79%. Commercial building and governmental building got 11 respondents at the same time with 19.64%. Residential building company got 10 people with 17.86%.

Table 4-6: Company Specialty

Company Speciality	Frequency	Percentages (%)
Commercial Building	11	19.64
Industrial Building	15	26.79
Governmental Building	11	19.64
Residential Building	10	17.86
Others	9	16.07
Sum	56	100.00

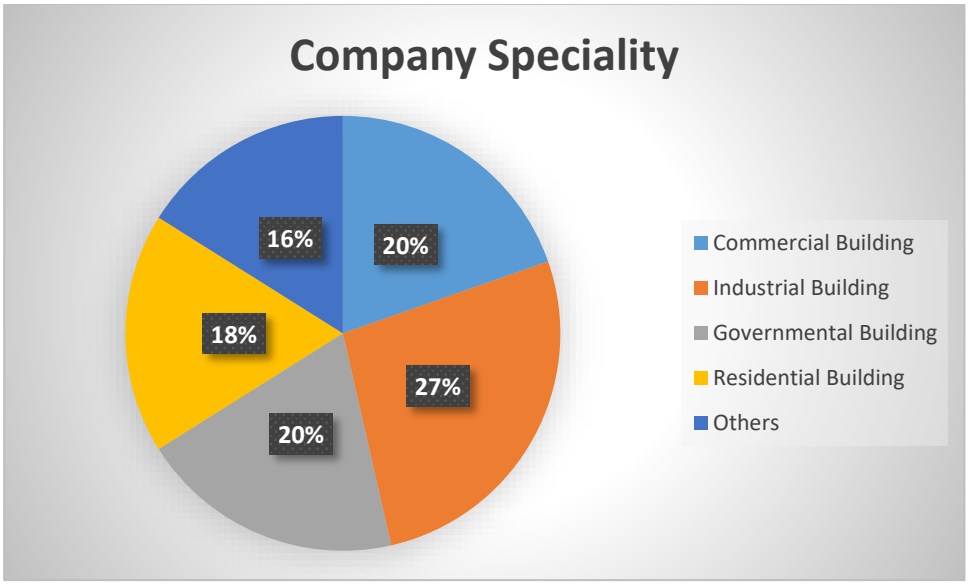

Figure 4-6: Percentage of Company Specialty

4.2.7 Working Experience in Construction Sector

In table 4.7 showed the percentage of working experience. The highest is 22 respondents have 5-10 years working experience with 39.29% while the lowest respondents is with 15 years and above which is 3 respondents with 5.36%. 1-5 years working experience got 15 respondents with 26.79% and 10-15years working experience category with 16 respondents with 28.57%.

Table 4-7: Working Experience

Working Experience	Frequency	Percentages (%)
1-5 years	15	26.79
5-10 years	22	39.29
10-15years	16	28.57
15 years and above	3	5.36
Sum	56	100.00

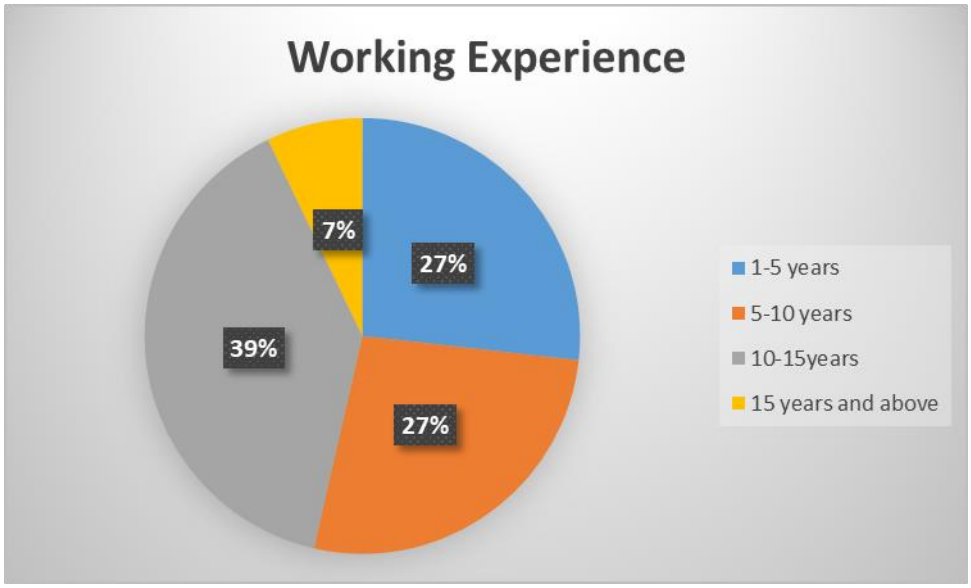

Figure 4-7: Percentage of Working Experience

4.2.8 Knowledge about Construction Waste Issues at Construction Site

Based on figure 4.8 showed that most of the respondents have knowledge about construction waste which is 82% say yes while 18% people say no.

Table 4-8: Knowledge about Construction Waste

Knowledge	Frequently	Percentage (%)
Yes	46	82.14
No	10	17.86
Sum	56	100.00

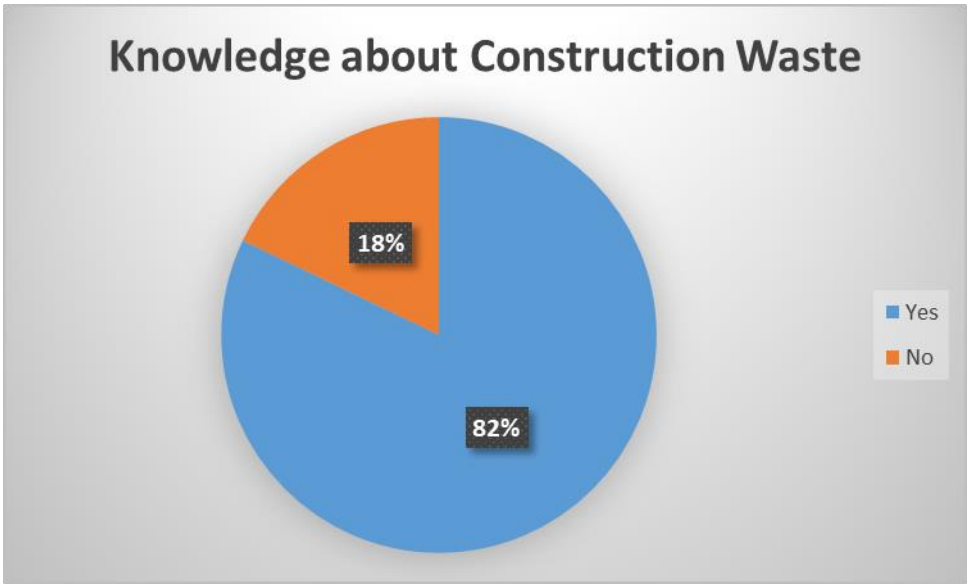

Figure 4-8: Percentage of Knowledge about Construction Waste

4.3 Attitude of Contractor in Managing Construction Waste.

For the section B or part of the information demographic analysis is about attitude of contractor in managing construction waste. The purpose was to classify in term of education, less motivation and less effective supervision. On the other hand, less positive attitudes towards waste minimization, possibly as a result of lower awareness of the impacts of construction waste amongst the workforce, misconception of the quality of recycled products, lower motivation linked to lower wages and less effective supervision (Majed I Al-Sari, 2011)

Table 4-9: Importance Index and Rank of Attitude of Contractor in Managing Construction Waste

Attitude of Contractor in Managing Construction Waste	**1**	**2**	**3**	**4**	**5**	**RII**	**Category**
Contractor give low wages to workers.	2	12	10	7	25	0.75	More Effect
Contractor ensure everything is done under control at construction site.	8	6	10	7	25	0.73	More Effect
Lack of trained staff and expertise.	6	10	9	9	22	0.71	More Effect
Contractor prevent delaying project from occur	5	12	4	20	15	0.70	More Effect
Lack of awareness about construction waste among workers	5	12	6	22	11	0.68	More Effect
Contractor always obey and alert about planning and schedule.	6	15	9	10	16	0.65	More Effect
A few contractors only with post-graduate degrees in construction-related fields.	13	12	6	7	18	0.62	More Effect
Workers have poor material handling	8	12	20	7	9	0.59	Average Effect
Lack of knowledge in managing construction waste	15	13	9	9	10	0.55	Average Effect

1 = Less Effect ($0.1 \leq RI < 0.2$)

2 = Rarely Effect ($0.2 \leq RI < 0.4$)

3 = Average Effect ($0.4 \leq RI < 0.6$)

4 = More Effect ($0.6 \leq RI < 0.8$)

5 = Most Effect ($0.8 \leq RI < 1.0$)

The attitude of contractor in managing construction waste in site is based on RII method. Based on table 4.9, it is showed contractor give low wages to workers is the highest value 0.75, while contractor lack of knowledge in managing construction waste is the lowest value which is 0.55. Then it is followed with contractor ensure everything is done under control at construction site with 0.73. After that, lack of trained staff with 0.71 and contractor prevent delaying project from occur is 0.70. Lack of awareness about construction waste among workers category with 0.68 and contractor always obey about planning is 0.65. A few contractors only with post-graduate degrees in construction-related fields got value which is 0.62. Lastly, poor material handling got 0.59 index value. Besides, higher numbers of unskilled workers were found to have a negative influence on the contractor's attitudes towards waste minimization (Majed I Al-Sari, 2011).

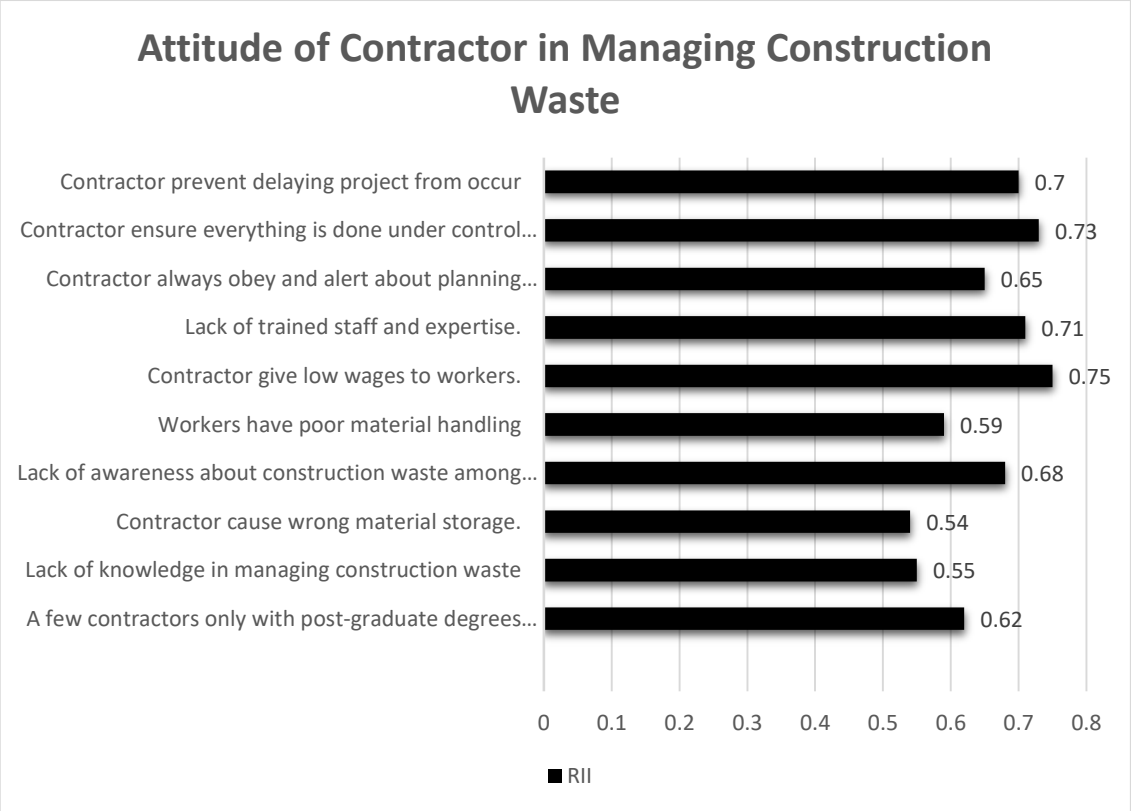

Figure 4-9: RII Values of Attitude of Contractor in Managing Construction Waste

4.4 Behaviour of Contractor in Managing Construction Waste

In the section B explained about behavior of contractor in managing construction waste. This section to analyze and study which is contractor sort construction waste onsite, type of disposal sites is used, material management and practice source reduction measures.

Table 4-10: Sort Construction Waste Onsite

Sort Construction Waste Onsite	Frequently	Percentage (%)
Frequently practiced	41	73.21
Not practiced	15	26.79
Sum	56	100.00

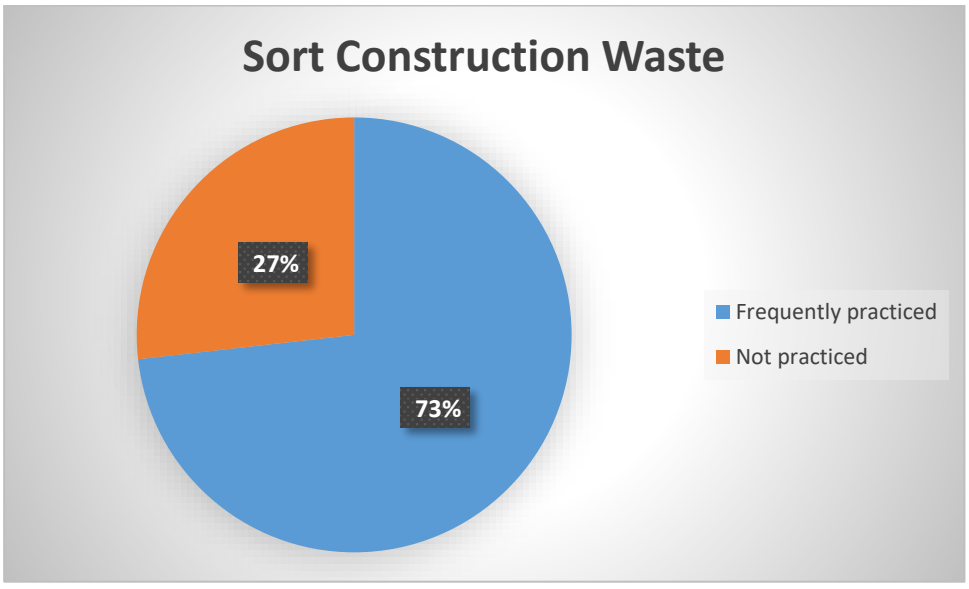

Figure 4-10: Sort Construction Waste Onsite

Table 4-11: Disposal Sites Used

Disposal Sites Used	Frequently	Percentage (%)
Municipal Domestic	9	16.07
Private Dumpsite	12	21.43
Municipal Construction Waste	9	16.07
Randomly (besides roads and others)	26	46.43
Sum	56	100

In particular, contractors' behaviour towards waste sorting and disposal tends to be less satisfactory amongst contractors that are less conscious about the potential environmental impacts from construction waste (Majed I Al-Sari, 2011). Randomly (besides roads and others) got the most significant way to dispose construction waste.

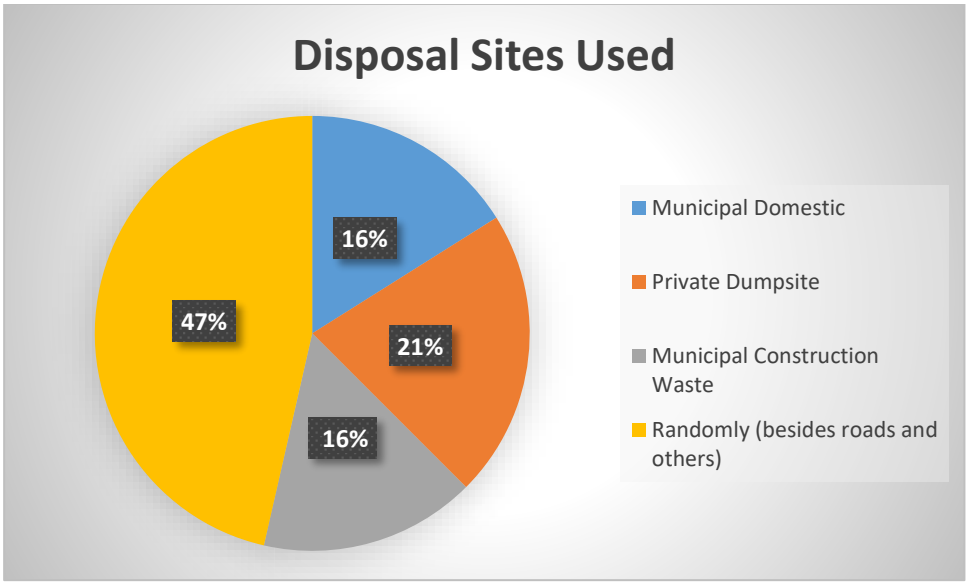

Figure 4-11: Disposal Sites Used

Table 4-12: Importance Index and Rank of Behaviour of Contractor in Managing Construction Waste

Behaviour of Contractor in Managing Construction Waste	**1**	**2**	**3**	**4**	**5**	**RII**	**Category**
Wrong material storage	5	11	13	9	18	0.69	More Effect
Contractor is buying repairable, refillable and durable materials.	10	11	14	6	15	0.62	More Effect
Contractor is purchasing appropriate quantities of material resources for an activity	12	10	11	8	15	0.61	More Effect
Contractor is ensuring the use of construction materials before their expiry date or damage.	5	13	16	17	15	0.61	More Effect
Ordering error	18	12	12	9	5	0.43	Average Effect

1 = Less Effect ($0.1 \leq RI < 0.2$)

2 = Rarely Effect ($0.2 \leq RI < 0.4$)

3 = Average Effect ($0.4 \leq RI < 0.6$)

4 = More Effect ($0.6 \leq RI < 0.8$)

5 = Most Effect ($0.8 \leq RI < 1.0$)

Based on table 4.12, demonstrated wrong material storage category got the highest value with 0.69 while ordering error category got the least value which is 0.43. Secondly, it is followed with 0.62 by contractor is buying repairable, refillable and durable materials category. Lastly, contractor is purchasing appropriate quantities of material resources and contractor is ensuring the use of construction materials before their expiry date have the same value, 0.61.

Contractor's attention to optimization of material purchasing, are statistically the most significant factors which influence contractors' behaviour towards waste sorting and disposal (Majed I Al-Sari, 2011). It is obviously different with the data which is wrong material storage got the highest ranking 0.69.

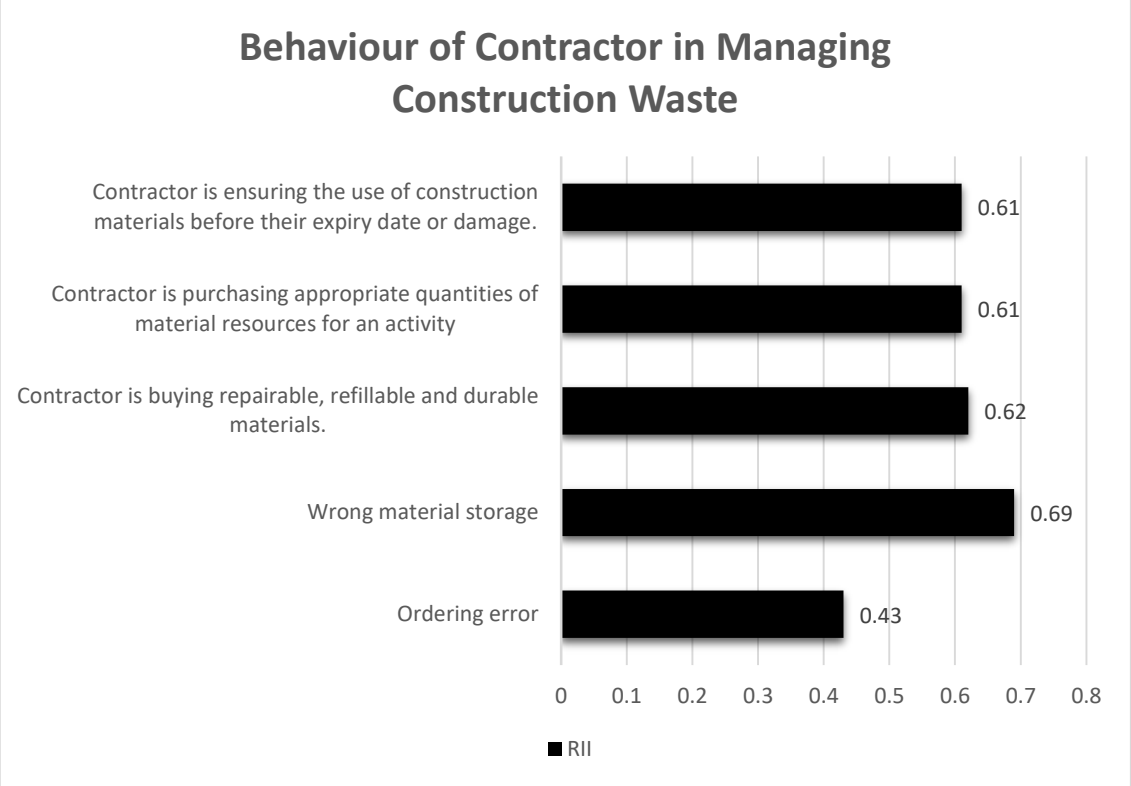

Figure 4-12: RII Values of Behaviour of Contractor in Managing Construction Waste

4.5 Effect of Contractors' Attitude and Behaviour in Managing Construction Waste.

For the section C or part of the information demographic analysis was to analyse effect of contractors' attitude and behaviour in managing construction waste. It is in environment, project, safety, cost and bad image of construction industry aspects.

Table 4-13: Importance Index and Rank of Effect of Contractors' Attitude and Behaviour in Managing Construction Waste

Effect of Contractors' Attitude and Behaviour in Managing Construction Waste.	**1**	**2**	**3**	**4**	**5**	**RII**	**Category**
Environment (environmental pollution).	4	11	7	15	19	0.69	More Effect
Project (Less quality, Project delay).	11	11	7	8	19	0.61	More Effect
Safety and Health (Causing injury).	5	12	6	14	19	0.61	More Effect
Cost (Increase cost, Cost overrun).	16	11	15	8	6	0.52	Average Effect
Bad image of construction industry.	10	11	7	8	20	0.43	Average Effect

1 = Less Effect ($0.1 \leq RI < 0.2$)

2 = Rarely Effect ($0.2 \leq RI < 0.4$)

3 = Average Effect ($0.4 \leq RI < 0.6$)

4 = More Effect ($0.6 \leq RI < 0.8$)

5 = Most Effect ($0.8 \leq RI < 1.0$)

Based on table 4.13 and figure 4.13, showed the effect of contractors' attitude and behaviour in managing construction waste. The highest RII value is in environment aspects which is 0.69 while the lowest value is bad image of construction industry which only 0.43. Then, it is followed in term of project, cost, safety and health which is 0.61, 0.61 and 0.52 index values.

According to Marzouk & Azab (2014), the environmental problems due to waste generation include diminishing landfill space due to incremental quantities of these disposed wastes in it, depleted building materials, increase in contamination from landfills that leads to serious negative health effects, damage to the environment, and increase in energy consumption for transportation, and manufacturing new materials instead of those materials dumped and which require energy production. Another study revealed that the effects of construction waste on the environment are clear (Spies, 2009).

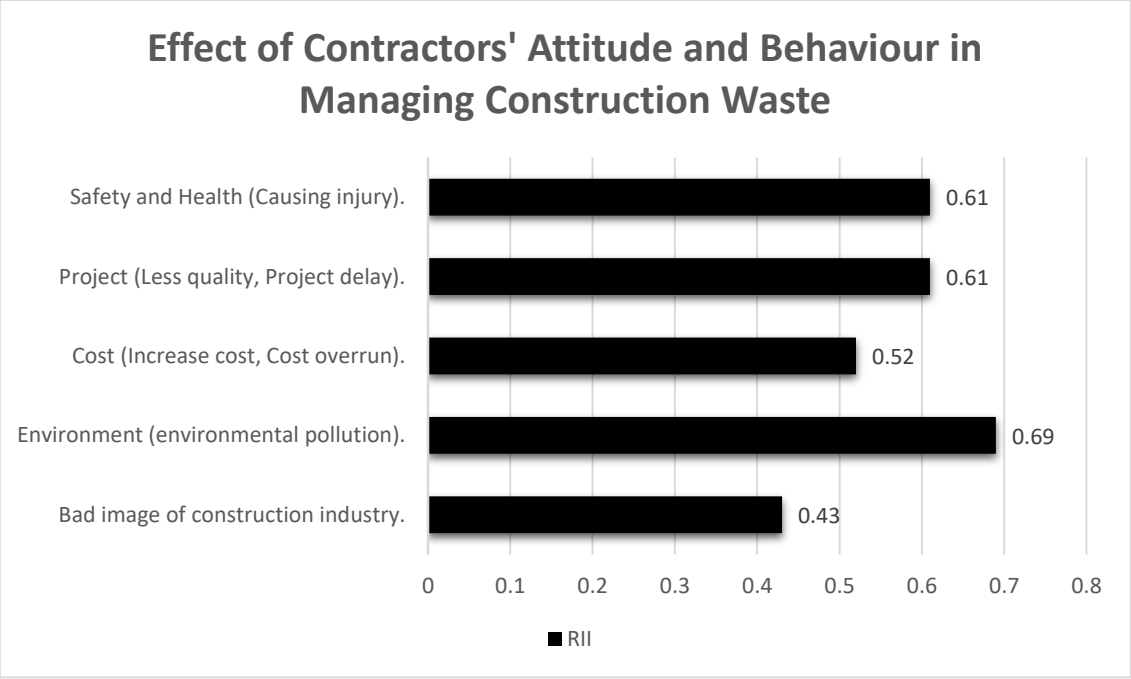

Figure 4-13: RII Values of Effect of Contractors' Attitude and Behaviour in Managing Construction Waste

4.6 Solution to Minimize Construction Waste.

In section D was to classify the best solution to minimize construction waste. It is can be classified into several parts which is contractor should be good in management of materials, be good in supervising worker, accurate in ordering quantities, should participates IBS, have a good storage, guide worker, order the material appropriately and worker should expert in material handling.

Table 4-14: Importance Index and Rank of Solution to Minimize Construction Waste

Solution to Minimize Construction Waste	**1**	**2**	**3**	**4**	**5**	**RII**	**Category**
Contractor should be good in management of materials.	6	12	10	7	21	0.75	More Effect
Contractor should be good in supervising worker.	6	12	12	20	6	0.71	More Effect
Contractor should accurate in ordering quantities	11	10	10	13	12	0.68	More Effect
Contractor should participates IBS	7	12	15	17	5	0.62	More Effect
Contractor should have a good storage	6	6	17	18	9	0.62	More Effect
Contractor should guide worker (seminar, talk, and training)	5	11	6	15	19	0.59	Average Effect
Worker should expert in material handling.	13	12	10	15	6	0.55	Average Effect

Contractor should order the material appropriately.	6	12	12	7	19	0.54	Average Effect

1 = Less Effect ($0.1 \leq RI < 0.2$)

2 = Rarely Effect ($0.2 \leq RI < 0.4$)

3 = Average Effect ($0.4 \leq RI < 0.6$)

4 = More Effect ($0.6 \leq RI < 0.8$)

5 = Most Effect ($0.8 \leq RI < 1.0$)

The above table 4.14, indicated the solution to minimize construction waste. The highest frequency in RII value is 0.75 which is contractor should be good in management of materials while contractor should order the material appropriately got the least value with 0.54. Then it is followed by contractor should be good in supervising worker, accurate in ordering quantities, participates IBS, have a good storage, guide worker, expert in material handling and order the material appropriately respectively with 0.71, 0.68, 0.62, 0.62, 0.59 and 0.55 index values.

The result is significantly different with actual situation. Currently, Malaysia is implementing IBS as the solution to this issue. Construction Industry Development Board Malaysia (CIDB) wants to make the industrialised building system (IBS) mandatory by 2020 (Nur Haziqah A Malek, 2018).

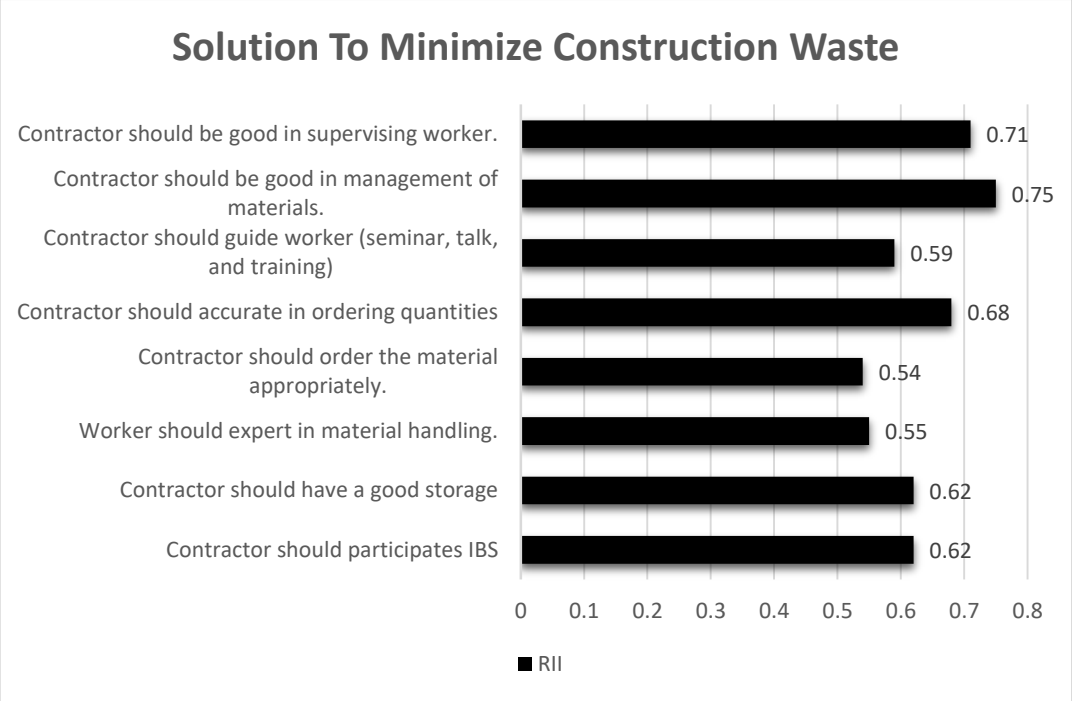

Figure 4-14: RII Values of Solution to Minimize Construction Waste

CHAPTER 5

CONCLUSION

5.1 Introduction

In this chapter, the results for all the objectives from this study is concluded and would be discussed recommendations regarding this issues. Everything about discussion is based on the analysis and result from previous chapter and this is the last part of the research. The conclusion is explained to know attitude and behavior of contractor in managing construction waste. Secondly, effect of contractors' attitude and behavior in managing construction waste. Lastly, solution to minimize construction waste.

5.2 Conclusion for Objective of Study

There are three objectives of this research are achieved. The conclusion that can be made is as follow:

5.2.1 Objective 1: To study attitude and behaviour of contractor in managing construction waste.

The first objective is to identify attitude of contractor in managing construction waste. The most effect attitude of contractor on construction site are determined:

a. Contractor give low wages to workers (0.75)
b. Contractor ensure everything is done under control at construction site (0.73)
c. Lack of trained staff and expertise (0.71)
d. Contractor prevent delaying project from occur (0.70)
e. Lack of awareness about construction waste among workers (0.68)
f. Contractor always obey and alert about planning and schedule (0.65)

g. A few contractors only with post-graduate degrees in construction-related fields. (0.62)
h. Workers have poor material handling (0.59)
i. Lack of knowledge in managing construction waste (0.55)

Through the index, contractor give low wages to workers is the highest index that lead in increasing construction waste under category of 'More Effect'. Since workers got low wages they would not care about construction waste as well. They just do their job as long it is completed. On the other hand, less positive attitudes towards waste mini-mization, possibly as a result of lower awareness of the impacts of construction waste amongst the workforce, misconception of the quality of recycled products, lower motivation linked to lower wages and less effective supervision (Majed I Al-Sari, 2011)**.**

The first objective is also to identify behavior of contractor in managing construction waste. The most effect behavior of contractor on construction site are determined:

a. Wrong material storage (0.69)
b. Contractor is buying repairable, refillable and durable materials (0.62)
c. Contractor is purchasing appropriate quantities of material resources for an activity (0.61)
d. Contractor is ensuring the use of construction materials before their expiry date or damage (0.61)
e. Ordering error (0.43)

It demonstrated that, contractor did wrong material storage have the highest value which is 0.69 under category of 'More Effect'.

5.2.2 Objective 2: To obtain effect of contractors' attitude and behaviour in managing construction waste.

The second objective is to identify effect of contractors' attitude and behaviour in managing construction waste. It is determined successfully and illustrated as below:

a. Environment such as environmental pollution (0.69)
b. Project such as less quality and project delay (0.61)
c. Safety and Health such as causing injury (0.61)

d. Cost such as increase cost and cost overrun (0.52)
e. Bad image of construction industry (0.43)

Through the index, effect of contractors' attitude and behaviour in managing construction waste is environment pollution is identified the highest value which is o.69 under category of 'More Effect'. Another study revealed that the effects of construction waste on the environment are clear (Spies S, 2011)

5.2.3 Objective 3: To analyse solution to minimize construction waste.

The third objective is to identify solution to minimize construction waste in managing construction waste. It is determined successfully and illustrated as below:

a. Contractor should be good in management of materials (0.75)
b. Contractor should be good in supervising worker (0.71)
c. Contractor should accurate in ordering quantities (0.68)
d. Contractor should participates IBS (0.62)
e. Contractor should have a good storage (0.62)
f. Contractor should guide worker (seminar, talk, and training) (0.59)
g. Worker should expert in material handling (0.55)
h. Contractor should order the material appropriately (0.54)

It showed that, contractor should be good in management of materials got the highest value which is 0.75 under category of 'More Effect'.

5.3 Recommendation

Everybody should be alert regarding this issues in order to minimize problem at construction site. It is because construction waste would cause a lot of impacts on workers, projects, society and environment. Industrial Building system (IBS) is one of the most effective solution for this issue.

5.3.1 Industrial Building System (IBS)

In globalisation era, there is so much information, knowledge and technology that can be easily shared and transmitted across the country. The industrial building system

(IBS) is one of the advancements that can be classified as an old innovation in created nations yet considered as another new innovation when achieved developing nations, for example, Asian district.

Despite the fact that the usage of IBS in Malaysia has begun since 1960's, it is just turned out to be mainstream in 1998 when cabinet of ministers embraced IBS Strategic Plan as the outline for the aggregate industrialisation of construction industry. After that time, Construction Industry Development Board (CIDB) has been currently advancing the utilization of IBS in Malaysian Construction Industry. Initial step taken by CIDB was defining IBS Roadmap which expressed a few procedures and forceful strides to advance the utilized of IBS in Malaysia. The primary purposes presenting IBS around to slowly decrease the reliance on foreign labours and to build efficiency.

Malaysia is currently lagging 20 years behind in the adoption of industrialised building system (IBS) technology, said Construction Industry Development Board (CIDB). CIDB chairman Tan Sri Dr Ahmad Tajuddin Ali said the slow uptake of IBS is due to failure by both IBS producers and construction players to reach a meeting point in adapting the system. For the past 20 years, he said, the government has been encouraging the construction industry to adopt the technology to mitigate low productivity in the industry and over-relying of foreign workers.

It is estimated that over seven million foreign workers are working in the country, with 107,156 of them registered with CIDB and working at construction sites. The implementation of IBS is in tandem with the government's Construction Industry Transformation Programme (CITP) 2016, which aims to achieve more than 2.5 times increase in productivity by 2020. "As at 2016, the productivity per worker in the construction industry was RM40,018, which is a significant increase from RM22,464 per worker in 2011. Through the initiative, the government sets to achieve up to RM62,000 productivity per worker in 2020," he added.

Currently, two giant construction companies, Gamuda Bhd and Country Garden Holdings Co Ltd, are working on their own in-house IBS technology. According to Ahmad Tajuddin, Country Garden, the Forest City project developer, has already

invested to establish thousands of square feet of factory space to produce IBS components for their projects.

Meanwhile, Master Builders Association Malaysia president Foo Chek Lee said the adoption of IBS, especially in local construction companies, is low due to some technical issues such as construction joints, standardisation of components size, economy of scales, as well as the high cost of investment. There are about 230 suppliers of IBS components in Malaysia, which indicate that the slow adoption is not due to the supply issue. It is important to enhance IBS adoption in the private sector, it has been made compulsory for all projects worth above RM50 million to achieve a minimum IBS score point of 50 via the CITP programme. It will be implemented in stages from this year before full enforcement by 2020 (Afiq Aziz, 2018).

Construction Industry Development Board Malaysia (CIDB) wants to make the industrialised building system (IBS) mandatory by 2020 (Nur Haziqah A Malek, 2018). CIDB CEO Datuk Ir Ahmad Asri Abdul Hamid said the board is working to develop the ecosystem for the utilisation of IBS.

"Looking at the trend for the past few months, there has been an increase in IBS usage, so I'm very positive that everyone will be using it by 2020 and can be made mandatory," he said at the launch of Pertubuhan Arkitek Malaysia (PAM) Contract 2018 in Kuala Lumpur on 11th April 2018. Ahmad Asri said the IBS has many advantages in terms of safety, productivity, faster object delivery, wastage reduction and quality control.

The IBS is a construction technique whereby components are manufactured in a controlled environment regardless of on-site or off-site, then placed and assembled into construction works.

5.4 Future Research

The government is set to enforce the Building Information Modelling (BIM) for construction of public projects above RM100 million by 2019. Works Minister Datuk

Seri Fadillah Yusof said the adoption of BIM would enable developers to control development cost by allowing precise building design (New Straits Times, 2018). There will be no changes in construction cost as BIM can reduce significantly the variation order (VO) and design error. Thus, we can minimize construction risk scope.

BIM is a digital building model software capable to detect the error in the initial design. The system also can make building improvement by visualizing the real building projects. BIM can minimize the error during design stage to ensure construction will be less variation order. BIM also allows construction projects to be completed ahead of time according to specific quality.

According to the Malaysian Productivity Corp, the construction industry experienced the lowest productivity level of RM40,018 per worker in 2016. This is in comparison to the agriculture sector at RM55,485 per worker, services sector at RM68,166 per worker while manufacturing remained as the sector with the highest productivity level at RM106,647 per worker.

Notable projects in Malaysia that have been developed through the use of BlM include the National Cancer Institute in Putrajaya, the Malaysian Anti-Corruption Commission Building in Shah Alam, the Educity Sports Complex in Nusajaya and the Ancasa Hotel in Pekan, Pahang.

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APPENDIX A

GANT CHART OF REPORT PROGRESS PSM

SEM 1 2017/2018

TASK	W1	W2	W3	W4	W5	W6
Identify research issues						
Decide and approval research						
Preparation of project research						
Introduction, background of study, problem statement, research objective						
Research question, scope of research, significance of study						
Literature review						
Research methodology						
Design questionnaire						
Submit draft proposal to SV						
Submit FYP 1 report to SV						
Presentation						
Collecting data						

SEM 2 2017/2018

TASK	W1	W2	W3	W4	W5	W6
Analysis respondent						
Interpret data						
Conclusion						
Overview of study						
Discussion						
Recommendation of future study						
Conclusion						
Submit draft proposal						
Presentation						
Submit a report						

APPENDIX B

UNIVERSITI MALAYSIA PAHANG

FACULTY OF CIVIL ENGINEERING AND EARTH RESOURCES

QUESTIONNARE

TITLE:

ATTITUDE AND BEHAVIOUR OF CONTRACTOR IN MANAGING WASTE MANAGEMENT IN CONSTRUCTION

RESEARCHER: MUHAMMAD FARID AIEZAT BIN ABDUL HAMID

STUDENT BACHELOR OF (HONORS) CIVIL ENGINEERING

RESPONDENT: CONTRACTOR AT KUANTAN, PAHANG

All information provided is confidential and private. It will not be used for purposes contrary to the purpose of this study. Cooperation from your part very much appreciated and preceded by thanksgiving.

QUESTIONNAIRE FOR THE RESPONDENT

"**Attitude and Behaviour of Contractor in Managing Waste Management in Construction"**

SECTION A: PROFILE OF COMPANY

Please tick (/) one answer from the following question**.**

1) Gender: Male ◯ Female ◯

2) Age: ……..

3) Level of Education: SPM ◯ Diploma ◯ Degree ◯
Master ◯ PHD ◯

4) Company Standard: Bumiputera ◯
Non-Bumiputera ◯

5) Type of company you work for:
Public ◯
Private ◯
Both ◯

6) Company specialty in building construction:
Commercial Buildings ◯
Industrial Buildings ◯
Governmental Buildings ◯
Residential Buildings ◯
Others, please specify: …….

7) Working Experience in Construction Sector:
1 - 5 years ◯
5 – 10 years ◯
10 – 15 years ◯
15 years and above ◯

8) Working Experience in Current Position:

- 1 - 5 years ◯
- 5 – 10 years ◯
- 10 – 15 years ◯
- 15 years and above ◯

9) Current Position:

- General Manager ◯
- Project Manager ◯
- Engineer ◯
- Contractor ◯
- Others, please specify: ……....

10) Do you know about the construction waste issues at construction site?

- Yes ◯
- No ◯

SECTION B: ATTITUDE AND BEHAVIOUR OF CONTRACTOR IN MANAGING CONSTRUCTION WASTE

Please kindly rank these causes by ticking the appropriate option:

5 – Strongly Agree 4 – Highly Agree 3 - Average

2 – Slightly Agree 1 – Disagree

1. Which of the following common construction waste are effected most?

No.	Common Construction Waste	Option				
		1	2	3	4	5
1.	Cement					
2.	Bricks					
3.	Metal					
4.	Sand					
5.	Aggregate					

2. What is the attitude of contractor in managing waste management in construction that affect the most in construction waste?

Attitude of Contractor	**Option**				
	1	**2**	**3**	**4**	**5**
1) Education					
A few contractors only with post-graduate degrees in construction-related fields.					
Lack of knowledge in managing construction waste					
2) Less motivation					
Lower awareness about construction waste					
Poor material handling					
Lower wag**es**					
Lack of trained staff and expert**ise**					
3) Less effective supervision.					
Contractor always obey and alert about planning and schedule.					
Ensure everything is done under control at construction site.					
Prevent delaying project from occur					

3. What is the behavior of contractor in managing waste management in construction that affect the most in construction waste?

Behaviour of Contractor	**Option**				
	1	**2**	**3**	**4**	**5**
1) Sort construction waste onsite					
Frequently practiced					
Not practiced					
2) Disposal sites is used					
Municipal domestic solid waste dumpsite					
Private dumpsite					
Municipal Construction Waste dumpsite					
Randomly (beside roads and others)					
3) Material management					
Ordering error					
Wrong material storage					
4) Contractors practice source reduction measures					
Buying repairable, refillable and durable materials.					
Purchasing appropriate quantities of material resources for an activity					
Ensuring the use of construction materials before their expiry date or damage.					

SECTION C: EFFECT OF CONTRACTORS' ATTITUDE AND BEHAVIOR INEFFECTIVE USAGE ON MATERIAL.

Please kindly rank these causes by ticking the appropriate option:

5 – Strongly Agree 4 – Highly Agree 3 - Average

2 – Slightly Agree 1 – Disagree

No.	EFFECT	Option				
		1	2	3	4	5
1.	Bad image of construction industry					
2.	Environment (environmental pollution)					
3.	Cost (Increase cost, Cost overrun)					
4.	Project (Less quality, Project delay)					
5.	Safety and Health (Causing injury)					

SECTION D: THE BEST SOLUTION TO MINIMIZE CONSTRUCTION WASTE

Please kindly rank these causes by ticking the appropriate option:

5 – Strongly Agree 4 – Highly Agree 3 - Average

2 – Slightly Agree 1 – Disagree

No.	EFFECT	Option				
		1	2	3	4	5
1.	Participate IBS.					
2.	Good storage.					
3.	Good material handling.					
4.	Order the material appropriately					
5.	Accuracy in ordering quantities					
6	Guide worker (seminar, talk, training)					
7	Good management of materials.					
8	Good supervision to worker.					