Research is focused on waste minimization construction essay

CHAPTER 1

INTRODUCTION

General

This research is focused on waste minimization in construction that influences the economic. Besides that this study is also intended to identify methods to reduce the waste in the construction site. In this chapter the basic elements of study are presented. Basically this chapter covers the problem statement, aims and objectives, scope of the study, and significance of the study. Construction waste can be one of the major impacts to the environment if proper disposal practice is not adhered. As such, greater concerns must be given to construction waste to reduce its burden to the environment. The product of construction industry that all of variety of waste which occur at every step of the construction activities and practices on site this amount of construction produced need to be taken seriously because it’s affecting and big problem to the environment. It is very important for the responsible disposal of construction waste to profit development and a sustainable future. Waste generated by construction operations need to be taken seriously because construction industry contributes a significant waste to the overall waste volume in a country. Today, its importance has a definite impact and becomes essential in the pursuit of productivity goals. In addition to the need to be a well-informed society on waste, it is necessary to effectively communicate and develop adequate understanding on waste minimization. Now waste management is necessary. Recycling is one of the best options to convert the waste material into recycled contents

1. 2 PROBLEM STATEMENT

Construction waste has many major impacts on the environment. There are varieties methods demand in execution of mega projects in Malaysia, together with many commercial building and housing development programmed, a large amount of construction waste is being produced by the construction sector. Construction waste must be balance justifiably with waste disposal because the huge volume and various compositions have the potential to post serious problem and leads to other surrounding impacts. The process involves awareness, cleanliness conservation, and efficient waste management process. To sustain better monitoring of construction waste, the sustainable development must demonstrate benefits rather than sacrifice to the public.(teoh su ping 2009)The amount and type of waste products depends on factors, such as the stage of construction, type of construction work and disposal practices on site. Extra construction materials are usually planned due to the lack of consideration given to waste reduction during the planning and design stage to minimize the generation of waste. The excessive wastage of raw materials, improper waste management and low awareness of the need for waste reduction are common in the local construction sites. Thus, waste minimization is an important area of concern in the implementation of waste management. Growth in construction activities generates construction waste which is fast becoming a serious environmental problem with deadly consequences Most of the construction and demolition, waste in our country are not recycled but end up in landfills occupying valuable land. not to mention the cost incurred in land filling. In line with this, a study on the benefits of waste minimization, the materials which could be recycled, methods used to dispose waste materials and the

factors as to why recycling is not popular was carried out.(Mohd Nizam, 2010)

OBJECTIVES OF STUDY

The objectives of this study are mainly: To identify type of construction waste that can be recycleTo recognize various construction site waste recycling methodsTo analyze the efficiency of recycling method, in order to reduce disposal effect.

1. 4SCOPE OF THE STUDY

My scope of study covered here are: The area of the study is in Malaysia Selangor. and the application of construction waste minimization as in practice and To study the recycle method of construction waste in the Malaysian construction industry.

1. 5SIGNIFICANCE OF THE STUDY

This study done due to many reasons, the first reason and it is the importance one which is considered as one of the three major environmental problems as construction industrial waste grows. That gives impact to the environmental so we can reduce that by construction management and to get benefit of waste minimization on construction site. Also in this research we looking how to reduce the construction burden to the landfill and give more life to the landfill. Other reason of this study is how to prevent construction waste by which way and which method to minimized construction waste to give notification by the responsible or supervisor or contractor to the workers in site to work properly and how to prevent the sources of waste. Other than that, this study hopes to convince the

responsible that who control or anyone who involved to construction industry like engineers, developer, construction site manger or supervisor and contractor that the best dispose of waste materials is recycling. With recycling the materials will not give burden to landfill but will give more life to the landfill and will not sent to incinerators just the contractor can sent the materials to recycling center or any recycling companies. Doing recycling to the materials on site or sent to recycling center will give profit to the contractor or at least will recoup his losses in same time that going to protect the landfill and give it more life. This is the way Malaysian construction industry can minimized and cut down on landfill site and protect the natural.

CHAPTER TWO

LITERATURE REVIEW

2. 1 INTRODUCTION

Chapter two is a review of contemporary literature related to the topic. It will explain how authors perceive Construction waste recycling method for waste minimization purposes. The literature review will also discuss about the underpinning theory, what is known and unknown about the topic. It will also discuss about what various researchers have done in the past, especially in the area of construction waste recycling method for waste minimization purposes.

2. 2 BACKGROUND

Much of the waste stream going to landfill consists of solid waste from the construction and demolition of buildings. Waste minimisation strategies have

been popular for some time in the construction industry. This paper considers the effect of these strategies on one case study. Sourcing materials with recycled content in terms of embodied energy and cost is suggested as the next phase of environmental management in construction. Many studies measure waste from construction sites on the basis of either volume or mass, to gauge the effect on disposal costs (Johnston and Minks, 1995; Graham and Smithers, 1996; Faniran and Caban, 1998). This does not give the best appreciation of the problem in terms of the environment. The savings from using materials with recycled content can be best measured in terms of the environment by considering their embodied energy (Thormark, 2000). Embodied energy represents 10-40 times the annual operational energy of most Australian residential buildings, depending upon building design, climate construction systems, equipment type, fuel sources and building usage patterns. Each year in Australia, the embodied energy used in construction is approximately equal to the annual operational energy of the built stock, and together they make up 30-40 per cent of national energy use and greenhouse gas emissions. There are several problems with existing embodied energy analysis methods, which include process analysis, input-output analysis and hybrid analysis. Process analysis, while accurate for particular processes, often ignores a large number of small to medium processes. Input-output analysis, despite its many inherent errors, is used because of its unique property of systemic completeness. Errors for process analysis data are approximately 10 per cent (Boustead and Hancock, 1979), and for input-output data errors are approximately 50 per cent (Miller and Blair, 1985). Hybrid analysis methods attempt to reduce the errors inherent in each of the two previous methods. There are two types: one based on the

process analysis framework and the other based on the input-output framework. For the hybrid analysis methods, errors vary between these rates, depending upon the mix of process and input-output data.

2. 3 Construction Waste

Construction waste can be divided into three principal categories namely material, labour, and machinery waste. However, material wastage is given more concern because most of the raw materials used in construction industry come from non-renewable resources(Ekanayake and Offori, 2000). construction waste is defined as: the difference between the value of those materials delivered and accepted on site and those used properly as specified and accurately measured in the work, after deducting the cost saving of substituted materials and those transferred elsewhere (Peng and Tan, 1998). Similarly, the Building Research Establishment (BRE) has defined building waste as the difference between materials ordered and those placed for fixing on building projects (Skoyles and Skoyles, 1987). Recently, for the purpose of evaluation of the construction material waste sources, Ekanayake and Offori (2000) have given a broader definition of the construction waste as: any material, apart from earth materials, which need to be transported elsewhere from the construction site or used within the construction site itself for the purpose of land filling, incineration, recycling, reusing or composting, other than the intended specific purpose of the project due to material damage, excess, non-use, or non-compliance with the specifications or being a by-product of the construction process.

2. 3. 1 Definition of construction waste

Construction waste is anything generated as a result of construction and then abandoned, regardless of whether it has been processed or stockpiled. It comprises surplus materials from site clearance, excavation, construction, refurbishment, renovation, demolition and road works. There are two types of construction waste: Inert construction wasteNon-inert construction wasteNon-inert construction waste is around 20% of the total and usually comprises bamboo, timber, vegetation, packaging waste and other organic materials. Some of these can be recycled while others are disposed of at landfills. In contrast, inert waste - otherwise known as public fill - mainly includes construction debris, rubble, earth, bitumen and concrete, which can be used for land formation. Materials like concrete and asphalt can also be recovered for construction use. Wastes can be defined as all wastes in solid form which are discarded as useless or unwanted and in general arise from human activities. Construction wastes are wastes generated from building, demolition and refurbishment works for individual housing, commercial building or other structures. (Peavy et al., 1985)

2. 4 Construction waste minimization

Waste minimization is a waste management approach that focuses on reducing the amount and toxicity of hazardous waste that is generated. In addition to hazardous wasted regulated under RCRA, the EPA encourages waste minimization techniques that focus on preventing waste from ever being created, (source reduction) and recycling. there are three general methods of waste minimization: source reduction, recycling, and treatment.

2. 4. 1 Steps of waste minimization:

Reduce consumption of resources by building smaller houses that are better designed for your needs. This is the most effective way to conserve precious resources for use by future generations and reduce waste. It also lowers costs. Re-use existing buildings and materials and reduce demand for resources, lower waste volumes and save money. Don't Demolish - Deconstruct, give old buildings new lives. Recycle resources that are left over or have reached the end of their useful life. This will reduce demand for new materials and lower the volume of waste going to landfill. sending building material to landfill is like throwing money in the bin. Use renewable resources like sustainably managed forests. This creates a sustainable economy and helps conserve non-renewable resources use materials with high recycled content to create a market for recycled resources. It will raise the price paid by recyclers for recovered resources and increase the viability of recycling.

2. 4. 2 Landfill

Our traditional means of waste disposal (landfill) is uneconomic. Costs to communities for operating and maintaining landfill sites are high and availability of suitable land is limited. Re-use options for landfill sites are extremely limited due to potential health hazards. Remedial action is often prohibitively expensive. Emissions and leachate from landfill sites can be highly toxic due to concentrations of heavy metals and toxic chemicals. These toxins find their way into the water table and/or waterways, often with disastrous consequences. We must reduce waste volumes going to landfill

and remove toxic content from materials before disposal. Using other option then sending to landfill. .

2. 4. 3 Why prevent waste and recycle?

2. 4. 3. 1 Reduce Costs

Recycling, reusing salvaged building materials and minimizing materials and packaging reduces waste disposal costs and material expenses.

2. 4. 3. 2 Marketing Opportunity

The company's experience in waste prevention and recycling can be an essential marketingTool to the growing number of potential clients interested in participating in the Leed andBuild green building programs.

2. 4. 3. 3 Tax Deduction

When you hire a deconstruction service to remove reusable building materials, the client canTake a tax deduction when they donate the materials to a nonprofit organization.

2. 5 Construction Waste Management

Construction Waste Management is the practice of reducing the actual waste that go to the dump site. Waste reduction is best met by recycling and construction wastes do offer a lot of opportunities for recycling. In fact, 80% of the wastes found in construction trash heaps are recyclable, one way or another. Wood, asphalt, concrete, bricks, metals, glass and even paint do offer several options for recycling. There are three basic steps for construction waste management. They are Reduce, Reuse, and Recycle.

Reduce is basically preventing waste from appearing. So it helps if those building materials come in with preplanned sizes.

2. 5. 1 Construction waste management strategies

Four main construction waste management strategies were identified from the literature (Gavilan and Bernold, 1994; Peng et al., 1997; Faniran and Caban, 1998). They were: reuse; avoid or reduction; recycling; anddisposal. Among these three strategies, avoiding waste which infers elimination or minimization of waste, has been given the highest priority as it requires the least resources other than planning and designing skills. Developing a waste minimization culture in the construction industry may be the initial process of a minimization strategy (Teo and Loosemore, 2001; McDonald and Smithers, 1998). Reuse refers to simply moving materials from one application to another. The third option is recycling and construction waste recycling is a process of separation and recycling of recoverable waste materials generated during construction and remodelling. Composting has also begun to emerge as a new application of an ancient technology, where organic land-clearing debris is processed to produce humus for soil treatment (Ekanayake, 2000). Further, incineration is another process of destroying waste material by burning it and, while once regarded as a practical method of disposing of hazardous waste materials, it has of late, become controversial for many reasons such as the fact that it creates toxic gas and ash, which can harm local populations and pollute groundwater. Disposal or land filling is the lowest in the hierarchy. Since reduction was identified as the most effective strategy for waste management, several techniques used in construction can be recommended as waste reduction

initiatives. Off-site construction technology (dry construction) was highlighted in the literature. For instance, using pre-cast elements one could eliminate 30 per cent to 40 per cent of wastage on building construction sites (Poon et al., 2004b). In addition, there are many advantages of pre-cast element manufacturing such as saving time and overall cost, due to enabling concurrent different production lines; increasing constructability and reducing congestion on site due to changing from an uncontrollable work environment on site to a controllable one in factories (Benjaoran and Dawood, 2004). Therefore, the present paper attempts to identify how effective the use of pre-cast elements in building projects are in construction to minimize construction waste.

2. 5. 2 Insufficient regulations

The importance of complete governmental regulations for supporting construction and demolition waste management has been extensively investigated. For example, although the Hong Kong government has implemented various types of regulations to minimize construction and demolition waste production, it is found by Tam (2008a) that the mandatory system in implementing the waste management plan for all construction projects would significantly affect the productivity of companies. This is echoed by the study from Shen and Tam (2002), suggesting that legal measures are not effective for implementing environmental management in Hong Kong construction. In all the regulations in Bulgaria, construction and demolition waste is mentioned jointly with municipal waste and the majority of measures envisaged are aimed at the improvement of municipal waste management (Hadjieva-Zaharieva et al., 2003). It is also reported by Kartam

et al. (2004) that clear regulations and rules from Kuwait Municipality are lacking for allowing and persuading contractors to use recycled products made from construction and demolition waste.

2. 5. 3 Insufficient awareness about construction and demolition waste management

Although practitioners' awareness about construction and demolition waste management is vitally important to effective waste management, waste managementis perceived as a low project priority (Teo and Loosemore, 2001). Consequences caused by the weak awareness of major practitioners have been extensively investigated. Innes (2004) and Poon et al. (2004), for example, found that about one-third of construction waste could arise from design decisions because designers attached relatively little importance to the potential for waste reduction when choosing building materials. Lam (1997) found that very few contractors had spent efforts in considering the environment and developing the concept of recycling building materials. Because contractors ranked timing as their top priority, their effort was always focused on completing the project in the shortest time, rather than the environment (Poon et al., 2001). Therefore, changing practitioners' awareness of construction and demolition waste management can make a significant contribution to the implementation of construction and demolition waste management (Teo and Loosemore, 2001)

2. 5. 4 Poor skills of operatives

Skill is one of the main factors affecting the amounts of waste produced by operatives (Chen et al., 2002). Significant amount of construction and demolition waste caused by various construction activities, such as cut-

corner of construction formwork, poor plastering work, deformation during transportation and delivering, could be largely reduced if skills of operatives can be improved (Wang et al., 2004). Clearly, poor skill of the operative is a significant contributor to the large amount of construction and demolition waste generation. According to Bilitewski et al. (1994) and Gilpin (1996) waste management encompasses collection, transporting, storage, treatment, recovery and disposal of waste, and is defined as a comprehensive, integrated, and rational system approach towards achievement and maintenance of acceptable environmental quality and support of sustainable development. In addition, Minks (1994) regarded waste management as a tool for controlling disposal costs of construction waste, as well as facilitating examination of other alternative disposal methods such as recycling and reusing in order to reduce waste that finally results in landfills. The European Environment Information and Observation Network (EIONET) also defined waste management plan as a " strategic document drawn up for achieving the objectives of waste management and waste prevention and recovery", adding a limitation of the environmental impact of waste on human health and the environment (European Environment Information and Observation Network (EIONET), 2006). The waste management hierarchy developed by El-Haggar (2007) is a useful framework and serves effectively as a guide while developing waste management plans. The framework works for providing an integrated approach in which options of waste management can be considered and thus serves as a systematic tool for those who generate and manage waste. There are five major steps in the structure:(1) Reduce.(2) Reuse.(3) Recycle. (4) Recover.(5) Disposal. When waste management is properly implemented

based on the framework, it can generate various benefits through the whole lifecycle of the waste from its generation to its final disposal. According to El-Haggar (2007), proper construction waste management will provide economic benefits by decreasing the cost of the project through proper implementation of a waste management plan. Apart from economic benefits, waste management may positively contribute to the following aspects (Crittenden and Kolaczkowski, 1992; Cunningham, 2001; Guthrie and Mallett, 1995; Guthrie et al., 1997; McGrath, 2001; Tam et al., 2007; Telford, 1995):

2. 6Types of construction waste

Construction waste can be broadly categorized into two types: direct and indirect. Skoyles and Skoyles (1987) defined direct waste as the waste that can be prevented and involved the actual loss or removal and replacement of a material, while in-direct waste is not wasted physically; but the payment for the material can be wasted partially or totally. Gavilan and Bernold (1994) and Bossink and Brouwers (1996) grouped the causes of direct and indirect wastes into six categories, including design, procurement, material handling, operation, residual and others such as theft (Table I). Further, Faniran and Caban (1998) used this categorization for their study of identifying waste minimization strategies. They found that design changes contributed the highest waste (52 per cent) to the total construction waste.

2. 6. 1 Material waste in the construction industry

The completeness and reliability of embodied energy analysis methods is crucial to the validity of the application of embodied energy data to scenarios such as waste minimisation. This also applies to the assessment of the direct and indirect costs associated with recycling and disposal

strategies. The selection of one strategy over another could be determined by small variations in the embodied energy and cost values. Figure 1 shows the waste streams for construction and demolition processes. The winning of raw materials is depicted on the left of the diagram. The " manufacturing" stage refers to transformation of basic materials into building materials and products, along with initial processing stages (for example, metallic ore refining). There may be several transactions between industries at this stage. The " construction" stage refers to the assembly of materials and products to form the finished building. In the " building use" stage, construction services may be used in facilities management for maintenance and refurbishment of existing buildings. The " demolition" stage refers to the final and total disassembly of the building. The horizontal arrows depict the flow of materials with or without recycled content. The curved arrows represent re-use or recycling processes, under two categories: 1. jpg

Figure 2. 1

Flows of materials, products and wastes for construction and demolition activities, including closed and open-loop recycling(1) closed loop recycling (i. e. within that industry or building life stages); and(2) open-loop recycling (i. e. between industries or building life stages). The use of recycled materials at any stage displaces requirements for new materials, and may save considerable cost, natural resources and embodied energy. The presence of a saving in each case depends on the reclamation and recycling processes not requiring more financial, natural or energy resources than are saved through the recycling effort, which is not necessarily always the case (Boustead, 1996). It also requires that the reclamation costs be compared to

the costs in financial, resource and embodied energy terms for providing a comparative product. In many cases, the recycled of a material may represent a serious downgrading of use, therefore recycling processes including transport and ancillary processes need to be efficient to ensure actual savings are produced. Accounting of financial and resource requirements are relatively straight forward compared to the embodied energy issue, as discussed above. Furthermore, a review of the literature indicates that major obstacles to implementing construction and demolition waste management can be grouped under five headings, encompassing insufficient regulations, lack of a well-developed waste recycling market, insufficient awareness about construction and demolition waste management, inadequate economic incentive, and poor skills of operatives.

2. 6. 2 Construction waste quantification

Waste quantification is a primary requirement for the waste minimization process. Some waste is generally recognized as unavoidable and this has been part of estimating conventions for a long time. In practice, allowances are made in determining the amounts of materials needed, which are above those actually required to construct a building. These allowances are generally referred to as " norms". In practice, these norms are considered to be the same throughout the industry. This will create practical problems for any waste quantification attempt as this figure may vary with the type of building and the individual characteristics of materials or sites. Therefore, better site accounting for waste in construction is essential in the effort toidentify the extent of wastages. Peng and Tan (1998) showed that developing an accounting procedure for material waste could become an

exercise in waste control and thus help the organization prevent further losses. Further, many researchers have adopted different approaches to quantify construction site waste (Bossink and Brouwers, 1996; Ekanayake and Offori, 2000, 2004; Poon et al., 2004a, b). They showed that waste can be quantified as a percentage of weight, volume or the cost compared to the initial delivery to site.

2. 7 Construction waste recycling

Construction waste recycling is the separation and recycling of recoverable waste materials generated during construction and remodeling. Packaging, new material scraps and old materials and debris all constitute potentially recoverable materials. In renovation, appliances, masonry materials, doors and windows are recyclable. Construction waste recycling is the separation and recycling of recoverable waste materials generated during construction and remodeling. Packaging, new material scraps and old materials and debris all constitute potentially recoverable materials. In renovation, appliances, masonry materials, doors and windows are recyclable. Recycling involves separating reusable materials such as metals, glass, and paper from solid waste. The recyclable materials are then processed and returned to the economy as parts of other products. Recycling offers many benefits including: reduced environmental impacts because of reduced waste disposal; improvement in the cost effectiveness of waste-handling and disposal by providing income from recycled materials and products; extension of landfill life and improvement of landfill management; conservation of natural resources and energy savings in production of new materials (e. g. using scrap aluminum saves energy over using virgin ore);

generation of economic activity and employment opportunities; reduction of dependence on imported goods and raw materials. Some materials can be recycled directly into the same product for re-use. Others can be reconstituted into other usable products. Unfortunately, recycling that requires reprocessing is not usually economically feasible unless a facility using recycled resources is located near the material source. Many construction waste materials that are still usable can be donated to non-profit organizations. This keeps the material out of the landfill and supports a good cause. The most important step for recycling of construction waste is on-site separation. Initially, this will take some extra effort and training of construction personnel. Once separation habits are established, on-site separation can be done at little or no additional cost. The initial step in a construction waste reduction strategy is good planning. Design should be based on standard sizes and materials should be ordered accurately. Additionally, using high quality materials such as engineered products reduces rejects. This approach can reduce the amount of material needing to be recycled and bolster profitability and economy for the builder and customer.

2. 7. 1 On-site Recycling

Recycling on-site is a recycling process where the contractor reprocesses the waste materials with the use of machines or reusing waste materials. Contractors who have huge amount of wastes are encouraged to purchase recycling processors which could be used on the construction site. Machines which produce less noise or generate lower decibels are generally preferred to keep the noise down. Materials which are commonly recycled on-site are

timber, drywall, asphalt, concrete and bricks. Wastes which cannot be reprocessed are treated timber, painted wood, plastic, vinyl and toxic hazardous materials.

2. 7. 2 Job-site Recycling

Job-site recycling is a recycling process where the contractor only separates the waste materials at the construction site and transports it to the recycling

2. 7. 3 Construction waste crushing process

Construction waste such as gravel, concrete, bricks, metal, mortar, tiles and other masonry material can be re-used as buiding materials after crushing. After you collect metal from the construction aggregate, the waste can be crushed. The complete crushing plant is consisted of jaw crusher, belt conveyor, and vibrating screen. Usually they choose mobile crusher to crush stone materials. Mobile crusher (protable crusher) is convenient, and unite crushing and screeing unit,

2. 7. 4 Construction waste recycling machine

The machines used in construction waste recycling process are mainly crushers. These crushers can crush construction debris, scrap concrete into building stone materials. There are several types of construction waste crusher machines. Jaw crusher for debris, Mobile crusher for waste Vibrating feeder, screening machineAnd CS series Cone crusher

2. 7. 5 Lack of a well-developed waste recycling market

One of the most important factors in the recycling of construction and demolition waste is the availability of markets for receiving the recycled

product (Mills et al., 1999). Peng et al. (1997) also stated that recycling requires an aggressive marketing effort to locate markets and sell materials at the highest possible prices. A rather low level of market development indicates that considerable time and money must be invested in establishing relationships, keeping track of pricing changes and becoming a reliable supplier of materials, in order to ensure a continuous intake of construction materials. Therefore, lack of a well-developed waste recycling market will to a large extent hinder the effective implementation of waste recycling.

2. 7. 6 Inadequate economic incentive

Many industry practitioners were reluctant to join the activity of embracing waste minimization simply because it meant higher costs (Mills et al., 1999). According to Chen et al. (2002), rewarding and penalizing methods in regard to on-site material handling can be used to effectively stimulate practitioners' efforts to minimize waste on-site. This is supported by Osmani et al. (2008), who found that financial reward was perceived as a key incentive that could drive waste reduction during the design process.

2. 8 Cost saving and profit maximization

An increased emphasis on waste reduction, reuse and recycling may produce favorable outcomes such as cost saving. Unnecessary purchase of new construction materials that may be substituted by reused or recycled ones results in additional costs. In addition, generating less waste from construction projects results in reduction in disposal costs and landfill charges; eventually cutting down the total project costs. Furthermore, the cost saving, in turn, can maximize profit.

2. 8. 1 Reduced demand for landfill spaces

Minimizing the amount of waste sent to landfills for disposal can lead to less demand for landfill and reduction of negative environmental effects such as noise, pollution effects of landfill as well as emission and residues from incinerators.

2. 8. 2 Improved resource management

Waste management also involves planning and control of resources committed to projects in order to control the amount of waste generated. Therefore, better control of resources may be achieved with reduction in waste as well as improvement of entire resource management performance.

2. 8. 3 Image improvement

Implementing waste management as a company policy may allow companies to enhance their public images as " environmental-friendly companies" enhancing their impression on clients.

2. 8. 4 Productivity and quality improvement

Productivity can be improved by avoiding delays caused by reordering and repurchasing of materials that have been wasted once. By selecting material of good quality and durability, significant amount of waste generation caused by replacement of poor quality material during the life cycle of facilities can be avoided. As reviewed previously, there are numerous benefits of implementing waste management. By exploring how different project characteristics affect these benefits allows the construction industry to understand the association between them.

CHAPTER III

METHODOLOGY

3. 1 INTRODUCTION

The research focuses on identity construction waste recycling method for waste minimization purposes in Malaysia. To achieve the research objective, the study of waste construction that has been faced the Malaysia projects in minimizing waste in construction to be identified. The investigations consider the overall view, opinion and experiences Malaysia contractors in waste construction waste minimization.

3. 2 RESEARCH METHODOLOGY

The method used to get the information related to this research is by descriptive survey and care of study. To do this research, the existing phenomenon was described, compare and evaluate by collecting, and interpreting the information from various sources. mmmmm. pngFIGURE 3. 1 Flowchart of Research Methodology Process

3. 3INFORMATION AND DATA COLLECTION

The information will be gathered through two means of descriptive instruments which are; Primary DataSecondary Data.

3. 2. 1 Primary Data

In primary data, information get which is from text based materials and information is gathered from various types of materials which are journals, conference transaction, reference book , newspaper and my research notebooks.

3. 2. 2 Secondary Data

Secondary Data is basically the analysis from questionnaires. The questionnaires were design according to the objectives and literature review that have been posted to the selected sample in order to get the data. A questionnaire is designed in order to collect qualitative data.

IDENTIFICATION THE ISSUE OF STUDY

The study is designed to find out among construction methods and the problems that are facing the contractors from all over Malaysia in waste management in construction industry, and comparing it with the conventional method.

TOPIC SELECTED SCOPE AND OBJECTIVE.

Based on the topic selected, the objectives and purpose are determined to achieve the requirement of the study and the scope is clearly adopted relevant to the topic.

LITERATURE REVIEW.

Chapter II will cover the Literature review which is carried out and basically covered five main heading; 2. 1 construction waste definition2. 2 Classification of waste management in construction industry. 2. 3 Factors that lean to waste management. 2. 4 Major components of waste management. 2. 5 Disadvantage of waste in construction site. 2. 6 Construction waste recycling. 2. 7 Viable technologies on Construction waste recycling.

DATA ANALYSIS

The data were collected and the data is analyzed from the result getting from the questionnaire survey. The result has been analyzed statically by using statically package for social science (SPSS) software determines the reliability of the questionnaire. The data generated from the question was first analyzed by using frequency analysis. The data then were analyzed by using reliable index (RI) for the questions which use ordinal scale of 1 to 5 descending order. 1 2 3 4 5Each scale represents the following rating: 1: Strongly disagreed2: Disagree3: Neutral4: Agree5: Strongly agreeBasically the relative index is a technique used to compute the strength of index of the familiarity, frequency and agreement of the specific questions. The computation of (RI) is given by the following form:(5n5 + 4n4 + 3n3 + 2n2 + In1)R1= 5(n5 + n4 + n3 + n2 + n1)Where RI= Relative indexn5, n4, n3, n2, n1 = No of responding index. The result analyzed then is presented in the table and chart. From the analysis, problem and challenges of the joint venture will be identified. Beside, the result will also be compared with the information gathered from the primary data and pervious researcher’s studies in their literature review discussed in Chapter II.

CONCLUSION

Information gathered in primary data and the result that will be found from analyses of the questionnaire will be combined in order to make a conclusion. An investigation into the waste construction site was carried out to understand the disadvantages, and to find the problems and control that are facing the waste construction in Malaysian construction industry. The selection of sub-contractors needs to consider their wastage reduction plan

as part of assessment criteria. Provision of waste reduction training to on-site staff is also considered important in raising environmental awareness and helping site staff generating a better working procedure to reduce generation of wastage. The construction site shall be clearly signposted with information relating to waste management including directions to waste containers and the recycling centre, waste collection intervals, waste management targets and progress on site, acceptable and unacceptable site waste practice and outstanding performers among others.