CONSTRUCTION WASTE MANAGEMENT PRACTICE TOWARDS SUSTAINABLE DEVELOPMENT

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DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time.

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ABSTRACT

Construction waste is becoming a serious environmental problem in many large cities in the world. In Malaysia, the construction industry generates lots of construction waste which caused significant impacts to the environment and aroused growing public concern in the local community. Thus, the awareness of construction waste management and minimization measures of wastes has become a pressing issue. The aim of this project is to establish an appropriate waste management practice and which will be practiced towards sustainable development. Hence, this study focused on the composition of construction waste and factors of construction waste being generated in construction industry. The case study also analysed the existing landfill and other waste management measures such as reusing and recycling of construction waste materials. This investigation provides an idea of the volume of waste generation, sources and compositions as well as method of reuse and recycling of materials at the construction sites taking into account the construction profession attitudes and behaviours. The method of data gathering is through questionnaires, site visit and interview with profession in construction industry. The analysis of questionnaires received were analysed by Importance Index. The construction waste generation in urban residential projects involved complex analysis as it is affected by several factors from different sources. Thus, construction waste management can be used to increase prevention efforts, and develop a desirable disposal practices, whilst to avoid the negative consequences of polluted environmental and disposal practices of construction waste materials.

ABSTRAK

Sisa pembinaan menjadi satu masalah alam sekitar yang serius di bandar-bandar besar di dunia. Di Malaysia, industri pembinaan menjana banyak sisa pembinaan yang menyebabkan kesan yang besar kepada alam sekitar dan menimbulkan kebimbangan orang ramai dalam masyarakat tempatan. Oleh itu, kesedaran pengurusan sisa pembinaan dan langkah-langkah pengurangan sisa telah menjadi satu isu mendesak. Tujuan projek ini adalah untuk mewujudkan amalan pengurusan sisa yang sesuai dan yang akan diamalkan ke arah pembangunan mampan. Oleh itu, kajian ini tertumpu kepada komposisi sisa pembinaan dan faktor-faktor sisa pembinaan yang dihasilkan dalam industri pembinaan. Kajian kes juga dianalisis tapak pelupusan dan pengurusan sisa lain langkah-langkah yang sedia ada seperti menggunakan semula dan kitar semula bahan sisa pembinaan. penyiasatan ini menyediakan idea daripada jumlah penghasilan sisa, sumber dan komposisi serta kaedah penggunaan semula dan kitar semula bahan-bahan di tapak pembinaan dengan mengambil kira sikap profesion pembinaan dan tingkah laku. Kaedah pengumpulan data adalah melalui soal selidik, lawatan tapak dan temu bual dengan profesion dalam industri pembinaan. Analisis soal selidik yang diperolehi dianalisis oleh Indeks Kepentingan. Generasi sisa pembinaan dalam projek-projek kediaman bandar terlibat analisis kompleks kerana ia dipengaruhi oleh beberapa faktor daripada sumber-sumber yang berbeza. Oleh itu, pembinaan pengurusan sisa boleh digunakan untuk meningkatkan usaha pencegahan, dan membangunkan amalan pelupusan wajar, manakala untuk mengelakkan kesan negatif daripada amalan alam sekitar dan pelupusan tercemar bahan sisa pembinaan.

TABLE OF CONTENTS

	TITLE	PAGE
	DECLARATION	**ii**
	DEDICATION	**iii**
	ACKNOWLEDGEMENT	**iv**
	ABSTRACT	**v**
	ABSTRAK	**vi**
	TABLE OF CONTENTS	**vii**
	LIST OF TABLES	**x**
	LIST OF FIGURES	**xi**
	LIST OF APPENDICES	**xiii**
CHAPTER 1	**INTRODUCTION**	**15**
1.1	Background	15
1.2	Problem Statement	17
1.3	Aim and Objective	20
	1.3.1 Research Objectives	20
1.4	Scope and Limitation	21
1.5	Significance of research	21
1.6	Thesis Outline	23
CHAPTER 2	**LITERATURE REVIEW**	**25**
2.1	Introduction	25
2.2	Definition of terms	26
2.3	Types and Components of Construction Waste	26
	2.3.1 Concrete and Aggregates	29
	2.3.2 Timber and Plywood	30
	2.3.3 Soil	31
	2.3.4 Brick and Blocks	32
	2.3.5 Metals	33

2.4	Causes of Construction Waste Generation	34
	2.4.1 Major Sources of Construction Waste	37
	2.4.2 Design Changes	39
	2.4.3 Material Storage/Handling	39
	2.4.4 Operation	40
	2.4.5 Planning and scheduling	40
2.5	Current Construction Waste Management	41
	2.5.1 Waste Management Hierarchy	43
	2.5.2 Rethink of Waste Production	43
	2.5.3 Reduce of Construction Waste	44
2.6	Impact of the Construction Waste	47
2.7	Benefit of Waste Management Plan	48
2.8	Current and Future planning of Malaysia towards Waste Reduction	49
2.9	Summarize of overall author regarding Waste Management Plan	51
CHAPTER 3	**RESEARCH METHODOLOGY**	**55**
3.1	Introduction	55
	3.1.1 Methodology	55
3.2	Data Collection Method	56
	3.2.1 Literature Review	56
	3.2.2 Site Visit	56
	3.2.3 Interview	57
	3.2.4 Questionnaires	57
3.3	Data Analysis	58
3.4	Summary of Methodology	58
CHAPTER 4	**RESULT AND DISCUSSION**	**61**
4.1	Introduction	61
4.2	Results from Survey Questionnaires	61
	4.2.1 Respondent Background	62
	4.2.2 Awareness of Waste Management System	63

4.3	Analysis of question no. 1: Composition of Typical Waste Generated at Site	65
4.4	Analysis of question no. 2: Causes of Waste Generation during Construction	68
4.5	Analysis of question no. 3: Measures for Waste Minimization in Construction Work	72
4.6	Results from Interview	77
	4.6.1 Interview with Project Engineer	77
4.7	Interview with Site Manager	78
4.8	Interview with General Worker	79
4.9	Site Visit	80
	4.9.1 Construction Waste found at CTMCC Site	80
	4.9.2 Construction Waste found at Forest City Site	85
	4.9.3 Construction Waste found at Tampoi Central Park Site	88
4.10	Evaluation of Site Visit	90
4.11	Waste Management Practice	92
	4.11.1 Initial Steps towards Waste Management Practice 92	
	4.11.2 Implement Waste Management Hierarchy	93
	4.11.3 Waste Management Solutions	96
4.12	Summary of Result and Discussion	96
CHAPTER 5	**CONCLUSION AND RECOMMENDATIONS**	**97**
5.1	Introduction	97
5.2	Conclusion	97
	5.2.1 Material that can be recycled	99
	5.2.2 Method used To Dispose Construction Waste	100
	5.2.3 Challenges Faced in Construction Waste Management Practice	102
5.3	Recommendations	103
REFERENCES		**105**

LIST OF TABLES

TABLE NO.	TITLE	PAGE
Table 2.1	Types of Construction Waste	23
Table 2.2	Type of aggregates and its uses	25
Table 2.3	Estimate of Wood Waste Composition	26
Table 2.4	Type of soil and its characteristics	27
Table 2.5	Type of bond and its characteristics	28
Table 2.6	Type of metal used in construction site with advantages and disadvantages	29
Table 2.7	Type of construction activity and its waste	30
Table 2.8	Summary of result on Construction material generation	31
Table 2.9	Sources of construction waste being generated	32
Table 2.10	Causes of construction waste from various authors	34
Table 4.1	Composition of Typical Waste Generated at Site	59
Table 4.2	Causes of Waste Generation during Construction	63
Table 4.3	Measures for Waste Minimization in Construction Work	67
Table 4.4	Steps towards Waste Management Plan	85

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
Figure 1.1	One of the four illegal dumpsites in Kampung Laut, Skudai.(Metro News)	15
Figure 2.1	Types and measures of construction waste	24
Figure 2.2	Waste Management Hierarchy	39
Figure 3.1	Flowchart of research.	54
Figure 4.1	Respondent's working experience	55
Figure 4.2	Respondent's Awareness on Construction Waste Management	56
Figure 4.3	Aid of Waste Management in Waste Reduction	57
Figure 4.4	Composition of Typical Waste Generated at Site	60
Figure 4.5	Causes of Waste Generation during Construction	64
Figure 4.6	Measures for Waste Minimization in Construction Work	68
Figure 4.7	Plastic waste found at CTMCC Site	73
Figure 4.8	Plastic bottle found at CTMCC Site	73
Figure 4.9	Plastic Packaging Waste left on site	74
Figure 4.10	Concrete waste found left on site	74
Figure 4.11	Concrete waste found left at corner	75
Figure 4.12	Plywood waste found left at corner	75
Figure 4.13:	Reinforcement waste found left at corner	76
Figure 4.14	Sand waste found left at corner	77
Figure 4.15	Concrete waste found left at corner	78
Figure 4.16	Metal waste found left at corner	79

Figure 4.17	Plywood waste found left at corner	79
Figure 4.18	Metal waste found left at corner	79
Figure 4.19	Concrete waste found left at corner	80
Figure 4.20	Plywood waste found left at corner	81
Figure 4.21	Cardboard waste found left at corner	81
Figure 4.22	Poor material handling of reinforcement bar	82
Figure 4.23	Improper ways to arrange material	82
Figure 4.24	Various reusable material can be found in dumpster which directly transported to landfill	83
Figure 4.25	Various Construction Waste being exposed at site	84
Figure 4.26	Metal and cardboard waste were separated in different dumpster.	86
Figure 4.27	Waste Management Hierarchy	86
Figure 4.28	Life cycle of Construction Waste	87

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	SWM Facilities in Johor	100
Appendix B	Questionnaires in Google doc	102

CHAPTER 1

INTRODUCTION

1.1 Background

With the increasing demand of houses and major infrastructure projects in Johor, the Malaysian construction industry continues to grow which stimulate the country's economy and citizen's living standard. The construction industry is one of the main contributors towards the development of whole nations, providing the necessary infrastructure for us. Despite a number of government policy initiatives, sustainable practices to address this issue, such as ZERO waste at construction sites by 2030,majority of the contractors and builder still take waste management as low priority in building project management.

The construction industry is responsible to global warming and environmental pollution. The generation of construction waste generation and unsustainable use of depleting natural resources as building materials are also connected to the adverse climate impacts of the construction industry. According to the Solid Waste Management Lab Report by Ministry of Housing and Local Government, the construction and demolition waste is expected to reach 13.3 million tons per year in 2020 and a whopping 60% are dumped in private land or possibly illegally dumped. Therefore, this study explores the source of construction waste generation and its type meanwhile identify current challenges in waste management. Also, it is to establish the industry's level of awareness and commitment to implement sustainable waste management. (SWM Lab Report, 2015).

Rapid continual development of construction industry has produced large volumes of construction waste. It is filling up the landfill. Disposal of construction waste is an easy and inexpensive approach compares to any 3R practice. In long term, landfills will not be able to accommodate the large volumes of construction waste

which reduces the lifetime of landfill. It also negatively affects the environment, human health and natural resources. Reducing construction wastes through 3R practices is a way towards sustainable waste management. The aim of this paper is to study on current construction waste management situation and the importance of waste reduction through 3R in Malaysia, particularly in Penang. Research methodology consists of interview and observation. Semi-structure interview section was conducted with officers in charge the Jelutong Landfill and participant observation was carried out at Jelutong Landfill and Illegal dumping area in order to obtain the current construction waste management situation in Penang. The paper contains findings from the synthesis of literatures, interview and field observations. Based on the information obtained from observation, the quantity of construction waste sent to Jelutong Landfill is increasing and landfill condition is getting worse compared to previous years. Besides that, it has also been found that there exist some illegal dumping areas of construction waste in Penang. The result indicated the implementation of reducing construction wastes through 3R is still low in among contractors in Penang. Therefore, construction contractors should play important role in reducing construction waste through 3R practices. Implementation of top-down approach and good governance is necessary to improve the effectiveness of reducing construction waste through 3R practice towards sustainable waste management.

1.2 Problem Statement

Issue related to construction waste towards environment, including three major problems would be investigated based on the construction waste which are generated as a result of construction activities and then abandoned processed or stockpiled. It comprises surplus materials from site clearance, excavation, construction, refurbishment, renovation, demolition and road works (GovHK,2014).

In the review of Yahaya and Larsen, 2008, construction waste are dumped illegally have swelled rapidly all over the country. Moreover, the study was focused in Johor district alone which shows there is 42% of 46 illegal dumping sites are of construction waste (Rahmat and Ibrahim, 2007). Recent news had highlighted that are four illegal dumpsites were discovered by Johor Department of Environment (DoE) officers, over a 0.81ha, was only 50m away from Sungai Skudai.

Figure 1.1: One of the four illegal dumpsites in Kampung Laut, Skudai.
Venesa Devi (2018) Joining forces to stop illegal dumping， *Metro News* Thursday, 5 Apr 2018

As developing country, it is very common to see the activity of site clearance, demolition, excavation and construction especially in municipal area. Those activities will generate large volume of construction waste which are mixing with other surplus materials. The value of construction projects for 2017 is forecast at RM138.0 billion

compare to RM 131.0 Billion in the year 2016. This projection and development of construction project in Malaysian construction industry show a view of an implementation of megastructure projects and a good investment for Malaysia (M.H.I.A Rahim, N Kasim, Mohamed, R Zainal, N Sarpin and M Saikah, 2017).

Also, the development of construction with usage of new materials had highly increased the manufacturing of material production. However, there is lacking of system to record waste generation and only fewer people will look into the sources. Additionally, by increasing number of demand in infrastructure, it was directly increasing the development of construction in Malaysia. Thus, it becomes vital to identify the composition of construction waste and its types and characteristics before it comes to reduce waste at all stages of construction.

Besides that, the method used in handling construction waste management has becomes significant important. Globally, it is estimated that approximately 10 to 30 per cent of wastes disposed of in landfills originates from construction and demolition activities (Effie.P, Christopher.P, C.Preece, Anis Adila, 2011). Commonly, the major approach for construction waste management is landfills which is site to bury disposal of waste materials. However, due to the scarcity of landfill space, we can no longer rely solely on reclamation to accept most of the inert construction waste. Landfills is not a sustainable approach and will be depleted in near future. As such, there are some organizations works with government in implementing construction waste management system to promote the reuse and recycling of construction waste. Nevertheless, the waste management system had not been well practiced in construction industry and there will still be a substantial amount of materials that require disposal. Thus, in my research, the problems will focused on the appropriate implementation of construction waste management system (Sharifah Norkhadijah, Latifah Abd. M,2013).

With the development of waste management system, all profession in construction industry such as developer, contractor, project manager and other workers must holding a persistence attitudes and behaviors in handling the construction waste generations. Unfortunately, in Malaysia, the contractor attitudes and behaviors regarding waste management to reduce the dump fill remains unclear. The awareness

of important of waste management are crucial to have a better understanding regarding construction waste and how it can be resolved. As the Malaysian construction industry is still labor-intensive, therefore, not only the profession at high level but also the individuals' attitudes and behaviors involved in this industry will make difference towards its growth and performance (R.A.Belgum,2007).

In summary, there is a need for a better understanding of constraints in construction waste management and a structured approach in identifying and modeling constraints to ensure viable waste management system. More specifically, the following research questions need to be addressed:

1) What are the composition of typical construction waste found in residential building construction projects?

2) What are the causes of construction waste generation during construction process?

3) What are the best waste management method in minimizing construction waste?

1.3 Aim and Objective

Construction Waste Management practice is part of the sustainable development which aims to fulfil human needs at the same time preserving the environment for future generations. In construction industry, all of the participants had to deal with the enormous amount of construction waste generation and there also fewer construction waste management practices have been in practice properly to reduce construction waste generation and improve in reusing and recycling rate. Typical waste management practice include landfill, green incentives for introducing environmentally friendly environment, illegal dumpsite, site management plan, source restriction, product quality and green building scheme. Although more construction waste management plan have been implemented. Therefore, the overall research objective is to propose a construction waste management practice for construction field.

1.3.1 Research Objectives

The aim of the research is to establish an appropriate waste management practice and which will be practiced towards sustainable development. The objective of the current study is to provide a comprehensive review of literatures and industry practices in relation to construction waste and outline the practical approach in implementing waste management to achieve the aim of the study, the following objective were identified:

1) To identify the type of construction waste typically found in building construction projects
2) To establish the causes of construction waste generation
3) To propose an appropriate waste management measures that can implement in construction project

The result of this study will be valuable to the industry practitioners as well as public in developing better practice and tools for waste management and look forward to sustainable construction.

1.4 Scope and Limitation

This research is mainly focusing on the construction wastes minimization in building construction field. In this research, the study of construction wastes mainly focusing in building residential project in Johor Bahru.

Initially, this research is to carry out whether that the awareness towards waste management practice has been concreting in those profession and labor who work in Malaysia construction industries. Apart from that, this study to investigate the causes of the waste generation at construction site in order to related to develop appropriate waste minimization method that can be implemented effectively. Secondly, this research is carrying out by questionnaires to the relevant respondents involved in building construction but may not possess relevant knowledge on waste minimization. The composition of construction waste can contribute to the research topic may be varies due to the main construction activities.

1.5 Significance of research

The findings of this study will redound to the impact of improper construction waste considering that construction waste management plays an important role in saving the earth today. The greater demand for sanitary landfill and other waste management practice justifies the need for more effective, life changing approaches in protecting the environment whilst continuing building development. Thus, the study of residential construction project in Johor will be able to bring out possible approaches which can be used to improve in future. The construction waste

management system should be emphasized not only by the professional, general worker but also the future generations in the educational process to make improvement and actual effort in residential project.

1.6 Thesis Outline

In Chapter 1, “Research Background and Research Objectives”, a brief overview of existing construction waste problem in Malaysia is presented and the research objective and structure of the thesis are outlined.

In Chapter 2, literature review which related to research background is presented. The literature review structure as follows: (1) Definition of construction and demolition waste; (2) Review of type and composition of construction and demolition waste; (3) Sources of construction and demolition waste; (4) Summary of Review Result from different authors.

In Chapter 3 is the description of research methodology. This section explains the theoretical aspects governing the construction waste management practice. Two sets of questionnaires and answer sheet was created and is distributed to relevant field practitioners.

In Chapter 4 starts with the discussion of type of construction waste generated from construction industry. The section also presents the analysis and result that obtained from simulations. The results explain the percentage of type of construction waste being generated in residential project. In order to have more understanding on the source of waste and its reasons behind that causing construction waste generation. A straightforward and construction waste management practice method is presented, and illustrated in detail. This chapter is based primarily on a review of the literature, including policies, technical journals, reports, waste industry reports, company websites and interviews.

In Chapter 5, conclusions of the study are summarized and suggestions on future research are described.

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