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STRATEGIC CONSTRUCTION WASTE MANAGEMENT MODEL FOR CONTRACTORS OF LARGE RESIDENTIAL PROJECTS

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ABSTRACT

High generation of residential construction waste in Selangor resulting adverse problems to the environment and due to low recycling percentage and unmatured market of recycled materials, most of the waste generated is disposed to the landfill. Most contractors do not generally support waste management due to their profit-driven nature. Thus, urgent actions are needed to increase the adoption of effective construction waste management by the contractors. Since impractical waste management will give a huge impact on the environment, which later can affect human health and welfare, is it crucial to determine the critical consideration of adopting construction waste management by the industry players, especially contractors? This is crucial not only to promote a sustainable environment but also to integrate waste management infrastructure instead of a solid reliance on conventional landfilling practice. 209 Grade 7 Contractors in Selangor participated in this study. The data was obtained and analysed empirically and the correlation was verified with Kruskal-Wallis test. Three critical consideration factors: the employees' adequate construction waste management practices knowledge, negative impact on economic output, and the requirement to improve environmental performance by the client have to lead these research findings in highlighting to construction industry players to increase the strategies of adopting construction waste management. The significance of this research is by understanding the critical consideration factors to strategize the construction waste management practices. Hence, the effective model for construction waste management developed critically not only in the construction process but also in the design and planning process.

Keywords: construction, waste management, consideration factors

1. INTRODUCTION

Kupusamy et al. (2019) define construction waste as abandoned materials generated from construction activities, irrespective of whether it has been processed or stockpiled. Zulzaha (2014) stated that Malaysia is the largest construction demolition waste generator in SEA (9.49 million tonnes), followed by Vietnam (8.88 million tonnes) and Thailand (7.20 million tonnes), whilst Myanmar is the smallest (0.05 million tonnes). The figure is expected to rise substantially over the next few years if no sufficient action is taken to deal with waste materials from construction and demolition due to an increase in urbanization activity.

Construction waste management can offer more than conventional method disposal of construction waste such as reduced demand for landfill spaces, improved resource management, profit maximization, quality improvement, image improvement, and productivity improvement. But somehow, there are few shortcomings of the adoption of waste management that need to be considered. According to Esa et al. (2017), linear economy-based practices of the "take-make-consume-dispose" paradigm are mostly practised by the main players of the construction industry in developing countries, especially Malaysia. This is also caused by the thought of resources being easily obtainable and managing the construction waste cost higher than disposing of the waste. Moreover, the landfill discharge fee of construction and demolition waste in Malaysia is quite low compared to the USA,

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Germany, and Japan (International Statistical Yearbook, 2014). Hence, it encourages the contractors to discard the waste instead of recycling or reusing it. Unlike, when the construction waste disposal costs are high, it can create another problem, which is raising more illegal dumping.

Udawatta et al. (2015) found that most of the attitudes and behaviours of construction project participants do not generally support waste management as they are constrained by the profit-driven nature and competitiveness of the construction industry. While Subramaniam et al. (2018) find that average construction waste generation for residential projects is higher with the value of 197.02-ton compared to non-residential projects and amenities projects. For the construction waste generation rate, residential projects with the highest value such as 0.016 t/m2, while non-residential projects with the smallest value such as 0.008 t/m2. As 5% of the collected wastes are recycled (Zain et al., 2012), a high volume of construction waste from residential is disposed of in the landfill, which results in a lot of contamination is inflicted upon the environment (Ismail & Manaf, 2013). In addition to this, an unmatured market of recycled materials is also one of the causes of the low percentage of recycling. Aggressive marketing is needed for recycling to locate the markets and to sell the waste at competitive prices. Tey et al. (2013) also agree that the barrier to the successful application of waste recycling is due to the insufficient proper waste recycling markets.

Construction waste management can offer more than conventional disposal methods of construction waste such as reduced demand for landfill spaces, improved resource management, profit maximization, quality improvement, image improvement, and productivity improvement (Hwang & Yeo, 2011). But somehow, there are few shortcomings of the adoption of waste management that need to be considered.

The scope of this research covered Grade 7 contractors in Selangor who is involved in residential construction projects. The implementation of construction waste management will be further study on its critical consideration factors. As the construction industry is diverse and is divided into building and infrastructural facilities, the scope of the project is limited to building construction projects specifically residential projects. The waste in construction is divided into two types, that are in terms of materials and non-materials.

2. METHODOLOGY

According to Convinced CIDB (2021), residential projects in Selangor gained the highest value of awarded projects compared to other categories of construction in 2020 and 2019. Consequently, these massive residential projects are very well known to produce high construction waste generation and more complicated compare with other types of projects. Therefore, Grade 7 Contractors in Selangor that involved in residential projects in Selangor were the targeted population for this study. Database from to the Construction Industry Development Board (CIDB), stated there were 2977 registered Grade 7 Contractors in Selangor. 380 questionnaires were distributed using two ways; circulated and invited to respond questionnaire online. Quantitative analysis is implemented in this study. To strengthen the findings from the distribution of questionnaires, existing documents review were done to determine the regulation of acts and standards regarding the issue discussed.

The questionnaires were aimed to gathers data to evaluate the consideration factors to adopt the construction waste management by the contractors. The statistical analysis technique takes place to compute the findings. The data were computed and analysed with a descriptive research method mainly employed to analyse all questions for all sections. Cronbach's Alpha was used to assess the internal consistency of the questionnaire's criteria as well as the data's appropriateness for analysis.

The non-parametric test for ordinal variables using the ordinal scales was conducted following the computation of the median value for each data class. This way, every variable can be analysed without the need of making a major assumption of the distributions. Hence, the Kruskal-Wallis test was used as it can conveniently fit the data from the questionnaire as is suitable for testing two or more independent variables. In this study, the non-parametric test was used to determine whether respondents' professions affect the pattern by which they ranked the variables at a 95% confidence level. As such, respondents' job positions were used as grouping variables, while the consideration factors were used as testing variables.

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3. RESULTS AND DISCUSSION

To establish the critical consideration factors to adopt construction waste management practices by the contractors where the established measures were ranked based on their mean. Table 1 presents the mean, standard deviation, overall ranking, and ranking within the group for the consideration factors to adopt construction waste management practices by the contractors.

To conclude, from research done with Grade 7 contractors that involved in residential constructions project in Selangor mostly implemented more construction waste management practices during the construction phase compared to design and planning phases. The contractors should increase their implementation of construction waste management practices during the design and planning phase to avoid managing generated waste during the construction phase instead.

Most of the contractors found that their practices towards waste management have an impact on their companies' environmental performance in terms of resource consumption where there is the reduction in energy, non-environmentally friendly material, and timber consumption. However, correlation test has revealed that most of the construction waste management practices are negatively moderately correlated to resource consumption. The strongest positive correlation is between Design Phase and Regulatory Compliance and followed by Planning Phase that also highly correlated with Regulatory Compliances.

Descriptive analysis has found three critical factors of the consideration factors to adopt construction waste management practices by the Grade7 contractors that involve in residential construction; employees have adequate construction waste management practices knowledge, decrease economic output, and the requirement to improve environmental performance by the client. So, if contractors want to embrace construction waste management methods in their firms, they need to have the expertise or knowledge to do so. Construction waste management can be taught to the workforce through training. Due to high investment prices and the risk of unanticipated charges, these training and technologies applied to construction waste management would reduce economic performance. This initial cost increase can typically be mitigated by large reductions in operational expenditures. Requirements and preferences from the clients are the factors for the project team to increase the environmental performance and potential of exclusion from participating in the tender if these conditions are not met.

4. CONTRIBUTION AND USEFULNESS/COMMERCIALISATION

The significance of this research is by understanding the critical consideration factors to strategize the construction waste management practices. Hence, the effective model for construction waste management developed critically not only in the construction process but also in the design and planning process. The findings of this study will be beneficial to construction industry players especially to authority bodies in Malaysia, construction industry workers or responsible construction personnel as well as future researchers.

These research findings will redound the consideration factors adoption of waste management practices and the impact of these practices on the firm's environmental performance. The result of this study can be used by future researchers as the guideline to improve the performance of the contractor's environmental performance and strategies to promote construction waste management practice based on the critical factor consideration in adopting waste management to enhance sustainability and preserve the environment.

5. CONCLUSION

The objective is successfully achieved in determining the critical consideration factors in practicing construction waste management by the contractors. Descriptive analysis has found three critical factors of the consideration factors to adopt construction waste management practices by the Grade 7 contractors that involve in residential construction. Therefore, it can be concluded that for the contractors to adopt construction waste management practices in their firms, expertise or knowledge to apply to manage the construction waste is crucial. Effective Training provided to the employees will be more focused and effective. As well as being the most practical medium for the employees to gain

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REFERENCES

Esa, M. R. (2017). Moving towards sustainable construction in Malaysia: a holistic model for construction and demolition (C&D) waste management. *Master Degree Thesis of The University of Queensland, Brisbane, Australia*.

Hwang, B. G., & Yeo, Z. B. (2011). Perception on benefits of construction waste management in the Singapore construction industry. *Engineering, Construction and Architectural Management*.

Ismail, S. N. S., & Manaf, L. A. (2013). The challenge of future landfill: A case study of Malaysia. *Journal Toxicology and Environmental Health Sciences (JTEHS)*, *5*(3), 2400-2407.

Kupusamy, K., Nagapan, S., Abdullah, A., Kaliannan, S., Sohu, S., Subramaniam, S., & Maniam, H. (2019). Construction waste estimation analysis in residential projects of Malaysia. *Engineering, Technology & Applied Science Research*, *9*(5), 4842-4845.

Subramaniam, S., Nagapan, S., Kupusamy, K., Manian, H., & Daud, Z. (2018). Investigate How Construction Waste Generation Rate Is Different for Every Types of Project in Peninsular Malaysia Using Site Visit Method. *International Journal of Integrated Engineering*, *10*(1).

Tey, J. S., Goh, K. C., Kek, S. L., & Goh, H. H. (2013). Current practice of waste management system in Malaysia: Towards sustainable waste management.

Udawatta, N., Zuo, J., Chiveralls, K., & Zillante, G. (2015). Attitudinal and behavioural approaches to improving waste management on construction projects in Australia: benefits and limitations. *International journal of construction management*, *15*(2), 137-147.

Zain, S. M., Basri, N. E. A., Mahmood, N. A., Basri, H., Zakaria, N., Elfithri, R., Ahmad, M., Ghee, T. K., & Shahudin, Z. (2012). Recycling practice to promote sustainable behavior at University Campus. *Asian Social Science*, *8*(16), 163.

Zulzaha, F. (2014). New plan to manage solid waste systematically. *The Star. Malaysia*.