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# Contractors' perception on construction waste management case study in the City of Bandar Lampung

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**Abstract.** Construction industry in the City of Bandar Lampung is a big industry and at an increasing trend. Industrial construction generates considerable amount of construction waste where the volume reaches four times of the household waste. With the increased cost of waste disposal as well as the capacity of city's final waste dump site of Bakung will not be able to accommodate municipal solid waste in the near future; it is important to implement construction waste management. This paper presents the study on contractors' perception on construction waste management. The perceptions were gathered through opinion survey to contractors that carrying out new construction, renovation and demolition projects in the City of Bandar Lampung in 2017. The respondents are professionals in construction projects that were selected based on purposive sampling represented contractors from both private and government owned companies. The questions asked consist of questions with open and closed questions. The result expecting from this study is to understand how the characteristics of project impact the benefits of implementing a construction waste management plan. Therefore, maximizing these factors can maximize the benefits.

## 1. Introduction

These The potential of the Indonesian construction industry is around Rp1,000 trillion per year. As the government and private infrastructure projects increase, the industry's growth rate is 8.1%. This condition, of course, impact on the growth of the construction industry in Bandar Lampung given its very strategic location and close to the Capital of Jakarta.

The construction industry generates a considerable amount of waste, which is about four times the household waste. More than 50% of this waste is discharged to landfill [1] [2]. In the City of Bandar Lampung, construction waste has not become an important thing to manage. In fact, with increased disposal costs and reduced landfill capacity, construction waste management is increasingly important.

According to Bilitewski et al. [3] and Gilpin [4], construction waste management includes collection, transportation, storage, treatment, recovery and waste disposal and is defined as a comprehensive, integrated, and rational system approach towards achieving and maintaining environmental quality to support sustainable development. In addition, Minks [5] considers waste management as a means of controlling construction waste disposal costs and also facilitates the evaluation of alternative disposal methods such as recycling and reuse to reduce waste to landfill. The European Environment Information and Observation Network (EIONET) [6] defines waste management as 'a strategic document developed to achieve waste management and waste prevention as well as recovery' objectives in addition to the health and environmental impacts of waste.



The waste management hierarchy developed by El-Haggar [7] is an effective framework to guide the development of waste management plans. This framework provides an integrated approach where waste management options are considered. It is also a systematic tool for those who create and manage waste. There are five main steps: (i) reduce, (ii) reuse, (iii) recycle, (iv) recover, and (v) dispose.

According to El-Haggar [7] and Greenwood [8], if waste management is implemented based on the above framework, benefits are obtained throughout the life cycle of waste from start to final disposal (landfill). El-Haggar [7], Crittenden and Kolaczowski [9], Cunningham [10], Guthrie and Mallett [11], Guthrie et al. [12], McGrath [13], Tam et al. [14] stated that construction waste management contributes to the following aspects: (i) cost savings and maximizing profits, (ii) reducing the need for landfill, (iii) improving resource management, (iv) enhancing image, and (v) improving productivity and quality.

According to Project Management Institute [15], the project is 'a temporary undertaking to create unique products, services or outcomes', implying that each building is different and comparing it with one another is not easy. There is a possibility that the classification of the characteristics of a construction project may affect perceptions in the implementation and benefits of waste management. For this study, the construction project is classified based on:

- Project size: < Rp.50 million, 50 – 200 million, 200 – 350 million, 350 – 500 million, 500 million – 2 billion, 2 – 10 billion, 10-50 billion and > 50 billion;
- Structure type: residential, commercial, infrastructure and institutional;
- Project type: construction, renovation and demolition;
- Duration; and
- Main material: steel and concrete.

## 2. Research Methods

Based on the above considerations, a questionnaire/opinion survey was chosen because it is suitable for assessing the success of a strategy/element where there are different perspectives on system performance between different groups [16]. Abernethy, Jinapala and Makin [17] describe aspects to consider in conducting opinion surveys such as techniques/methodologies, questionnaire types, and analysis of findings. Adapted from Abernethy, Jinapala, and Makin [17], opinion surveys of parties involved in construction waste management are useful for:

- Identify the important benefits of implementing waste management in construction projects.
- Getting the respondent's views on whether the project characteristics have an impact on benefits of implementing waste management.
- Gain insights and opinions on other project characteristics that may affect benefits of implementing waste management.

In this study, quantitative methods are utilized because they are easy and fast, reliable and easy, and can be used for populations with low levels of education. A set of questions was then set up to gain insights and opinions on the characteristics of selected projects and the specific impact on benefits of implementing a construction waste management plan. The questionnaire was asked to a selected respondents to get their opinion.

The questionnaire was designed in the local language (Bahasa Indonesia) and as short as possible (consisting of 10 questions). Both closed-ended questions and open-ended questions were used in the survey and were divided into two parts. Part A consists of general questions to identify the respondent's profile and Part B is intended to gain views and opinions from professionals. The results of the questionnaire survey were statistically analyzed using the SPSS (Statistical Program for Social Science) program.

### 3. Result and Discussion

The opinion survey was conducted from September 23 to November 23, 2017. The projects were randomly chosen, but they represented both government and private projects as well as representing highway and building projects. While, the respondents were chosen by utilizing a purposive sampling method, in which the respondents were selected based on consideration or criteria as follows:

- having a positions in project management,
- having sufficient experience in project management, and
- willing to be a respondent and fill out the questionnaire.

The number of respondents were 14 people, both from contractors and consultants of the projects. The survey was conducted to get opinions and views of professionals about the specific impact on benefits of implementing a construction waste management plan. Professionals consist of project managers, contractors, quantity surveyors, field supervisors, and consultants.

Based on the results of the analysis of respondents' answers, it was known that 64% of projects in the City of Bandar Lampung did not have construction waste management plan. 57% of the respondents thought that implementing a waste management plan was useful to reduce the need to dump construction waste to landfill.

The majority of respondents (vary from 84.6 - 92.3%) said that project characteristics such as size, structure type, project type, duration and major materials used in the project have an impact on the benefits of implementing a construction waste management plan. 93% of respondents agreed that the larger the size of the project, the impact on benefits of implementing a construction waste management plan the greater. The majority (46%) also said that projects with category 1 (project value of more than 100 billion Rupiah) is most benefited when applying a construction waste management plan.

In addition, the majority of respondents thought that new construction and demolition projects (37% respectively) were most benefited by implementing a construction waste management plan. While from the main material point of view, major building material of steel (71%) was the most benefited in implementing a construction management plan.

### 4. Conclusion and Recommendation

Based on the above discussion, it is known that the majority of construction projects in Bandar Lampung have not yet implemented a construction waste management plan. The majority of respondents are already aware that a waste management plan is a solution to minimize and manage construction waste, which in turn can reduce disposal costs as well as contribute in easing the burden of landfill (the City of Bandar Lampung Landfill has been declared over capacity since 2012). Regardless of the size, structure type, project type, duration and major material used, a construction project that implementing a construction waste management plan will receive various benefits.

To increase the percentage of projects implementing a construction waste management plan, the authority authorized of issuing a project development permit have to establish a policy of requiring each project has its construction waste management plan when applying for a permit.

### 5. Acknowledgement

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