Waste Management Issues in the Northern Region of Malaysia

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Abstract

This study highlights the factors that contribute to the generation of waste and identifies a number of barriers as potential hurdles of waste management. The results for the factors which contribute to waste generation obviously show that traditional construction method, poor workmanship, poor storage, poor handling, untidy construction sites and lack of management techniques to minimize waste are the main factors that have the highest mean responses. The barriers of waste management show that lack of knowledge of construction waste management has higher ranking compared with the other issues, with a mean response which ranges from important to most important.

1. Introduction

Previous surveys reported that waste management has been receiving less attention from business senior management in comparison with construction cost and time. Nowadays, construction waste is considered one of the factors that lead to the problems faced by man and animals which ultimately results in economic, environmental and biological losses. Thus, waste minimization is an important area of concern in the implementation of construction waste management in the construction industry of

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Malaysia. The study shows that enforcement of the Industrial Building System (IBS) method by the government can reduce construction waste by as much as 41-50 percent, which is a big amount of reduction (Bukhari, 2009). The comparative level of waste generated at site when using the IBS method and the conventional method also shows that IBS has a lower mean level of waste generated than the conventional method. This shows that our government is serious about reducing the waste management at site and IBS is one of the factors that contribute to less generation of waste at site. The result of this study also shows that most of the factors that contribute to the generation of waste come from the traditional construction method used by most contractors.

2. Literature Review

2.1. Definition of Construction Waste

Construction waste materials consist of the debris generated during the construction, renovation, and demolition of buildings, roads, bridges and all other work related to civil engineering. Construction waste materials often contain bulky, heavy materials that include concrete, wood, asphalt (from roads and roofing shingles), gypsum (the main component of drywall), metals, bricks, glass, plastics, PVC, trees, stumps, earth, and rock from clearing sites (EPA, 2008).

Normally, construction waste may contain hazardous material which may affect humans and the environment. The generation of hazardous wastes commonly done during construction activities include paints, solvents, adhesives, caulks, pesticides, wood preservatives, oil, or stored materials (such as solvents or pesticides) that have exceeded their shelf life. Other common examples of hazardous construction wastes are asbestos, polychlorinated biphenyls (PCBs) and heavy metals that can be released during demolition or renovation of existing structures (EPA, 2008).

Construction waste is becoming a serious environmental problem in many large cities in the world (Chen, 2002; Ferguson, 1995; Shen 2000; Smallwood 2000). According to statistical data, construction and demolition (C&D) debris frequently make up 10 to 30% of the waste received at many landfill sites around the world (Fishbein, 2008).

2.2. Waste Generation at Site

Wyatt identified factors underlying material wastage which include inadequate material scheduling, delivery, checking and offloading of materials and components on site, delivering more materials than are actually required on site due to overestimation, poor materials handling and placing, and inadequate care and protection of materials (Wyatt, 1978).

The additional factors are the serious lack of awareness and attention amongst management and supervisory staff concerning the utilization of materials and equipment, and inaccurate scheduling, accounting, packaging, delivery and improper storage of materials. A significant portion of waste is caused by problems which occur in stages that precede production, such as inadequate design, lack of planning, and flaws in the material supply system (Soibelman, 1993). As Skoyles (1976) asserts, most causes of waste are related to flaws in the management system, and have very little to do with the lack of qualification and motivation of workers.

2.3. Issues Related to the Generation, Disposal and Recycling of Construction Waste
The study done by Environmental Protection Agencies and stakeholders in Queensland has identified a number of site issues that impacted heavily on the management’s ability to recycle and reduce construction waste.

- Site Congestion
- Subcontractor Co-Operation
- Separation of Building Waste Types
- Commitment in Implementing Waste Management
- Market Demand
- Financial Incentives
- Technology of Construction Waste Recycling
- Research and Development

3. Research Methodology

3.1. Questionnaires

Data was collected through questionnaires given to the project participants at the selected project site. The questionnaire was constructed based on the review of literature. Questions were chosen to get information about construction waste from selected contractors. The entire questionnaire was distributed to selected respondents in Kedah and Pulau Pinang.

All the respondents were approached at the construction sites in Kedah and Pulau Pinang. A total of 42 respondents gave their responses. The respondents came from various company backgrounds such as main contractors, sub-contractors, consultancy agencies, mechanical and electrical consultants and architects.

3.2. Ordinal Scale

Measurements with ordinal scales are ordered in the sense that higher numbers represent higher values. When items are classified according to whether they have more or less of a characteristic, the scale used is referred to as an ordinal scale. The main characteristic of the ordinal scale is that the categories have a logical or ordered relationship to each other. This type of scale permits the measurement of degrees of difference, but not the specific amount of difference. This means that data can be interpreted in terms of differences in the distance along the scale. An example of the ordinal scales used in the questionnaire for this research is as follows:

(1 = not practised at all, 2 = least practised, 3 = moderately practised, 4 = normally practised, 5 = mostly practised)

3.3. Data Analysis and Presentation

Since the data obtained from the field survey is in the form of an ordinal scale, it will be analyzed based on the mean responses of respondents so that the data can be categorized according to the ordinal scale of the mean responses. The results and findings will be presented in the bar chart with a scale of 1 to 5 and a summary table will indicate the categories and ranking of the mean responses. The ranking will compare the factors from the most to the least preferred.

4. Results and Discussion
There were a total of 42 respondents in this study. The survey shows that 60% of the respondents answered the questionnaires out of the 70 distributed. A majority of the respondents (59%) have more than 10 years of work experience, with 20% in the range of 5 to 10 years and 21% with less than 5 years of work experience. Almost all the respondents have bachelor degree (95%). The respondents are project managers (70%), and site engineers (30%).

### 4.1. Factors Affecting the Generation of Construction Waste in Terms of Site Management

The results and analysis on the factors that affect the generation of construction waste in terms of site management and practices are shown in Fig. 1. From the results, it is obvious that traditional construction method, poor workmanship, poor storage, poor handling, untidy construction sites and lack of management techniques to minimize waste are the factors that have the highest mean responses compared to the other three factors whose responses range from moderately important to important.

![Factors affecting the generation of construction waste in terms of site management and practices](image)

**Fig. 1.** Factors affecting the generation of construction waste in terms of site management and practices

**Table 1. List of Methods indicated in Fig. 1**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Lack of management techniques to minimize waste</td>
</tr>
<tr>
<td>C2</td>
<td>Untidy construction sites</td>
</tr>
<tr>
<td>C3</td>
<td>Poor handling</td>
</tr>
<tr>
<td>C4</td>
<td>Inadequate design</td>
</tr>
<tr>
<td>C5</td>
<td>Inadequate protection of finished work</td>
</tr>
</tbody>
</table>
The other three factors which are inadequate design, inadequate protection to finished work and limited visibility on site resulting in damaged materials and work are much less important compared with the factors that have been discussed above with the mean responses ranging from least important to moderately important. Most of the factors that contribute to the generation of waste above are related to the traditional construction method used by contractors in this region. This shows that introducing the Industrial Building System (IBS) is one of the solutions to reduce waste generation on construction sites.

### 4.2. The Barriers or Issues that Limit the Practices & Development of Construction Waste Management

The results and analysis on the issues that affect the practices and development of construction waste management in this country are shown in Fig. 2. The summary on the ranking of the issues is shown in Table 2. From the result, it is obviously show that all the issues are important because all of them have the mean value of importance that exceeds 3. The results also show that lack of knowledge on construction waste management has a higher ranking compared to other issues with the mean response of important towards most important.

![Levels of Importance](Levels.png)

<table>
<thead>
<tr>
<th>Levels of Importance</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>1=Not Important</td>
<td></td>
</tr>
<tr>
<td>2=Least Important</td>
<td></td>
</tr>
<tr>
<td>3=Moderately Important</td>
<td></td>
</tr>
<tr>
<td>4=Important</td>
<td></td>
</tr>
<tr>
<td>5=Most Important</td>
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</tbody>
</table>

**Fig. 2. Issues that limit the practices and development of construction waste management in Malaysia**
Table 2. List of issues indicated in Fig. 2

<table>
<thead>
<tr>
<th>Issues</th>
<th>Descriptions</th>
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</thead>
<tbody>
<tr>
<td>D1</td>
<td>Lack of knowledge on construction waste management</td>
</tr>
<tr>
<td>D2</td>
<td>Less encouragement from related agencies</td>
</tr>
<tr>
<td>D3</td>
<td>Lack of construction waste management technology in Malaysia</td>
</tr>
<tr>
<td>D4</td>
<td>Costs of managing construction waste</td>
</tr>
<tr>
<td>D5</td>
<td>No commitment from the organization in managing construction waste</td>
</tr>
</tbody>
</table>

Less encouragement from related agencies is the only issue that has the mean response of importance. The ranking is then followed by issues of lack of construction waste management technology, costs of managing construction waste and no commitment from the organization, with the mean responses ranging from moderately important to important. This finding supports the study done by Begum et. al. (2006) that the average maximum willingness to pay to improve construction waste collection and disposal services is higher for large contractors as compared to the medium and small contractors. This finding is very critical because most contractors in Malaysia are medium and small class ones. Contractors need to change their attitude in order to achieve our country’s project goals and reduce construction site waste.

5. Conclusion

In conclusion, the main factors that contribute to waste generation are obviously those related to the traditional construction method: poor workmanship, poor storage, poor handling, untidy construction sites and lack of management techniques to minimize waste. The barriers of waste management implementation in the Northern Region show that lack of knowledge about construction waste management has higher ranking compared to other issues, with the mean response of importance towards most important. Hopefully, the findings obtained, will assist in the formulation of a suitable policy to improve the management of the Malaysian construction waste. However, this study has only focused on the Northern Region of Malaysia. Further studies should be conducted to assess other areas and any related factors that may contribute to a more efficient waste management system to be used by construction players in Malaysia.

Acknowledgement

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References


