Constraints of Construction Waste Management in Penang Island

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Abstract—Construction industry is seriously contributes to waste in Penang. Constraints of construction waste management caused unsystematic construction waste management even led to environment pollution. This paper generally aimed to identify the constraints of construction waste management in Penang Island, Malaysia. This paper has been conducted by interview method and questionnaire survey. The study scope area is around the Penang Island. The respondent in this study include 20 contractors that are registered under Class A, B and C in Contractor Services Centre (PKK) located at Penang Island and a Penang Island Municipal Council (MPPP) officer. Based on the result, the major constraints faced by contractors and Municipal Council in Penang Island is shortage of land and financial problem. Therefore, a systematic construction waste management needs to be implemented by contractor. Moreover, law enforcement of Local Authority also important to reduce the in construction waste management and environment pollution in Penang Island.

Keywords—construction waste management, constraints, island

I. Introduction

Constraints of construction waste management caused unsystematic construction waste management even led to environment pollution. Construction industry uses large number quantities of raw material and contributes one of environmental pollutant [1]. Waste disposal process in Penang almost paralyzed when the waste disposal center in Ampang Jajar faced technical problem that can not accommodate hundreds tonnes of garbage and solid waste from Penang Island and Seberang Perai [2]. Unsystematic of construction waste management will cause the environment pollution especially in island area. Therefore, law enforcement is important for construction wastes management to reduce the environment pollution [3].

With the shortage of land in Penang Island and land prices are soaring high have causing insufficient land for waste management [4]. Traditional disposal methods had used a large area of land. Disposal method currently also affect healthy and ecology risk [5]. This problem occur also when the construction site is very small and limit and it become more complicated when the construction waste generated in large quantities [6]. However, this also raise problem where contractors have to use time and pay cost for construction waste management [7].

Lack of law enforcement to construction waste management is also an important constraint [8]. Construction and demolition waste always ignored compare with domestic waste. Besides that, there are no legislation exist directly to solve the issue of construction and demolition waste management in many Asian country. [9]. Attitude of contractors are necessarily important for construction waste management. It is because contractor have important role and responsible to manage construction waste. Contractor usually used easier way to manage construction waste [10]. Some irresponsible contractors illegal dump and open burning construction waste. Environment pollution caused by unsystematic construction waste [11]. A few contractors still lack of knowledge and awareness of sustainable practice of construction waste management and impact to environment [12].

This paper is aiming to study the constraints faced of construction waste management in Penang Island, Malaysia. The study scope in Penang Island and focused on 20 contractors registered under Class A, B and C in PKK located at Penang Island and an officer from Penang Island Municipal Council.

II. Research methodology

The research methodology consist semi-structured interview method and questionnaire survey. The questionnaire survey was conducted by electronic mail, mailing and face-to-face distributed to contractors while the interview method was done by face-to-face with an
Engineering Department officer from Penang Island Municipal Council. Based on the sample size as shown in table of Krecjie and Morgan [13], 92 person samples required. The respondents were consisted an Engineering Department officer from Penang Island Municipal Council and 20 contractors registered under PKK Class A, B and C were selected randomly from samples. The results of the questionnaire were analyzed by using Statistical Packages for The Social Sciences (SPSS) and Microsoft Excel.

III. Result and discussion

Based on the result, this paper was discussed about the constraints of construction waste management in Penang Island faced by contractors and Penang Island Municipal Council.

A. The constraints of construction waste management faced by Penang Island Municipal Council

The officer agrees that cost and time consuming and lack of land were the constraints of construction waste management. Disposal activities very limited to cover the amount of waste. Jelutong landfill was estimated around 30 meters high above the sea level. The area of landfill that confronted with Expressway DR. Lim Chong Eu was already beginning partial closed since 2012. Penang Island Municipal Council and Department of Environment had stated rules and law to be followed by contractors in contracts and permits issued as Environment Quality Act 1974 and Law of Cleanliness and Public Safety Penang Island Municipal Council, 1980.

Besides that, the landfill planed to terminate but still operates even the landfill already operated over 20 years. They can’t find a new suitable location to replace caused by shortage of land in Penang Island. Therefore, most of the waste was disposed at landfill in Penang Main Land. The transportation fees from Island to Main Land paid by Penang Island Municipal Council. In addition, Penang Island Municipal Council had to pay about RM4000.00 per day for the cost of equipment rental and administration to construction waste in landfill. The landfill entry permit fee is not sufficient.

Due to the landfill is the level 1 landfill, they do not use advanced technology. The wastes can only be disposed by overturned the waste and the bulldozer will level the waste. Then, when waste reached a limited height level, the surface of level will be covered by soil. Besides that, there was also no any waste treatment in the Jelutong landfill. The chemical of construction waste will pollute the sea water, air and plants around the landfill.

Moreover, attitude of contractors dump construction waste illegally at road side and sea near landfill or into river caused environment pollution. This may due to them not willing to pay for disposal fee. The constraint of road traffic occurs due to the Jelutong landfill was located at town area. Movement of trucks that carried construction waste to landfill was disrupted road traffic. This constraint also complained by many residents about the smell of waste during transport waste to landfill. According to the officer, there are about 300 to 400 trips of trucks per day entry landfill.

B. The constraints of construction waste management among contractors in Penang Island

As the result analyzed of questionnaire survey from the 20 contractors, Fig. 1 shows the percentage of contractors faced constraint in construction waste management. Majority contractors were faced constraint in construction waste management which is 90 percent. Contractors always face constraints in term of time and cost. Besides that, Fig. 2 shows the percentage of contractors assumed construction waste management was a burden to manage constructions project. Construction waste management was a burden for 55 percent of contractors to manage a construction project.

Fig. 1. Percentage of contractors faced constraint in construction waste management

Fig. 2. Percentage of contractors assumed construction waste management was a burden to manage construction project
TABLE 1 shows the constraints faced by contractors in construction waste management in Penang Island. Constraint of higher cost charge for disposal was faced by the most contractors which is 50 percent. It is because, material wastage was counted in tender but the construction waste management fees were not counted in project cost. Contractors have to pay the management cost without project cost.

Besides that, constraints of lack of land and limited space to manage construction waste and consume time and cost to manage construction waste were faced by 45 percent of contractors each. This problem becomes complicated when the construction waste generated in large quantity. In addition, result also shows only 5 percent of contractors faced constraints other than. Some contractors also faced trouble with the contractor collect construction to landfill. Moreover, some contractor also lack of knowledge and guideline to manage construction waste.

TABLE I: THE PROBLEMS FACED BY CONTRACTORS IN CONSTRUCTION WASTE MANAGEMENT IN PENANG ISLAND.

<table>
<thead>
<tr>
<th>Constraints faced</th>
<th>Numbers of contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of land and limited space to manage construction waste</td>
<td>9 (45%)</td>
</tr>
<tr>
<td>Higher cost charge for disposal.</td>
<td>10 (50%)</td>
</tr>
<tr>
<td>Consume time and cost to manage construction waste</td>
<td>9 (45%)</td>
</tr>
<tr>
<td>Others</td>
<td>1 (5%)</td>
</tr>
</tbody>
</table>

Based on the result, Fig. 3 shows that several activities that charged cost in construction waste management among contractors such as disposal cost, pay to Local Authority for transport and disposal, equipment and machine rental and worker wage to manage. Most of contractors had been charged for worker wage during managed construction waste which is 13 persons. Next, 12 contractors also have to pay for rental fee of equipment and machine used to manage construction waste. Besides that, 9 contractors had also charged by Local Authority for transport and disposal construction waste while the 11 contractors had been charged cost for disposal activity.

Percentage of contractors charged by Local Authority for transport and disposal waste was less. It is because Local Authority had not interfered in process of construction waste management. Contractors almost only pay for disposal cost. They usually managed construction waste at site by employ their workers and rented equipment. Besides that, wage and equipment rental were charged to most contractors because they need more worker and equipment to manage construction waste especially in large quantities and different types of material waste.

Fig. 3. The activities charged cost in construction waste management among contractors

iv. Recommendation

All the parties involved have to overcome the constraints in order to manage construction waste systematically and reduce environment pollution. Various views and suggestions highlighted to overcome the constraints of construction waste management which discuss as below:

A. Use of technology

Contractors should use advanced technologies in their projects in order to reduce construction waste. Contractors can use Industrialized Building System (IBS) components to reduce formwork wood waste. IBS is a construction process that utilizes techniques, components or building systems which involve prefabricated components and installation at the construction site. IBS usage guarantee reduction of unskilled workers, construction waste reduction or materials wastage, reduction in the building material, environmental improvement and construction sites cleanliness and better quality control.

B. Legislation and law enforcement

Law enforcement can monitor contractor in manage construction waste and give summons to those contractor illegal manage construction waste. Local Authority should send auditor to construction site for checking construction waste management among contractors. In addition, compounds should be fine according to the types and
quantities of construction waste managed illegally. Furthermore, contractor given summons or fine should be blacklisted in order to revoke the contractor license if they repeat the offense. Contractors will manage their construction waste properly to avoid the summons. At the same time can reduce the constraints of environment pollution.

C. Provide incentive

Government and Local Authority should provide incentives to contractors. The incentives given in financial can cover the cost of construction waste management. Contractors will interest in aspect of cost and credit. In addition, local authority also can provide financial incentive in term of subsidies or loans on credit to contractors for buy equipment or machine used for manage construction waste. Financial incentives will attract interest of contractors to manage their construction waste systematic and legal in order to reduce environment pollution.

D. Awareness among contractors

Awareness among contractors and workers is very important for construction waste management. Contractors and workers should be given the knowledge of construction waste management through courses and campaigns. This is the effective way to delivery information and knowledge to manage construction waste systematically.

E. Provide guideline

Local Authority and Construction Industry Development Board (CIDB) Malaysia should propose guidelines for contractors to manage construction waste systematic. Those contractors lack of knowledge in manage construction waste can follow the guideline to manage construction waste in their projects.

F. Cooperation supplier and manufacturer construction material

Construction material manufacturers and supplier can cooperation with contractor to reduce waste through material packaging. Packaging material can be replaced with container that can be reuse repeatedly. Manufacturer and supplier can save cost for packaging and reduce waste to manage by contractors.

v. Conclusion

The construction industry was development rapidly in Penang Island. The large quantity of construction waste has make contractors can’t manage construction waste systematic even led to environmental pollution. Contractors necessarily play an important role in the construction waste management. This paper discusses the constraints of construction waste management among the contractors and Municipal Council in Penang Island. Overall, the way to overcome constraints of construction waste management should be implementing in order to manage construction waste systematic and reduce environment pollution.

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