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STRATEGIES OF EFFECTIVE WASTE MANAGEMENT PRACTICES IN BUILDING CONSTRUCTION SITE DURING PANDEMIC COVID-19

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ABSTRACT

Waste management in the construction industry is a critical aspect of sustainable development. Construction activities generate a substantial amount of waste, including materials, debris, and packaging. Effective waste management in this industry involves minimizing waste generation, proper handling, and disposal, and promoting recycling and reuse. During pandemic COVID 19, waste management in Malaysia have face several challenges in Malaysia. Therefore, an effective strategy important to overcome this situation. The aim of the study for this paper is to suggest the effective strategies on waste management practices in building construction project during pandemic. This study used quantitative approach and questionnaire survey as the data collection instrument. The data were collected from project manager, site manager and site supervisor team from contractor companies Grade 7. The findings show the top three main elements of the strategies in managing the waste management in building construction project during pandemic COVID 19 are recycle and reuse construction, impose penalties for poor waste management on site and provide environmental education for the worker. By adopting these strategies, the benefits can be obtained are minimize waste generation, conserve resources, protect the environment, and move towards a more sustainable future in construction industry.

Keywords : Waste management strategies, Building waste construction, pandemic COVID 19

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INTRODUCTION

The construction industry is one of the largest producers of waste globally. The amount of construction waste generated depends on factors such as the scale and type of construction project, construction techniques, and waste management practices. Construction waste can arise from various sources, including construction sites, building demolition, and renovation projects.

Construction waste refers to the materials, debris, and by-products generated during the construction, renovation, demolition, or excavation of buildings, infrastructure, and other construction projects. It includes a wide range of materials such as concrete, wood, metal, bricks, plaster, insulation, wiring, plumbing fixtures, and packaging materials.

Waste management refers to the process of collecting, treating, and disposing of waste materials in a safe, efficient, and environmentally responsible manner. The construction industry plays an active role in developing the growing of Malaysian economic. But if the building construction process is carried out to completion, construction waste is also generated. The bigger the building construction project, the bigger the amount of waste construction. The situation may be worst if construction waste management is not under control.

The handling of construction waste presents considerable issues for Selangor, one of Malaysia's most developed states. Construction waste management must work smoothly even though the geographical area in Selangor has less land to manage the construction waste. So, to achieve a successful progress, there will be a barrier to overcome with in construction industry to manage a mass solid waste. To highlight the situation, the management of construction waste become more difficult since the Prime Minister of Malaysia, has announced to extend the Movement Control Order (MCO) until 12th May 2020. In fact, as we all know, the MCO still continuing for the next phase until year 2021. But then, waste disposal can have a significant negative impact on the environment. (Salonga, 2019)

According to (Ogunnusi et al., 2020), the reasearch he made has found that one of the biggest obstacles the construction sector has faced even before COVID 19 is construction delays, which frequently cause time and expense overruns. With the Pandemic, the situation has grown incredibly complicated said him. Muhyiddin Yassin, the country's prime minister during the phase of pandemic COVID 19, stated on May 1 2020, that most firms in the nation would be permitted to resume operations as of May 4 2020 as long as they complied with stringent health standard operating procedures (SOP). In accordance with the fourth MCO phase, the government has released new SOPs for the construction sector. Most of the nation's construction sites

are still closed, despite the government's approval for them to reopen. Hence, 3603 of the 4183 building sites that the CIDB has inspected as of May 18 2020 were still under construction, according to Senior Minister for Security Ismail Sabri Yaakob.

During the COVID 19 pandemic, waste management practices in building construction projects underwent several changes and adaptations to ensure the safety of workers and the community. Malaysia is running out of suitable and wide area of sites for new landfills and currently, a lot of landfills are getting close to being fully utilized, and a lot of them are planning to close during the following several years (Cheen, 2018). Furthermore, when the instruction for MCO is out before, several waste management places need to stop its operation and close for the time being. And in 2022, after 2 years of continuing life as usual with the Covid-19 virus, some waste management places have reopened and are back in operation. For that reason, a proper management of construction waste is important to control and supervise construction waste without fail to make the construction process successful.

In comparison to other industries, the building industry in Malaysia produces the most waste to be manage (Nizam, 2015). That is why a construction waste management is needed to lead a proper management of the construction process (Sezer, 2017). It will be a negative value if the construction end with success within the appropriate time but then the construction waste management is not excellent. In line with this aim which is to determine effective strategies on waste management practices in building construction project during pandemic, the various strategies that have been identified need to be practiced obtaining the best waste management.

OVERVIEW OF WASTE MANAGEMENT PRACTICES IN SELANGOR

Construction waste adds to the demand on landfills, which are becoming more and more scarce, thus waste management is crucial. Hazardous materials can pollute soil and water if demolition and building debris are not properly managed (Business Waste, 2023).

Waste management practices in the construction industry are essential for reducing environmental impact, conserving resources, and promoting sustainability (Ferronato & Torretta, 2019). A building construction project may involve a number of parties up till the production of waste building materials. The parties can be the client, the construction contractor, the project manager, the site supervisor, the quantity surveyor, the suppliers, the subcontractors and the environmental consultants. These parties cooperate throughout the construction project to guarantee the application of effective waste management strategies.

Several regulations and policies in Selangor control how waste construction materials are managed. Selangor's Damansara, where construction waste is managed, implements broader waste management policies. (D. Gamon and S.Tagoranao, 2016) refers the Malaysian legal framework for waste management, including the handling of building waste, is provided by the Solid Waste and Public Cleansing Management Act 2007 (Act 672). To manage waste within their respective jurisdictions, local authorities like the Damansara Municipal Council (MDKL) or the Petaling Jaya City Council (MBPJ) are in charge (Primuscoreadmin, 2019).

The Damansara area in Selangor was formed as a residential and commercial area. A mukim in Petaling District, Damansara is a suburb in Petaling Jaya. It is one of Malaysia's most densely populated regions. It had those living there, making it Malaysia's second-largest district subdivision in terms of population. Since in one of the mukim in the Petaling district that has a large population, this statement has led to a production of waste in line with population. Therefore, the most effective strategy is necessary to manage construction material waste well and Damansara was chosen in finding the respondent.

In consequence, to ensure the waste management practices to be functional, the parties involved should be responsible and concerned about the current situation at the construction site and observing how construction material waste management is carried out. Effective waste management practices in building construction during the COVID 19 pandemic require careful planning and implementation to ensure the safety of workers and the community while minimizing environmental impact. In general, the strategies practiced before the COVID 19 pandemic are still used during the pandemic but it is more about how there are applied when there are new standard operating procedures to be followed.

STRATEGIES OF EFFECTIVE WASTE MANAGEMENT PRACTICES IN CONSTRUCTION INDUSTRY DURING PANDEMIC COVID 19

Any type of waste does not straight away go to the dumpsite. As much as possible, waste that can be recycled should be separated to reduce the amount of waste that is thrown away directly (Umar et al., 2021; Sezer, 2017). Landfills in Malaysia, most of them will reach the maximum limit for waste thrown away every day. Moreover, during the pandemic COVID 19, there are a strict condition related to reducing movement outside the home based on reducing the spread of the COVID 19 virus (Yan et al., 2021). On that order, the number of workers has been reduced and this had made it even more difficult to manage the solid waste and construction material waste that is produced every day. Frequently, valuable materials like wood, concrete, metal, and bricks can be found in construction debris. Conservation of natural resources, limit extraction and production processes, and cut down on the ensuing energy use and greenhouse gas emissions by recycling and reusing these materials

(Umar et al., 2021). More energy is not needed to recycle construction trash than to collect and refine primary materials (Mohammed Arif et al., 2012). Reusing materials reduces the demand for new resources, which saves money for building companies and lessens the total impact on the environment (Umar et al., 2021).

Even in the middle of the COVID 19 pandemic, teaching employees about environmental issues is a method for efficient waste management on a building site. By providing an environmental education for the workers (Umar et al., 2021; Mohammed Arif et al., 2012), it is hoped that workers will be more aware of the management and care of the construction site by practicing waste management of building construction materials wastes. Employees who receive environmental education are better capable to acknowledge the value of good waste management procedures as well as the potential environmental effects of improper waste disposal (Da Rocha & Sattler, 2009). Workers may make wise judgements and handle waste management responsibly by raising their awareness and knowledge.

From the aspects of compliance with regulations, workers are informed about significant rules and laws regarding to waste management through environmental education, including any unique COVID-19 procedures (Yan et al., 2021). By assisting them in following to legal standards and standard procedures, they lower their risk of non-compliance and the ensuing charges. Environmental education can advise employees about the proper handling and disposal of pandemic-related trash, such as personal protective equipment (PPE), to reduce the risk of virus transmission.

Imposing penalties for poor waste management on site is one of the strategies of effective waste management practices during pandemic COVID 19 (Umar et al., 2021). This strategy encourages a responsibility on the parties concerned to manage the waste from building construction project to avoid any environmental pollution. To impose a penalty for an offense committed, periodic inspections need to be carried out to detect any violation of the law has been made or neglect of responsibility involving waste management practices has occurred (Mohammed Arif et al., 2012). Establish a system of routine inspections to keep an eye on site-specific waste management procedures. To conduct inspections and guarantee complying to the waste management strategy, assign qualified staff or hire a waste management expert. At various points throughout the project, inspections should be done to catch any problems early. Besides, in addition to imposing penalties for offenses, committed, the appraiser may offer a reward for effective and quality waste management made at the construction site of the building involved. Rewarding behaviour positively can promote responsible waste handling practises and higher waste management performance.

Furthermore, to ensure effective waste management in the building industry, the Malaysian government has created rules and guidelines. To prevent fines and legal issues, it is crucial to operate by these rules. Construction companies can

demonstrate their commitment to environmental sustainability by meeting the requirements established by authorities by implementing efficient waste management procedures. Adopting sustainable waste management strategies may enhance stakeholder engagement and a construction company's reputation. Besides, be ensure that every employee complies to strict hygiene standards, which include frequent handwashing, the use of hand sanitizers, and the wearing of personal protection equipment (PPE) like masks and gloves (Yan et al., 2021). Place special handwashing facilities or hand sanitizers next to garbage collecting locations is highly recommended during the COVID 19 pandemic to reduce the spread and infection of the COVID 19 virus at that time.

Hence, standardising building designs can help promote efficient waste management techniques (Umar et al., 2021). Standard building designs can incorporate dedicated spaces for waste segregation, recycling, and composting. Design guidelines can specify the provision of adequate storage areas, chutes, or collection points for different types of waste, making it easier for residents to sort and dispose of waste properly (Sezer, 2017). In addition, during the pandemic COVID 19, a standard building design that is simple and easy to understand can avoid any waste if the remaining workers continue the construction work well without the guidance of skilled workers. Requirements for waste storage facilities, such as dimensions, placement, and accessibility of waste disposal units or containers, can be established through standardization. With this method, waste management can be done well if the separation and arrangement of waste can be done because each type of construction material waste has advantages and disadvantages from the aspect of impact on the environment, the size and type of transport to carry the waste, the care of the waste when collecting the waste until the maximum quantity is disposed of and so on.

Table 1: Strategies on effective waste management practice in building construction industry supported by authors

Strategies	Usman et al., 2021	P.X. Wong et al., 2019	Mohammed Arif et al., 2012	Ahmet Anil, 2016	Amri Hadri et al., 2017	Nur Zalikha et al., 2019
Environmental education for the work force				√		
Standardisation of design			√			
Provision of recycling and waste companies as part of the supply chain / Recycling and reuse of construction waste	√	√	√	√	√	√
Penalties for poor waste management			√			
Continuous promotion for environmental management / promoting green environment	√					√
Use green material	√					

METHODOLOGY

To achieve the study objective, a quantitative approach was used. This study used quantitative approach and questionnaire survey as the data collection instrument. Since the pandemic COVID 19 happened in Malaysia in the middle of December 2020, this scope of research needs a respondent that works during COVID 19 pandemic until now. The limitation of the research will be specific place in Selangor due to most of the construction company is in Selangor especially in Petaling district. All the questionnaires were distributed to the targeted respondents in construction industry located in Damansara, Selangor from grade 7 construction companies. The

populations of the study were 600 (n=600) selected Grade 7 construction company in Damansara, Petaling district, Selangor, therefore the minimum sample size of this study is 234 (s=234) respondents (Krejcie& Morgan, 1970). However, only 138 respondents responded to the questionnaire survey which made up the return percentage of 58%. But a total of 123 returned questionnaire survey is valid make the return percentage of 53%. The position of respondents is classified into four categories which are project manager, site manager, site supervisor and others team (quantity surveyor, architect, client, etc) In conducting literature review in this research, it helps in critical and analytical discussion on the strategies to improve waste management practices in building construction project during pandemic COVID 19. With a targeted time, the questionnaire has been distributing through emails, WhatsApp messages, and advertising on social media. As the data has been analysed, the findings from the data will be transfer into writing under analysis and discussion of result.

ANALYSIS AND DISCUSSION OF RESULT

Position of Respondents

Figure 1 shows the percentage on position of the respondents. It shows 9.40% are the project manager, followed by the site manager which is 7.20%. There are 20.30% who hold the position as a site supervisor and lastly 63% as the respondent from other teams which are quantity surveyor, architect and client. The reason why the respondent from other teams is higher for its percentage is because these questionnaires were answered by the other parties who still work in company contractor Grade 7, with working experience during pandemic COVID 19 and know about waste management happened on construction site.

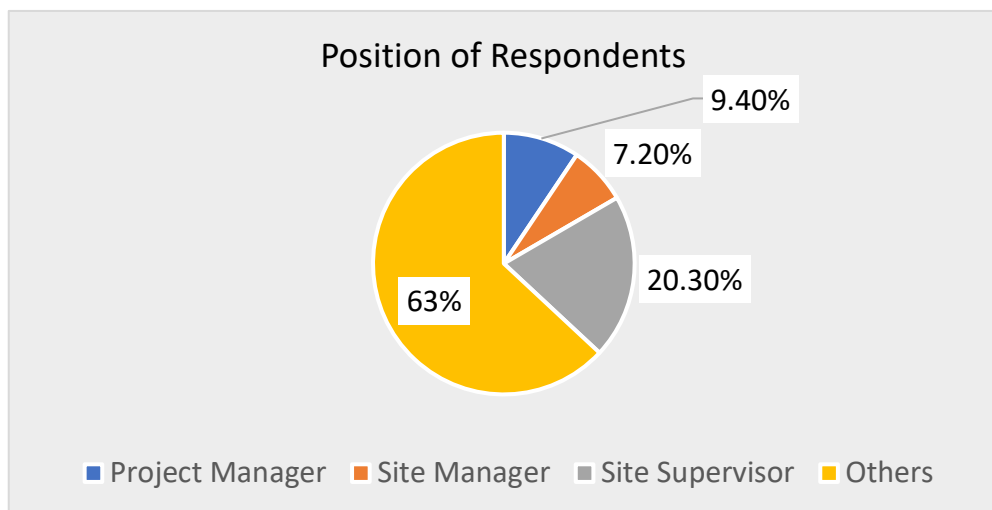


Figure 1: Position of respondents

Strategies of effective waste management practice

Table 2 and Table 3 interpret the level of mean score and the ranking on strategies of effective waste management practices in building construction sites during pandemic COVID 19. The highest mean score and ranking is 4.54 for recycling and reusing construction waste and provide a recycling company and the lowest mean score and ranking is using green material for construction which is 4.11. The total average mean for the strategies of effective waste management practices in building construction sites during pandemic COVID 19 is 4.37 that indicates the level is high. Therefore, it can be concluded that recycling and reusing construction waste and providing a recycling company is the most effective strategies in waste management practices. This is also supported by Usman et al. (2021), when construction and demolition of waste is recycled and reused, there will minimize the impact on the consumption of natural resources, but it also reduces the embodied energy, which could become important.

Table 2: Level of mean score

Score Rating	
1.00 – 2.33	Low
2.34 – 3.68	Medium
3.69 – 5.00	High

Table 3: Ranking on strategies of effective waste management practice in building construction project during pandemic COVID 19

Element	Mean Score	Ranking
Recycle and reuse construction waste and provide a recycling company	4.54	1
Impose penalties for poor waste management on site	4.50	2
Provide environmental education for the worker	4.47	3
Create promotions and advertisements related to the environment	4.31	4
Standardization of building design	4.28	5
Use green material for construction	4.11	6

Overall, the effective strategies to manage waste construction in building construction projects were rated at an agree level of agreement. The top three challenges that have been found in this research paper were recycling and reusing construction waste and providing a recycling company, imposing penalties for poor waste management on site and provide environmental education for the worker.

The major strategies analyzed in this research paper which were agreed by respondents is recycling and reusing construction waste and providing a recycling company. Recycle and reuse construction waste and provide a recycling company had been said and approved that this strategy gives a good impact to the construction industry. This research study revealed that respondents tend to agree on the strategies to increase the effectiveness of waste management practice due to maintaining and preserving the environment. From the findings, several authors which are Usman et al. (2021), P.X.Wong et al. (2019), Nur Zalikha (2015), Ahmet Anil (2016), Mohammed Arif et al and Amri Hadri (2017) agreed that recycle and reuse construction waste and providing a recycling company was one of the strategies that need to be implement in waste management practices in building construction project during pandemic COVID 19.

Besides, imposing penalties for poor waste management sites took second place in the list of strategies in this research study. The project manager, site manager, site supervisor and others rated their opinion with the highest agreed of challenges. This finding was agreed by one author which Mohammed Arif et al. (2012) mentioned that impose penalties for poor management is one of the strategies and due to that there will be argument to apply the penalties for the construction waste management mistakes done.

Furthermore, providing environmental education for the workers also had been determined as one of the strategies to improve waste management practices during pandemic COVID 19. This finding also was supported by Mohammed Arif et al. (2012) and Ahmet Anil (2016) stated that provide environmental education for the worker to have an effective waste management is the strategies to manage waste of building construction during the pandemic COVID 19. This is because no knowledge means no quality practices in the management of construction material waste.

In a nutshell, overall results of strategies to practice waste management in building construction projects during pandemic COVID 19 have received positive comments and feedback from the respondents. Most of the respondents felt that practicing waste management in the construction industry is difficult and challenging tasks during pandemic COVID 19. The strategic findings of this research also were previously validated by the literature review.

CONCLUSION

To practice these strategies, it is crucial for construction teams to adopt effective strategies. This may involve developing a waste management plan, prioritizing waste minimization, segregating waste properly, and implementing strict hygiene practices during pandemic COVID 19. By addressing these strategies effectively, construction industry can continue to operate until completion phase during pandemic and post pandemic COVID 19 while protecting the environment, achieve sustainability goals, save costs, and stimulate economic growth.

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Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
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