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SUSTAINABLE CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT IN MALAYSIA: CURRENT ISSUES

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Abstract

Construction and Demolition Waste (CDW) is a deep concern for most developing countries with a harmful impact on the environment, society, and economy. This study attempts to offer insights into the management practices of CDW and to identify several barriers that hinder the future management of CDW in Malaysia. The data collection approach includes a thorough review of all CDW related academic papers, official reports and statistics, and government legislations. This study also includes the issues and challenges of sustainable management of CDW in Malaysia with the aim of demonstrating the current challenges related to sustainability of CDW. The findings of this study will contribute substantial evidences to both academicians and practitioners towards better management and planning of policies for CDW.

Keywords: Construction and demolition waste, waste management, challenges, sustainability, Malaysia

■1.0 INTRODUCTION

Sustainability is now an area of deep concern for global citizens particularly in the engineering industry sector. The practice of sustainability has been noted to affect the economy of a nation and its ecosystem both directly and indirectly. For example, it has been found that the utilization of particular construction materials right from the process of extracting raw materials to processing, manufacturing, fabricating, transporting, and maintaining to disposing contributes to global warming. Sustainability is generally defined as the ability to address the present demands or needs without foregoing requirements of future generations. Thus, it can be concluded that sustainability is a mode of action whose final outcome is continuous and sustainable for the future [1].

The construction industry has been pinned as one of the most destructive industries to the environment and the ecological system. Thus, sustainable practices in the construction industry are an important factor in gearing towards sustainability. Construction approaches, which cause the least damage to the environment, are known as sustainable construction practices. It is necessary to implement sustainable practices in this industry in order to have a win-win situation that is mutually beneficial to the environment, society, and the economy [2].

In the past two decades, the Malaysian Gross Domestic Product (GDP) has benefitted from a consistent provision of 3%-5% from the construction industry (CIDB, 2007). However, this industry is also the culprit of contributing the most adverse effects to the environment including flash floods, sedimentation and erosion of soil, depletion of natural resources, and the usage of building materials hazardous to humans [3]. The continued development of this industry is mainly caused by the need to reach Vision 2020 which points to dynamic urbanization and sufficient housing for all [4]. Consequently, many developers are more concerned about the economic aspect instead of the ecology and environmental aspects.

Among the top priority of the Eighth Malaysia Plan (2001–2005) is the concern over sustainable development. An outcome of this concern is that the government is prioritizing research and development work in order to reach a level of sustainable development [5]. The Malaysian plan also emphasizes the need for targeted efforts in the process of construction planning that would increase energy efficiency and a better management of waste and environment [6]. This issue continued to gain attention through the recent plan namely the Tenth Malaysia Plan (2011–2015); as the nation continues its development, it is important that the needs of the future generation are not compromised [7].

Even though, Malaysia is still new to the move towards sustainability, most stakeholders in the construction sector are showing positive indications by putting into place concrete sustainable initiatives.

■2.0 CONSTRUCTION & DEMOLITION WASTE MANAGEMENT

In general, the construction and demolition waste (CDW) refers to waste derived from building, renovating, demolishing as well as excavating, in addition to building and civil construction, clearance of worksite, demolishing activities, road works, and renovating [8]. In

the last twenty years, both practitioners and academicians have taken a keen interest in managing CDW issues in many countries. In most cases, the research has played a major role in promoting sustainability in the construction industry. Most researchers globally have acknowledged the multitude of advancement in the implementation of CDW management. These attempts in practice has increased the use of renewable and secondary resources as opposed to non-renewable materials [9], extend landfills' lifespan [10], as well as decrease environmental pollution by lowering waste materials and the use of natural resources [11]. The benefits derived from a well-executed CDW plan is aligned with the strategy of the two major aspects of construction sustainability namely lowering the consumption of resources and environmental pollution [12].

In general, the research and practice of CDW has used the guideline of the "3Rs" strategy, namely reduce, reuse, and recycle. This strategy categorizes the waste management plans in accordance with the preferred use [12]. Reducing waste is regarded the most efficient and effective strategy. It not only minimizes waste generation, but also reduces costs in areas such as waste transport, waste recycle, and waste disposal [13]. Reusing refers to reutilizing the same material used in construction again for a similar purpose such as in construction formwork [14] and for a new-life reuse for a new purpose such as utilizing the cut-corners of steel bars for shelves and utilizing the stony fractions for road based materials [15]. Waste materials unable to be reused with be both recycled for new construction purposes or disposed at landfills. Thus, reusing is the most preferred method following reducing since only a decreased processing and usage of energy is required [12]. Following these methods, recycling is the next option. New materials can be produced from the wasted materials by recycling.

It is important to identify the main challenges of implementing the management of CDW in Malaysia since it would enable the policy makers to comprehend the challenges faced and act as the foundation for establishing new plans in the management of CDW.
Thus, this study intends to identify the main challenges that hinder the enhancement of the CDW management performance in Malaysia. The findings of this study are expected to contribute to both the theory and practicality of CDW in Malaysia.

■3.0 CDW MANAGEMENT CURRENTLY PRACTICED IN MALAYSIA

According to the by Nagapan et al. (2012), the construction sector's rapid growth has been due to the increase in the living standards, higher demands for infrastructure, changes in consumption prefrence, and the increase in general population. All these construction activities result in creating construction waste in the form of rubble, debris, concrete, soil, timber, mixed site waste materials and even steel [8]. The research by Hassan, Ahzahar [16] discovered that construction waste can be dangerous such as asbestos, which is generated at the time of demolishing current buildings. Thus, a sound, well-formulated policy and technology in the management of construction waste is necessary to decrease the severe impact on the environment, economy, and society.

Waste Management Technologies

According to Giusti [17], the most environment-conscious requirement for the hierarchy of a waste management strategy should begin with minimizing waste through reuse, recycle, and composting. Consequently, key players in the industry have gradually begun to consider the significance of adopting techniques for minimizing waste in the construction sector [16]. Minimizing waste includes reduction at source which alleviates waste generation at source itself and recycling which includes reuse or recovery of waste materials [18]. Malaysia is proceeding with the aim to adopt the Industrial Building System (IBS), which can control the generation of waste during the processes of construction and it is environmentally friendly [19]. IBS is described as a construction system built by utilizing pre-fabricated components [20].

Zeng, Tam [20] claim that it is critical that the construction sector adopts the IBS, which could decrease waste from construction activities substantially, conserve the capacity of the landfill and achieve sustainability in the management of waste. Nevertheless, the occurrence of a higher initial expense hinders the construction managers from adopting this approach even though the IBS is among the most effect ways of waste minimization at the work sites.

Thus, challenges in establishing a sustainable waste management system need to be examined further to find out better the exact major issues and to move towards the achievement of waste management sustainability.

CDW Policies

Construction waste includes a huge amount of municipal waste; thus, it is advisable to provide a policy that would be better able to deal with this type of waste to eventually establish an environment that is pollution free. Consequently, the government of Malaysia has established a board known as the Construction Industry Development Board (CIDB) to change the sector by enhancing its environmental management [21]. The CIDB introduced a Construction Industry Master Plan to improve the key players of construction further towards becoming more aware of the issue of sustainability.

In line with this development, the government also set up the Standard Specifications for Building works (SBW) under the jurisdiction of the Ministry of Works, and the CIDB governs the Pembinaan Malaysia Act 1994 [22]. SBW's main objective is to make sure that the construction and garbage clearing is carried out twice a week and sent to the landfill while the PMA will aim to avoid and decrease the pollution brought on by construction wastes.
The acts and policies set up by government agencies demonstrate the intention to manage construction waste in a proper manner. Nevertheless, the practitioners in the construction sector do not closely follow all the implemented policies and thus more thorough and comprehensive policies are required in ensuring the protection of the environment, society and economy..

■4.0 FACTORS CONCERNED WITH REACHING SUSTAINABILITY IN THE CDW MANAGEMENT IN MALAYSIA

In the past decade, the number of projects related to construction has grown rapidly given the 'Malaysian Plan 2020' [23]. Thus, the construction and demolition waste management in Malaysia has become a critical cause of concern in recent years (Begum et. al, 2010) while addressing the challenges of decoupling financial developments and the era of waste materials (National Economic Advisory Council, 2010). Construction waste within Malaysia, is truly a critical waste flow but in spite of the various policies by the government to curb these challenges, the concept of a sustainable resource and waste management strategy on site is still not a top priority for most contractors and developers [24].

In general, various issues remain in the achievement of a sustainable CDW management such as insufficient legislative enforcement, insufficient classification of CDW, the contingencies of CDW management, concerns about using CDW as raw materials, poor awareness regarding the requirements of CDW management, disconnect between policies and practices, insufficient proper recycling markets, and the lack of funds.

Insufficient Explicit Legislature Controlling the Management of CDW

First, the issue of insufficient explicit legislature controlling the management of CDW [26]. This issue is commonly found in most developing countries including India, Cyprus, Czech Republic, as well as Malaysia. Legislations are not effective and poor in governing and monitoring the operations of construction and demolition such as control of quality in the practices and building materials. When there is a lack of oversight in the operations of construction and demolition by the those in charge, the consequent structure could face lowered quality levels leading to the structure being compromised. Buildings built with poor quality materials could be hazardous to people and the demolition process could produce materials that are non-recyclable or dangerous to the environment. The lack of proper enforcement also causes illegal CDW dumping into unauthorized landfills, which is a common practice in developing nations.

Legislative techniques that have been effective in lowering the generation of CDW involves techniques such as taxation or enforcing a fee for collecting CDW (Denmark, Austria), banning landfilling (Belgium as well as most EU nations) and laws that require the separation of CDW (Germany). For instance, in Malaysia, a complete revamping of the solid waste legislature is being carried out (Solid Waste Bill 2007) and anticipated to involve the provisions for CDW management.

Insufficient Classification of CDW

The insufficient or poor classification of CDW is another area of concern [26]. In most developing countries (where the generation rate of CDW could possibly be higher than the industrialized countries), no explicit laws exist that govern the generation, management as well as the disposals of CDW. Rather, it is regarded as being a part of the municipal solid waste (MSW) and thus planned accordingly. Many chemical and physical variations exist in comparing MSW and CDW. The variations cause a large gap in the options for the management and in the finance related commitments in sustainable management. A breakdown occurs in removing/disposing CDW services when these differences are not acknowledged.

Lack of Funds

Most practitioners in the industry are not satisfied about joining the activities leading to the minimization of waste as the costs would be higher [27]. Chen, Li [28] claimed that the reward and penalize approach in relation to handling of materials on-site can be utilized to successfully encourage the practitioners reduce on-site waste. Osmani, Glass [29] supported these findings and discovered that financial rewards were regarded as a major incentive, which could motivate waste reduction in the design stage.

Therefore, since minimization of waste incurs a higher cost, most construction practitioners are hesitant in applying the waste management technique. A suitable fund or incentive could be their main motivation to apply minimization of waste as among the waste management approach [30].

Concerns About CDW as Raw Materials

The following challenge is in the recycling of the CDW as a raw material source (a type of urban mining), instead of solid waste [26]. Unmanaged CDW disposal into landfills, as practiced currently in developing countries, is a dire waste of finite natural resources. As an example, 40% of the natural resources available in the USA have been utilized in the operations constructions. Waste materials from the construction sector, when correctly produced (through de-construction instead of demolition) could act as a wealthy urban mine. However, the deconstruction takes a long time and it is not sustainable economically; thus, successful effective CDW mining can only be reached with a compromise between cost and earned income using the raw materials.

Poor Awareness of CDW Management Requirements

The lack of awareness and knowledge related to the issues, result in the comparative slow transformation towards sustainability in the construction sector in Malaysia [31, 32]. It is critical that the entire stakeholders in the construction sector including the developers, contractors, consultants and clients are completely aware of the significance of achieving CDW management that is sustainable.

Insufficient new knowledge within the contractors has also resulted in yet another barrier in reaching a sustainable CDW management [30]. It results in failure in arriving at a consensus by the younger generation and the experienced developers. This is due to the fact that up until a decade ago, environment related issues were not critical and thus not prioritized in education until a decade ago. The seasoned contractors' experiences are essential and valuable in the industry, even though they may not have new knowledge about sustainable practices. However, the younger generation who are educated and aware of knowledge regarding sustainability in CDW management experienced obstacles in distributing the theoretical understanding of sustainability into practice. Thus, developers are likely to ignore the ideas proposed by the younger generation [32].

Disconnect Between Policies and Practices

It has been observed that the current processes will not ensure the proper placement of CDW management policies. The disconnect between policies and practices are caused by factors such as poor implementation, lack of enforcements, doubts in the excessive tasks and obligations within the monitoring authority and the confined stakeholders' coordination [21].

Insufficient Contingency Manage-ment of CDW

Agamuthu [26] clarified that the concern is with the insufficient contingency management of CDW. Sustainable CDW management should include the provision of large-scaled emergency conditions. Even though CDW is a part of the current waste management approach, it becomes challenging following an occurrence of a large-scaled destructive situation whereby lifesaving processes should be mounted immediately. In an ideal situation, the rescue and debris clean up should start together since the two processes are complementary. The spreading of diseases related to destructive events could be prevented in returning a state of normalcy. In addition, contingency management of CDW can also be planned strategically to meet pertinent long-term waste management concerns (or concerns during normal routines) by obtaining investments for the operations, effective waste collection/disposals, re-development of infrastructure in domestic waste management, local capacity building, and spreading awareness.

Insufficient Proper Recycling Markets

Among the significant aspects of the CDW recycling is the existence of markets that receive the recycled products [27]. According to Peng, Scorpio [12], recycling needs aggressive marketing attempts to locate the markets and to sell the materials at competitive prices. The poor market development shows that substantial amounts of money time are needed to establish relations, keep track of price changes and to become an adequate materials supplier that would allow a continuous flow of construction materials.

Thus, insufficient proper waste recycling markets will largely act as a barrier to the successful implementation of waste recycling [33].

■5.0 CONCLUSION

In conclusion, efforts must be carried out in the establishment of CDW management, which is simpler to manage compared to MSW. CDW contains lesser emission points and generators; as it is profit driven, it is easier to make this sector adhere to the suitable enforcement and legislature. In addition, the illegal CDW disposal is difficult due to its

Furthermore, illegal disposal of CDW is actually difficult given its visibility. Since many landfills around the world are already arriving at the point of saturation with many anticipated to reach in the near future, CDW should be seen as a viable option for global sustainable management and be emphasized accordingly.

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