

SUSTAINABLE CONSTRUCTION WASTE MANAGEMENT IN MALAYSIA: A CONTRACTOR'S PERSPECTIVE

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ABSTRACT

The Malaysian construction industry continues to grow, benefiting the country's economy and providing essential infrastructure. However, this thriving industry is responsible for one of the single largest waste streams in the country. This paper focuses on the current status of waste management in the Malaysian construction sector. It builds on existing research and assesses the level of sustainable practices on construction sites in terms of waste management. It is a reflective paper examining the attitudes and reaction of Malaysian contractors towards a more structured approach to on-site sustainable resource and waste management, the "Site Waste Management Plan". The Site Waste Management Plan, is a framework that has been used in Europe and has successfully reduced on-site construction waste generation. The aim of this study is to gauge the industry's appetite and commitment to sustainable waste management and ultimately guide the future development of a framework for the management of construction wastes in Malaysia. A number of semi-structured interviews were conducted with Malaysian contractors, with no previous experience of Site Waste Management Plans. This exercise allowed the researchers to explore the industry's level of awareness and commitment to sustainable waste management, identify current barriers and suggest future recommendations for an implementation strategy.

Keywords: sustainable development, construction waste management, contractors, Malaysia, environment

INTRODUCTION

The construction industry is one of the main contributors towards the development of nations, providing the necessary infrastructure and physical structures for activities such as commerce, services and utilities. The industry generates employment opportunities and

injects money into a nation's economy by creating foreign and local investment opportunities (M. Agung, 2009). However, despite these contributions, the construction industry has also been linked to global warming, environmental pollution and degradation (Jones & Greenwood, 2009).

Construction waste generation and unsustainable use of depleting natural resources as building materials, are also linked to the adverse environmental impacts of the construction industry. Globally, it is estimated that approximately 10 to 30 per cent of wastes disposed off in landfills originates from construction and demolition activities (Fishbein, 1998). In Malaysia, construction waste is one the single largest waste stream and yet despite a number of government policy initiatives to address this issue, sustainable resource and waste management on site remains a low priority for the majority of the contractors (Begum, 2009). This study explores the Malaysian contractors' perspective in relation to sustainable resource and waste management and in particular the application of a more structured management framework, based on the "Site Waste Management Plan" (SWMP) approach. The paper examines what appetite there might be for the adoption of SWMP, to explore the industry's level of awareness and commitment to sustainable waste management, to identify current barriers and suggest future recommendations for an implementation strategy. The paper concludes with recommendations for the formulation of a Malaysian SWMP, based on the empirical findings of this investigation.

SUSTAINABLE WASTE MANAGEMENT AND THE MALAYSIAN CONSTRUCTION SECTOR

Sustainable Development and Waste Management in Malaysia

During the second half of the 20th Century, there were increasing calls for action by scientific, political and civil society groups who raised the need to address the negative impact of human activities on the natural environment. The publication of the Brundtland Report in 1987 followed by the Earth Summit in Rio de Janeiro in 1992 helped to establish the concept of 'sustainable development'; an approach to development now supported by a wide spectrum of governments. The concept rests on the notion of 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland, 1987).

As a developing country aspiring to achieve developed country status by 2020, Malaysia is faced with the challenge of decoupling economic growth and waste generation (National Economic Advisory Council, 2010). Sustainable growth is a central theme of the 10th Malaysia Plan (Economic Planning Unit, 2010) and demonstrates the Government's commitment to sustainable development. In 2005 the "National Strategic Plan for Solid Waste Management" was adopted forming the basis for solid waste management policy and practice in peninsular Malaysia until 2020 and providing the foundation for the subsequent years (United Nations Development Programme, 2008). The Government's efforts to address this pressing issue include the introduction of the Solid Waste and Public Cleansing Management Act 2007, and the establishment of two new federal institutions aiming to implement the country's solid waste management policy, the National Solid Waste Management Department and the Solid Waste Management and Public Cleansing Corporation, the latter being the operational arm.

Solid waste management has been a concern in Malaysia for some time, due to poor management and handling practices which in turn affect the environment as well as the public. Malaysians produce approximately 25,600 tonnes of waste daily, in response to rapid

development and urbanisation (Fazleena Aziz, 2010). Solid wastes are generated from residential, industrial, commercial, institutional, construction and demolition, municipal services and other human processes (UNESCAP, 2009). Only 76 per cent of solid wastes are successfully collected in Malaysia, and only around 5 per cent is recycled, with 95 per cent of collected wastes disposed at the country's 112 landfills (Alam Flora Sdn. Bhd., 2007). According to the Ministry of Housing and Local Government (MHLG), the majority of landfills are at full capacity and operate to old standards with limited leachate and landfill gas control. This is a far reach from the Government's target for 22 per cent waste minimisation and recycling (Nadzri, 2007), 100 per cent separation at source and closure of all historic, unsanitary dump sites by 2020 (Japan International Cooperation Agency, 2006).

It is clear to see that current practice does not reflect waste management policy in place. Factors such as a lack of implementation, weak enforcement, uncertainty over roles and responsibilities amongst governing authorities and limited stakeholder coordination have all contributed towards this disconnect between policy and practice. Furthermore, despite efforts by the MHLG, public awareness of the environment and, more specifically, waste management is low. However, the Malaysian Government recognises that appropriate waste management is essential in achieving sustainable development as highlighted by the Malaysian Government Model (National Economic Advisory Council, 2010).

In terms of general awareness of sustainability in the Malaysian construction and building sector, the launching of a national initiative called the Green Building Index (GBI) and increasing attention towards international sustainability assessment standards, such as Greenmark, LEAD and BREEAM have served to raise awareness of the broader issues associated with sustainability. However, as long as these initiatives remain voluntary and outside of the remit of government legislation, broad scale uptake of sustainability standards across the sector will remain low.

Status of Construction Waste Management in Malaysia

A study from Mohd Nasir et Al., (1998) reported that 28 per cent of municipal solid waste originates from industrial and construction waste in the central and southern regions of Malaysia. Waste minimization, reuse and recycling practices are limited in the construction sector and natural resources required as building materials are available at relatively low cost (Begun et al 2009). In addition there is no mandatory requirement for construction companies to practice sustainable resource and waste management and illegal dumping is still an issue for the authorities (Begun et al 2009).

In response, the Government formed an agency called the Construction Industry Development Board (CIDB); one of its aims is to transform the industry by improving its environmental performance. In support to national policy, CIDB has reinforced the industry's commitment to sustainable development and an environmentally responsible industry in the "Construction Industry Master Plan" (Construction Industry Development Board, 2007) and is continuing to educate the industry's key players with series of training courses, workshops and awareness raising events. In addition, the introduction of the GBI is providing a framework to design and construct green sustainable buildings and raises awareness within the sector.

In 2009 the Malaysian construction sector reported a 5 per cent productivity growth (Malaysia Productivity Corporation, 2009). On one hand this figure demonstrates the crucial role the Malaysian construction sector can play in contributing towards the Government's commitment to sustainable development. On the other, it supports predictions that construction waste generation rates will continue rising, putting increasing pressure on the already overstretched waste management infrastructure of the country.

In summary, there are number of policies and voluntary initiatives supporting sustainable resource and waste management in the Malaysian construction sector, however the reality remains challenging. The continuous growth of the sector provides an opportunity for a wider uptake of sustainable waste practices, contributing to the country's aspirations for sustainable development.

Site Waste Management Plans

A Site Waste Management Plan (SWMP) provides a framework which can help contractors or project managers to forecast and record the amount and type of construction waste that is likely to be produced in a project, as well as assist in setting up appropriate management actions that reduce the amount of waste that will be sent to landfill (WRAP, 2007). A construction waste management plan aims to improve materials resource efficiency by implementing reuse, recovery and recycling as well as to minimise issues such as illegal dumping by properly documenting waste removal processes (Defra, 2009).

In number of developed countries such as United States, United Kingdom and Australia, construction waste management plans have been gaining popularity as an important tool to minimise the adverse impacts of the construction industry towards not only the environment but also the nations' economies. The plan requires the cooperation between all parties involved in a construction project, including the client, contractor, designer, engineer, sub-contractors, workers and even the suppliers. It is initiated during the project's pre-planning stage and involves activities throughout the duration of the project up to its completion to ensure the waste management plan's effectiveness and efficiency.

In United States, the framework called Leadership in Energy and Environmental Design (LEED) Green Building Rating System is popularly used, which is a set of standards for environmentally sustainable construction incorporating practices for sound waste management into construction activities (LEED, 2004). Construction projects gain points when they adhere to LEED requirements which subsequently secure a certification. Similar frameworks for sustainable buildings and developments include the Building Research Establishment's Environmental Assessment Method (BREEAM) rating system in the UK, the Green Building Index certification (Real Estate and Housing Property Developers' Association Malaysia, 2010) in Malaysia, Green Mark in Singapore, Green Star in Australia and many more. Sustainable resource and waste management features in all of these frameworks, encouraging the adoption of a form of site waste management plan to guide the process from the design to the decommission of the development.

In most countries SWMPs are voluntary. However, in 2008 SWMPs eventually became compulsory for projects in England exceeding £300,000 (BRE, 2009). This move was supported by developing and offering a SWMP template and other related tools such Netwaste and SMARTwaste for designers, engineers, contractors, developers and other professionals in the constructions industry (WRAP,). Guidance and training courses are freely available to aid the industry achieve waste reduction, re-use and recovery, from the procurement, pre-construction and construction phases of a project.

Typically a SWMP will require the project manager to provide basic information about the type, scale and value of the project, identify the responsible persons involved in the stages of the project (principal contractor, engineer, client, designer, person responsible for waste management on site etc), a proposed timescale and programme of works. The Key Performance Indicators (KPIs) for waste minimisation, recycling, materials recovery or waste generation per area unit, or other relevant targets will be agreed during this initial stage. Figure 1 presents a broad outline of a SWMP.

In the next stage, the series of waste prevention, waste reduction, waste management and recovery actions to be taken during the design, procurement and construction will be agreed and recorded by the project team. Following this, the type, source and quantity of waste arisings anticipated from the project are forecasted with the aid of benchmarks for the various types of development (residential, education, health, infrastructure, commercial, retail etc). Details of the suitably licensed waste carriers and ultimate waste management destinations of waste arisings are recorded to ensure Duty of Care and prevent illegal dumping or other inappropriate handling of wastes. The actual waste arisings, prevention, recovery, recycling and reuse actions are recorded and compared against the forecasts and KPIs to measure performance, adjust and improve the SWMP as required. Training of staff on site is crucial to the success of a SWMP. Monitoring and reporting continues for the duration of the construction project and informs the final project review and recommendations for future improvements.

Figure 1: Proposed Outline of SWMP

Project Stage	SWMP Actions
Project Set Up	<ul style="list-style-type: none"> • Enter project details
Concept Design	<ul style="list-style-type: none"> • Record waste prevention actions
Detail Design	<ul style="list-style-type: none"> • Forecast waste • Record waste reduction actions
Pre Construction	<ul style="list-style-type: none"> • Specify waste carriers • Plan waste destinations • Record waste management and recovery actions
Construction	<ul style="list-style-type: none"> • Enter actual waste arisings, reduction, recovery and management activities. • Carry out training, monitoring and recording.
Post Construction	<ul style="list-style-type: none"> • Compare actual against forecast waste management activities • Assess performance based on KPIs • Suggest improvement for next project

Note: Adapted from WRAP Site Waste Management Plan Template version 2.3

METHODOLOGY

The study included a literature review on sustainable development, the effects of human activities on the environment, the solid waste management systems used in Malaysia and their impact to the nation’s development and environment. SWMPs from developed countries were reviewed to identify their main elements and how they affect a project for contractors. An outline SWMP was created by simplifying the elements in the site waste management plans from other countries, extracting the perceived best practices and combining them into one proposed framework to be tested in Malaysia.

Seven semi-structured interviews were conducted as part of this research to determine the uptake of any form of SWMPs by Malaysian contractors, the suitability of existing SWMPs in relation to the local environment, and their impact on the actual project and the environment as a whole. According to the literature review carried out, SWMPs are relatively new in Malaysia and levels of awareness and adoption by contractors are low. Therefore, the target sample chosen were eight (8) contractors located around the Kuala Lumpur and Selangor area who have never implemented SWMPs. The selected contractors were seen as a

representation of the Malaysian construction industry which does not have an official system or guidelines for managing construction wastes on site, yet.

The contractors interviewed, were randomly chosen and are considered a convenience sample. The selected companies had different backgrounds and experiences, and are assumed to be reliable samples by the researchers as they will represent different groups in the construction industry. In this research, seven (7) out of the targeted eight (8) contractors located in the Kuala Lumpur and Selangor area were successfully interviewed using exploratory, semi-structured interviews. All chosen contractors were class G-7 companies with extensive experience in civil, infrastructure works and structures for the commercial, industrial and residential uses, among others. Meanwhile, the respondents interviewed were experienced project managers and engineers with extensive involvement in construction projects.

The interviews were conducted to obtain reviews for the outline SWMP produced by the researchers based on literature review. The selected contractors were asked to review and comment on the proposed framework, in particular the perceived benefits to a project and its effectiveness. Contractors were also asked about their awareness of the campaigns made by the Government and Construction Industry Development Board (CIDB) in encouraging contractors to take up a SWMP, and the incentives that can be awarded by the Government to encourage contractors to adopt SWMPs.

There were limitations to this research which could have inadvertently affected the results. Some of the selected firms were unresponsive and unsupportive, therefore making the data for the research incomplete and possibly biased. There were also time limitations to complete the research, thus fewer interviews were conducted than initially planned for. One the main barriers to this study was the low level of awareness amongst Malaysian contractors regarding sustainable resource and waste management and in particular SWMPs. The lack of knowledge about SWMPs made contractors more reluctant to implement any form of a SWMP. Finally, this study was conducted as a preliminary exploratory exercise to gauge the industry's level of awareness and commitment to sustainable waste management, identify current barriers and suggest future recommendations for an implementation strategy. Further investigations would be required to build on the findings of this study.

FINDINGS AND DISCUSSIONS

Specific Findings

From the target sample of eight contractors, seven were successfully interviewed for the purpose of this research. The questions asked to the interviewees were broadly grouped in the following categories: barriers to SWMPs, awareness of environmental impacts, on site sustainable management practices and recommendations for improvements. The following section details the findings from these specific questions before leading into a broader discussion of the implications for sustainable waste management in Malaysia.

Barriers to SWMPs

The interviewees felt that the main factors preventing contractors from using SWMPs in Malaysia are the lack of promotion and encouragement by the Government and CIDB, and the perception that appropriate solid waste management practices reduce contractors' profits. 57 per cent of contractors stated the perceived cost implications of SWMPs as the main reason why they would not implement one, whereas 43 per cent identified the lack of

available information and guidance, incentives and practical tools about SWMPs as the main barrier.

Level of awareness of environment impact of construction waste generation and current waste practices

The majority of the interviewees (85 per cent) were unaware of the adverse impacts of waste to the environment. 6 out of 7 contractors send all of their wastes to landfill or burn them on site illegally, while 1 contractor admitted to disposing construction wastes on site.

Sustainable resource and waste management practices on site

Despite the low levels of environmental awareness and unsustainable waste management activities, there are some examples of sound waste management practices on site.

According to the contractors that were interviewed some waste segregation at source is practiced with the ultimate aim to recycle materials with some value. Waste materials such as scrap metal are separated and stored on site to be sold on to waste recycling companies, while other wastes are mixed together into one container and either sent to landfill, burned or illegally buried on site.

There are some sustainable practices carried out on site by the contractors, such as recycling and re-using of certain materials or using Industrialised Building System (IBS) which reduces the amount of wastes produced on site. None of the interviewed contractors have targets with regards to waste management on site, which shows that contractors still lack knowledge and awareness on encouraging sustainable practices.

Recommendations for improvement

Six of the contractors felt that the Government should promote SWMPs better, while financial incentives such as tax reduction were perceived the best way to increase uptake. Finally, the interviewed contractors felt that they would support the creation of legislation making SWMPs compulsory as it would ensure the success of their projects and allow them to deal with their wastes more responsibly.

Discussion

Based on the contractor interviews, it can be concluded that there is a greater likelihood of adoption of SWMPs by contractors if there is the correct level of encouragement, incentives, promotion and training. The factors preventing contractors from using SWMPs could be eliminated with suitable training, guidance material and awareness raising. Indeed, the main issue preventing the use of construction waste management plans on site relates to the lack of information on both the contractors and CIDB's part. Before any of these parties can develop construction waste plans for the Malaysian construction industry, they must first equip themselves with the knowledge and understanding of the topic. However, given the limitations in the research as well as the small number of samples taken, more data is needed to confirm this assumption.

The interviews reveal that the Malaysian construction sector relies solely on initiatives led by the government bodies and CIDB and is reluctant to invest time and effort to drive change. The UK experience demonstrates that industry driver initiatives are also required to change the face of the industry. Based on the SWMPs developed in other countries, it is evident that the implementation of construction waste management plans is beneficial to contractors in

terms of the promotion of good management practices, reduction of unnecessary wastes on site, cost and time savings and more. CIDB should also take a step towards increasing promotions for construction waste management as part of the industry's need to deliver sustainable practices for the benefit of the society, economy and the environment.

The study also tested the industry's appetite for regulation on sustainable construction waste management, making SWMPs a mandatory requirement. The industry appeared surprisingly positive and supportive for such a measure appreciating the business benefits it could lead to. This response suggests that the Malaysian government should consider creating regulation on construction waste management which will address the increasing problems caused by excessive development and environmental degradation and create awareness among contractors to implement SWMPs for their projects. By creating legislation on construction waste management, the efforts in promoting recycling, reducing and re-using activities which the Government has been campaigning in the past years would be fully addressed.

The interviewed sample's response to proposed outline SWMP framework was positive. The contractors felt that the proposed waste guideline was comprehensive and encompassed all stages of a construction project. Most of the activities carried out in the guideline were also seen as achievable and beneficial for contractors if properly carried out. Furthermore, the contractors highlighted the need for waste reduction during the design stage, avoiding unnecessary designs and specifying using durable and reusable building materials.

Finally the inadequate waste management infrastructure of the country and current policy lacking coordination were raised as a concern by the Malaysian contractors. The interviewees were aware that suitable and adequate recycling plants and related infrastructure are crucial to ensuring the success of SWMPs. An example of the disjointed policy is the fact that the Public Works Department's authority has yet to certify and accept the use of recycled materials for construction projects. Therefore, currently the lack of relevant infrastructure, supporting policy, legislation and enabling mechanisms make it difficult to promote sustainable activities like recycling in the Malaysian construction industry and limit the number of options for contractors in the implementation of SWMPs.

CONCLUSION

SWMPs provide a useful framework for the sustainable resource and waste management of construction waste, offering environmental, social and financial benefits. The aim of their implementation on site is to increase the resource efficiency of materials through recycling, reusing or recovering products before they are disposed, and reducing environmental problems, such as illegal dumping and open burning (DTI, 2004). There are many proven benefits of construction waste management plans for contractors, such as cost and time savings, increased productivity on site, good corporate social responsibility and the ability to control the quality and ensure the safety of project sites as a result of a clean site environment.

However, despite these benefits construction waste management remains poorly implemented in construction projects in Malaysia, despite some promotion from the Government and CIDB. It is clear that more efforts are required by CIDB and the Government to promote and develop SWMPs into the local construction industry and contribute to the country's aspirations for sustainable growth. Based on the results of this exploratory exercise guidance, practical tools, regulation and incentives are amongst the priorities highlighted by the Malaysian contractors. Construction waste management guidelines such as the one proposed by this research aims to promote sustainable construction practices by contractors in Malaysia to ensure a comprehensive and integrated management of wastes on site.

In terms of further research, studies exploring the practices that can be adopted by the construction industry to promote sustainable development are recommendation. Currently, there is limited if any research investigating behaviour change in the industry that would lead to improved waste management attitudes and practices. Furthermore, the development of a national standard for SWMPs for Malaysia supported and promoted by CIDB would benefit the sector and improve sustainable resource and waste management of construction waste in the country.

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