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Assessment of different construction and demolition waste management approaches



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KEYWORDS

Construction and demolition waste;
Waste management;
Strategic perspective;
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Abstract The waste generated from construction and demolition sites is considered one of the most irritating problems in Egypt. In the last 10 years some effort has been made toward solving this problem, the most outstanding is the newly issued Egyptian rating system “Green Pyramids Rating System”. It emphasizes on waste management and particularly “site provision and environment” which contributes to 75% of the management category score. However the traditional practice which is limited to dumping all the generated waste is still dominating. The absence of sustainable practices in construction sector in Egypt led to the lack in financial and environmental data. From strategic perspective, the research aims at developing a detailed procedure to evaluate two construction and demolition waste management approaches by means of Decision Matrix technique. A detailed study is introduced for the two approaches; for each approach a flow chart is developed to demonstrate its lifecycle, as well as the cost break down structure and the different stakeholders’ roles. A penetration discussion of the pros and cons for each approach was developed accordingly and came out with sixteen influencing attributes for both approaches. The previous steps paved the ground to construct a Decision Matrix to decide on one of the approaches from a strategic environmentally oriented perspective. The study relied on the detailed and deep demonstration of the two approaches to justify the assigned weight for attributes and scores for corresponding approach. From a strategic perspective, the decision came out in favor of the more environmentally friendly approach.

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Introduction

For many contractors and builders in Egypt, as well as in many other developing countries, the issue of construction waste management is still new. Garas (2003) [1] stated that understanding and identifying the factors affecting the waste help in controlling the waste stream. In Egypt some improvement has been made or is under development, where some related codes are now under development in Egypt, such that the Green Building Code and the Code of Recycling Solid

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waste. And the most outstanding is the issuing of the Green Pyramid Rating System (GPRS). However, the main obstacle in all the researches and studies of CDWM is the absence and/or inaccuracy of data related to quantities, cost, environmental impact, etc. A recent report by National Solid Waste Management Program NSWMP and the Ministry of State for Environmental Affairs stated that there is a contradiction in the estimated annually generated CDW where the estimated quantities by the Ministry of Local Development are 10 times the quantities estimated by the Egyptian Environmental Affair Agency EEAA, (2013) [2]. Therefore evaluating CDWM based on any technique encountering lifecycle cost analysis is considerably a harsh task in Egypt.

One of the triggers of the current research is the newly issued Egyptian rating system GPRS. It emphasizes on CDWM and particularly "site provision and environment" which contributes to 75% of the management category score. Therefore studying SDWM approaches is important to see how to comply with this new orientation in Egypt. From a strategic perspective, the research aims at developing a detailed procedure to evaluate two approaches of CDWM by the means of Decision Matrix technique.

Research methodology

The current research has approached its objectives by following these steps:

- Conducting a theoretical study: By reviewing the literature of both developed and developing countries and defining the concept of life cycle cost analysis and explaining its role in decision making.
- Demonstrating the CDWM approaches: A detailed study for two approaches of CDWM is provided. First CDWM lifecycle flowcharts for each approach are developed and the cost components of its related activities are clearly identified. Second the cost breakdown structure for CDWM lifecycle is constructed. Then the roles of different stakeholders for each approach are identified. And finally the paper came out with a penetration discussion of the pros and cons of each approach.
- Assessment of the two approaches: It is conducted, from a strategic perspective, by extracting, weighting and scoring the influencing attributes from all the above and applying Decision Matrix technique to decide on one of the introduced approaches.

Literature review

CDWM in developing countries

Most developing countries do not have the technical and financial resources to manage solid wastes safely. This means that storage at the point of waste generation is often inadequate and collection services are inefficient and insufficient. Final disposal in those countries is usually a matter of transporting the collected wastes to the nearest available open space and then discharging them, (2002) [3]. Effective management of solid waste requires the cooperation of the general public. Lifting the priority of, and allocating more resources to, the

solid waste management sector need the support from decision makers. It is, therefore, important to ensure that public and decision makers' awareness activities are incorporated into the external support package. The aim of these activities is normally long term and it takes some momentum to build up before the effects are realized. But, once the interests of the public and decision makers in improving solid waste management are created, the sustainability of solid waste management projects will be significantly improved, Ogawa (1996) [4]. The Government of Egypt identifies solid waste management as one of the most important environmental issues. It is related to the social, economic and technical factors, which affect the quantity of waste generated and its management. However, due to many financial, managerial, technical and institutional reasons, this system has been unable to adequately address the problem of solid waste management and thus contributed to different environmental problems, Bushra (2000) [5].

CDWM in developed countries

The economical aspect of solid waste management is a debatable issue even in the developed countries. Developing countries have solid waste management problems different than those found in fully industrialized countries; indeed, the very composition of their waste is different than that of 'developed' nations, Mueller (2003) [6]. In California some studies addressed the economics of C&D waste management; unfortunately, the mainstream construction industry has been slow to view C&D waste management as a business opportunity. In fact, C&D waste management is often overlooked, even in large-scale construction projects. This oversight may occur because the decision-maker follows outdated conventional wisdom, which dictates that construction waste management is never cost-effective, Zerbock (2003) [7]. In US a study listed the factors related to generated quantities and composition of waste that should be considered by the solid waste and project managers before commencing with any form of a recycling operation to ensure that the recycling project is both financially and methodologically feasible, Dolan et al. (1999) [8].

Life cycle cost (LCC)

Life cycle cost (LCC) is the total discounted cost of owning, operating, maintaining, and disposing of a building or a building breakdown. The LCC equation is a function of the following three variables: the pertinent costs of ownership, the period of time over which these costs are incurred, and the discount rate that is applied to future costs to equate them with present day costs. Plenty of efforts have been made to discuss life cycle cost analysis of waste management. These include; Reich (2005) [9] Al-Salem and Lettieri (2009) [10], and Massarutto et al. (2001) [11]. In a recent research that developed a contractual relation guideline, two essential contract documents for applying sustainable practices in construction projects were included; a waste management plan and a cost estimate for construction waste management activities, Abdelhamid (2013) [12]. Waste management plan and cost estimate are not only necessary but also related to each other where cost estimate is a prerequisite to waste management plan implementation. To implement a sustainable CDWM approach, first identify its lifecycle; it starts by waste generation in C&D site, passes

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