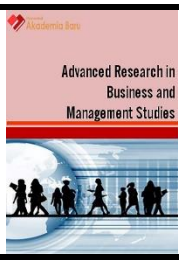
Penerbit Akademia Baru

Journal of Advanced Research in Business and Management Studies

Journal homepage: www.akademiabaru.com/arbms.html
ISSN: 2462-1935



Implementation of Eco-Costs per Value Ratio (EVR) in Construction Industry to reduce Construction Waste Disposal cost in Shah Alam, Malaysia towards Sustainable Development

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ARTICLE INFO

Article history:
Received 11 January 2019
Received in revised form 14 March 2019
Accepted 2 August 2019
Available online 7 August 2019

Keywords:
Sustainable Development, Eco-costing, Construction Waste

ABSTRACT

Construction industry identified as combination of raw material and manufactured material used development. Due to rapid development in Malaysia, huge amount of material required for construction industry, which indirectly caused construction waste production increased. Eco-costing is a process to monitor and reduce the construction waste throughout the contract period. This study evaluates the method to identify the EVR index between projects. The findings useful for evaluating the EVR index for residential projects in selected project sites within year 2013-2017.

1. Introduction

There have been increasing construction wastes attributable from insufficient waste management practices in the construction projects since the last two decades [1]. Apart from being a waste contributor, construction waste also contributes to serious environmental issues in Malaysia. As a developing country, construction is one of the most active industries in Malaysia. Foreign and local investment in the construction industry has spurred employment opportunities and contributed to the nation economy

Although this industry brings many advantages to the country such as creating more job opportunities and brings a healthy economic growth, but there are some issues that need attention from the public as well. Due to these activities, a large amount of construction waste was being produced by this industry. This waste produced from the construction and demolition (C&D) has been a serious issue related to environmental in many large cities in the world. The construction material waste mainly consist of concrete materials, aggregates, soil and sand, wooden materials, bricks and blocks, metal products, roofing materials, plastics, and others [2]. In general all construction activities

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that produce cost whether direct or indirect, but do not add value or progress to product can be called waste [3].

2. Analysis

Figure 1 above shown the analysis for calculation between trades to obtain the EVR index. Total of 10 calculation criteria has been justified from this analysis. The analysis has been made through spreadsheet on construction waste disposal process and eco-costing per value index between sample selected sites as table 1 below.

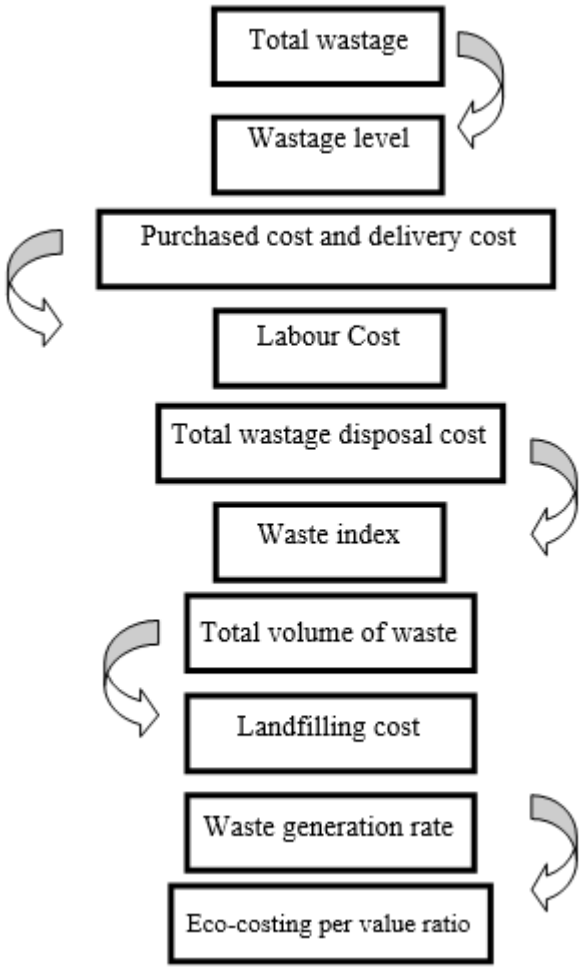

Fig. 1. Shows the analysis breakdown calculation between trades

Table 1 below shows the EVR index between selected projects in Shah Alam. The eco-cost per value ratio (EVR) is justified as 0.0054 for above project D, which was categorised as lowest EVR among selected project sites.

Table 1
Eco-costing per Value Ratio (EVR) between selected projects

Project	A	B	C	D	E
Type of building	Low-rise residential 72 units (Double Storey)	Low-rise residential 127 units (Double Storey)	Low-rise residential 108 units (Double Storey)	Low-rise residential 48 units (Triple Storey)	Low-rise residential 80 units (Double Storey)
Construction Method	Semi IBS (drywall for partition),shear wall for party wall and conventional method for rest	Semi IBS (drywall for partition),shear wall for party wall and conventional method for rest	Semi IBS (drywall for partition),shear wall for party wall and conventional method for rest	Semi IBS(,shear wall for party wall) and conventional method for rest	Semi IBS (drywall for partition),shear wall for party wall and conventional method for rest
Total Construction Period	December 2016-March 2018 (15 months)	October 2016-January 2018 (15 months)	October 2016-January 2018 (15 months)	December 2016-April 2018 (17 months) (on-going)	November 2016-February 2018 (15 months)
GFA (m2)	136,800	208,280	189,000	163,200	133,600
Contract Sum (RM)	14,217,543.46	24,152,992.65	19,103,112.53	18,864,702.25	12,601,026.77
EVR = Eco Costs (RM) /Total project cost (RM)EVR (x10-2)	**6.3344**	**8.1211**	**7.5162**	**5.4058**	**12.25**

4. Results and Discussion

As per the figure 2, EVR ratio for project D was identified as lower than other projects. This is because the total wastage and disposal cost compare with total project cost is makes the project D with lower EVR ratio. The wastage EVR benchmark for Malaysian construction industry shall lies at around 0.0024 – 0.0028 for typical multi-storey projects applying conventional and/or partial semi-IBS, and shall be considerably less, by up to 0.0014 for projects utilizing full IBS system or projects with exceptionally good waste management awareness and practice[4]. Based on the analysis, the projects selected not fall within the range of benchmarking.

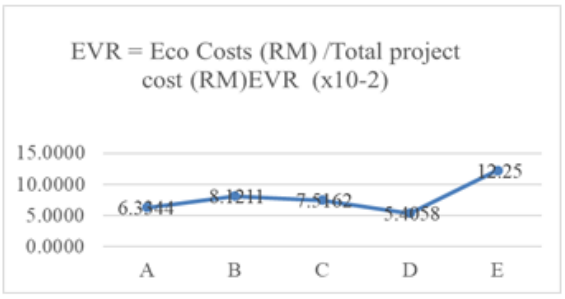

Fig. 2. Eco-costing between projects

5. Conclusion

Eco-costs considered in this study include, the purchased cost and delivery cost, labour cost, wastage disposal cost and landfill cost. Besides cost waste generation rate (WGR), waste index (WI) and waste level (WL) identified in this analysis. Major data extracted include Gross Floor Area (GFA), material order quantities and material work done quantities from Bills of Quantity (BQ), construction debris disposal trip record, purchase and delivery costs, costs associated with waste generation and total project cost (contract sum). The detail of assessment on the waste disposal cost saving between conventional and sustainable building material projects by using EVR method will be discussed in detail in the near future work. The assessment will provides a different dimension of handling construction waste that leads to sustainable construction waste management.

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