

VISUAL QUALITY OF ON-SITE DOMESTIC WASTES STORAGE BINS AS TO ENHANCE GOOD URBAN IMAGE OF KUCHING CITY

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1.0 Introduction

The functional elements of solid waste management from the point of generation to the final disposal are categorized into six: (1) waste generation; (2) waste handling and separation, storage, and processing at source; (3) collection, (4) separation and processing and transformation of solid wastes; (5) transfer and transport; and (6) disposal (Tchobanoglous, Theisen et al. 1993). For the purpose of this study, the researcher would focus mainly on the second element, particularly on the visual quality of the on-site storage of wastes.

On-site storage of waste can be convenient to the waste generators, especially to those who generate large amount of wastes every day. The on-site storage of wastes has also arise concern regarding public health and aesthetics considerations. The use of unsightly makeshift containers or open ground storage causes visual pollution (Tchobanoglous, Theisen et al. 1993) which will impair the image of a city.

Human, as one of the components of the biodiversity, understand their environment through what they see. The perception of and preference for the visual environment are part of what makes and environment psychologically comfortable (Xu 1995). Environments that are considered to have high aesthetic value can significantly increase the general well-being of individuals who are in contact with the environment (Galindo and Rodriguez 2000; Tweed and Sutherland 2007).

Visual pollution is an aesthetic issue, referring to the impacts of pollution that damage our ability to enjoy a view which includes visibility and limits on the ability to view distant objects. Visual pollution is also used broadly to cover more subjective issues such as visual clutter, structures that encroach otherwise appealing scenes, as well as graffiti and other visual destruction (www.pollutionissues.com).

There has been extensive research conducted to improve the understanding of aesthetic qualities of the environment (Coeterier 1996; Priestley and Evans 1996; Arriaza, Cañas-Ortega et al. 2004; Wong and Domroes 2005; Bulut and Yilmaz 2008) which more often than not examined the visual preferences for the natural landscape. On the other hand, research on resident's visual preferences and concerns for solid waste management facilities is still limited. For a more effective solid waste management practice, it is essential to understand how people perceive the visual quality of on-site storage facilities of wastes.

2.0 Research Goal and Objectives

The ultimate goal of this study is to understand the perceived visual aesthetic quality of on-site storage facilities of wastes at collection points within Kuching City.

To achieve this goal, there are certain objectives to be accomplished, which are

- i. to study the design and types of bins used by the public for on-site storage of domestic wastes;
- ii. to investigate the problems of solid waste management systems as perceived by the public;
- iii. to compare the perceived visual quality and its among different groups of residents, specifically:
 - a. Between urban and suburban groups.
 - b. Between residents of different education attainment; and
- iv. to determine the variables known to influence the perception of visual quality of on-site waste receptacles, the level of each contributive variable, the relationship between the perceived visual quality and these contributive variables, and the dominant predictor variables that influence the perception of the visual quality.

3.0 Research Methodology

Study Area

Kuching city, located in East of Malaysia, is the fourth largest city of Malaysia. The city of Kuching lies within the [district](#) of Kuching which covers an area of 1,863 square kilometres (719 sq mi). The district of Kuching is administered by three [local governments](#), namely Kuching North City Hall (DBKU), Kuching South City Council (MBKS) and Padawan Municipal Council (MPP).

The solid waste management in Kuching city is taken care of by Trienekens (Sarawak) Sdn. Bhd., the operating company appointed by Sarawak Waste Management Sdn. Berhad. Since 1999, the company has been providing uniform mobile garbage bins to residents and commercial areas. This step is one of their strategies of implementing integrated solid waste management and to provide satisfactory services to city dwellers.

Photographic Survey

The first step of the research is photographic survey of the type of wastes bins in Kuching city. Photographs of bins at different type of residential areas, commercial areas and parks were taken to identify the type of bins available for users. The photographs are then being categorized according to the type of bins.

The selected photographs were used for the visual appraisal section of the questionnaire. The breakdown of this section was based on (a) descriptive scales, measuring the physical attributes of the selected scenes; (b) affective scales, mainly to measure the reactions or mood of the respondents when exposed to the scenes; and (c) appraisal scales, indicating the aesthetic value and quality of the scenes (after Galindo and Rodriguez 2000).

Data sampling

The total number of household in the three councils in Kuching is approximately 85,000 with a total number of approximately 560,000 inhabitants. Having considered Yamane's (1967; Yamane 1983) sampling method, a total of 400 respondents is required for this study. According to Yamane (1983), the sample size gives a 95% confidence

level (or a standard error of 5%). Therefore, if the result of the study has a probability $p < 0.5$, the relationship or differences can be said to be significant.

The sampling procedure for this study was clustered random sampling whereby the participants were from areas under the jurisdiction of DBKU, MBKS and MPP. A list of municipal waste collection areas were obtained from the local authorities. Each area consisted of several residential areas and each area was assigned codes. The codes were listed in Microsoft Excel and 5 areas were randomly selected from the lists giving a total of 15 areas.

Data Analysis

Statistical analyses were conducted using statistical software, SPSS Version 17. For the preliminary analysis, descriptive statistics were used to analyze the respondents' demographic profile. Correlation and regression analysis will be applied to explain the degree of relationship between the dependent and independent variables. Correlation analysis will be used first to avoid the case of multicollinearity which will later affect the inferences of the regression analysis results. Besides that, t-Test and ANOVA will be applied to assess the differences in means of groups.

4.0 Preliminary Results and Discussion

At this moment, only the first and second objectives have been achieved. Therefore in this section, only results and discussions for the first two objectives will be included.

Design and types of bins used as on-site waste receptacles

The management of solid waste in Kuching, the capital city of Sarawak, is taken care of by Trienekens (Sarawak) Sdn. Bhd. Trienekens is the operating company appointed by Sarawak Waste Management Sdn. Bhd. Trienekens and was awarded a 25 years concessionaire for the collection and treatment of solid waste within the jurisdiction of the three local councils of Kuching (Tang, Soon et al. 2003).

Since the official operation in June 2000, the company has been providing uniform mobile garbage bins (MGB) of standard sizes to residents and commercial areas. The residents in Kuching are provided with 120-litres MGBs whereas shop-houses and flats were provided with 240-litres MGBs or 660-litres MGBs. Table 1 summarizes the dimension, capacity and other specifications of the MGBs. The company also provides 1100-litres and $10m^3$ Roll-on-roll-off (RoRo) containers to markets, industrial areas and shopping centers. Other than that, Trienekens is responsible for educating the residents the right way of taking care of the MGB. To date, this system has improved the solid waste collection system especially in residential areas.

Table 1 Types and designs of Mobile Garbage Bins

Capacity (Liter)	Dimension (mm)	Other specifications
120	475 x 480 x 885	<ul style="list-style-type: none"> • Two / four wheeled
240	660 x 587 x 1000	<ul style="list-style-type: none"> • Compatible with the automatic lifter of collection truck
660	1360 x 770 x 1180	<ul style="list-style-type: none"> • High density polyethylene (HDPE)resin

Public's perceptions of the problems of solid waste management systems**(i) Demographic profile**

The proportion of male and female in the sample is 51.6% females and 48.4% males. The sample groups were represented by the major ethnic group in Malaysia, Malay (26.0%), Chinese (48.9%), Indian (1.5%), Iban (11.4), Bidayuh (9.0%), Melanau (1.4%) and other minor ethnics (1.2%). 65.5% of the respondents are between 20 to 39 years old. 25.1% of the respondents received upper secondary education, 20.2% received certificate or diploma while 30.9% are university graduates.

(ii) Problems of SWM in residential areas

The second objective of the study is to investigate the problems of solid waste management (SWM) systems as perceived by the public. Respondents were asked to rate the seriousness of the problems at their residential areas based on a scale of 5. The problems were identified based on previous interviews with the public health officers of all three local councils. Generally the respondents rate the SWM problems in the residential areas as moderately serious (Table 1). Since the privatization of the SWM, the concessionaire implemented an integrated system to provide a more efficient and effective service to the public. The introduction of the mobile garbage bins MGB usage has improved the collection system as well as the aesthetics problems (Ng, 2009). The MGB is designed to be compatible with the automatic bin lifter of the collection truck. This ensures time-efficient collection and proper handling of the MGBs which reduces damage of bins during collection. At terraced housing area, SWM problems are minimal. On the other hand, for communal bins such as 660L MGB and RoRo containers, problems such as overflowing waste, indiscriminate waste disposal, foul odor, leachate and scavenging have been an unsolved problems for the local authorities (Ng 2009).

Table 2 Problems of SWM at residential areas

Item	Problems of SWM	*Seriousness (%)				
		1	2	3	4	5
1	Overflowing wastes at waste containers	14.1	15.6	33.6	21.7	15.1
2	Vandalism of waste containers	21.4	25.3	30.7	12.7	10.0
3	Littering around waste containers	12.4	19.5	26.3	26.8	15.1
4	Inappropriate location of containers	21.7	26.5	31.6	14.4	5.8

5	Foul odour	14.4	18.0	31.6	19.2	16.8
6	Visual blight at dumping sites	17.0	17.5	29.9	21.9	13.6
7	Misuse of on-site disposal facilities	23.1	32.1	23.8	13.6	7.3
8	Failure of on time collection	14.6	25.5	29.7	19.7	10.5
9	Residents are not concern about the cleanliness of on-site waste containers	12.2	17.3	34.8	21.9	13.9
10	Lack of enforcement and monitoring by authorities	7.8	17.0	37.2	22.1	15.8

***Scale for seriousness of the problems:**

1 Not serious – 3 Moderate – 5 Very serious

There are several factors to be considered in on-site storage of wastes such as the types of containers used and the container locations. Improper management of waste containers could cause public health and aesthetic issues. Aesthetics issues are related to the production of odours and unsightly conditions when care is not given to the cleanliness of the waste containers and its surroundings (Tchobanoglou, Theisen et al. 1993). In this study, more than 60% of the respondents disagree that problems such as damaged bins, exposed waste containers (without lids), usage of non-standardized waste containers and unsuitable location of waste containers cause visual pollution (Table 2). However, 52.8% respondents do think that overflowing wastes at waste containers cause unpleasant sight.

Table 3 Problems of SWM that cause visual pollution

Item	Problems of SWM	Agree (%)	Disagree (%)
1	Damaged waste containers	37.7	62.3
2	Exposed waste containers (without lids)	37.0	63.0
3	Usage of non-standardized waste containers	16.1	83.9
4	Overflowing wastes at waste containers	52.8	47.2
5	Improper location of waste containers	14.8	85.2

Significance of Findings

The visual quality and the understanding of the waste generators' perceptions of SWM problems have significant impacts on the SWM in a municipality. By understanding these, the government could plan for a sustainable municipal solid waste management and receive cooperation from the public. Further analyses are to be conducted to establish and verify the findings of these preliminary results.

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