

Waste Management and Society: A Case Study of Public Participation In Waste Management Kota Kinabalu City

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ABSTRACT: The increase in world population will cause impact on solid waste. This impact is mostly felt by local authorities. Therefore, cooperation with other stakeholders is essential to ensure that municipal solid waste plan works perfectly. Among the most important element is the involvement of public society. This study aimed to introduce waste recycling in the city. In this study, questionnaire was used to achieve the objectives stated. The study found that residents in the study area are not satisfied on the services provided by the municipal. Furthermore, people in the study area 'refuse' to engage actively in the recycling activities. This is because they are not motivated and did not realize the benefits to the environment. Thus, the provision of adequate infrastructure is essential. It can help people to change lifestyles to a more environmentally friendly. Municipal level planning should emphasize methods to increase motivation to carry on recycling.

Keywords: Waste management, public participation, Sabah

Introduction

The increase in the world population and industrialisation of more cities mean that managing the waste produced by city inhabitants is a complex issue due not only to the increasing volume of waste through high material consumption but also to the changing characteristics of waste and uncertainty regarding uncontrolled dumping and overflowing landfills. This is especially significant for many cities in the developing world, where populations and economies are rapidly expanding but the infrastructure necessary to manage the ensuing problems remains inadequate.

Over the last century, the world has seen a considerable increase in amounts of waste discharged into the environment. The high generation of solid waste has been identified as a factor contributing to the world environmental problems, and the decrease in suitable landfill sites and scarcity of natural resources is creating greater demand for remanufacturing and reuse. Waste creates environmental consequences such as

surface and groundwater contamination by leachate; contamination of the soil by direct waste contact or leachate and of the air when burnt; the spread of diseases by vectors such as birds, insects and rodents; and the uncontrolled release of methane from anaerobic waste decomposition (Ebreo *et al.*, 2002; Mosler *et al.*, 2006; Vidanaarachchi *et al.*, 2006).

At present, annual production of solid waste is estimated to be about 1.6 billion metric tonnes, with a large proportion coming from many developing countries (Ahmed and Ali, 2006). Urban areas in Asia alone produced approximately 760,000 tonnes of municipal solid waste per day in 1998, predicted to rise to 1.8 million tonnes per day in 2025, while waste management costs in this region will almost double from US\$ 25 billion (1998) to US\$ 47 billion by 2025. This becomes more problematic when the amount of waste produce is affected by an urban lifestyle high in consumption, particularly of packaged consumer goods. To this end, most developing countries spend 20–40% of their revenue employing 3–6 workers per 1000 members of the population on solid waste management (Wilson *et al.*, 2006, Alam *et al.*, 2007).

The introduction of sustainable waste management for today must therefore ensure that waste is managed in such a way that will reduce both the amount and the hazards it presents, and that it is used as a resource wherever possible. The different waste treatment methods suggested in the waste hierarchy have different benefits and drawbacks that are mostly associated with environmental

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considerations. Choosing the best method to manage the waste we produce depends on several interdependent factors including community acceptance, the informal sector, the formal waste collector's initiative and the local authorities to achieve sustainability in waste management. Achieving a high rate of recovered materials in an environmentally sound manner requires high levels of investment, expenditure and public participation.

Public Participation – Some important Issues

The public form the largest category of stakeholders in waste management systems and have a multi-faceted relationship with waste management activities: as waste generators, waste service clients, receivers of information and participants in waste management and urban sanitation (Ball and Tavitian, 1992, Joseph, 2006). To support the public in performing its role, it is important to recognise that within a neighbourhood community, households may belong to a variety of social or religious groups and so may vary in their cultural and religious beliefs and practices, main occupations, income and expenditure patterns, access to community and infrastructure services, gender and age. To discover the impact of these factors, many researches have tried to relate individual recycling behaviour to demographic variables; attitudes and understanding of recycling, and the influence of education and publicity materials (De Young, 1990, Coggins, 1994, Ebreo *et al.*, 1999). The involvement of the public in waste management depends on initiatives from the local authority (Al-Bakri *et al.*, 1988, Al-Yaqout and Hamoda, 2002) such as provision of basic facilities that possibly attract the public to participate in the local program through waste segregation (De Young, 1990).

Studies found that the cost of waste management is reduced if the community participates by segregating its waste (Agarwal *et al.*, 2005, Rathia, 2006). The substantial reduction in cost with community participation is achieved due to separation of waste at source, which in turn leads to a reduction in the requirement for community bins and transportation of waste (Gupta *et al.*, 1998, Agarwal *et al.*, 2005, Rathia, 2006). However, many local authorities do not recognise the importance of the public in their waste management systems (Awortwi, 2004; Barnes, 1999; Beecher and Goldstein, 2005).

Public cooperation is influenced by the perceived logistics (location of the recycling centre) and convenience of the system. Previous research shows that logistics and convenience have a direct influence on the level of participation (Boldero, 1995, Berger, 1997, Martin *et al.*, 2006). Factors

such as time and effort may also play some part in the initiation to participate in recycle but can reinforce the public's persistence in recycling (Garces *et al.*, 2002). Personal difficulties with space, time availability and distance to and from the containers have a negative effect on recycling performance which shows up in the total recovery rate (Margai, 1997, Seik, 1997, Martin *et al.*, 2006). Study shows that the public will not participate if there is no facility (recycling bank) close to their home or if they are not provided with recycling boxes (Perry *et al.*, 2007). The convenience factor also significantly influences the amount and the variety of materials set aside for recycling (Domina and Koch, 2002).

Geographical location also plays an important role in determining the volume of waste generated per capita and recycling rates, which may vary widely among locations in different municipalities. Differences in regional characteristics such as residential composition, the living and natural environment, types of industries, municipal policies regarding waste disposal and community activities are considered the causes of these variations (Alexander, 1993). The volume of solid waste generated per capita in rural municipalities, which have larger residences, is lower due to the tendency of the residents to store items regarded as waste by city dwellers rather than disposing of them. In contrast, the volume of solid waste generated per capita in urban municipalities is much higher with the high concentration of stores and restaurants in this area (Matsuto and Ham, 1990). Similarly Upadhyaya and Shukla (1987) found that municipality in India shows per capita production in urban areas is greater than in rural areas, at about 350g/day and about 200g/day respectively.

Waste Management in The Study Area

Solid waste management in the study area is under the administration of Kota Kinabalu City Hall (KKCH). There are three departments in KKCH responsible for dealing with solid waste management, i.e. (i) the Urban Service Section, responsible for cleaning the streets, beaches and lagoon and for waste collection, (ii) the Engineering Section, responsible for landfill operations in Kayu Madang, and (iii) the Enforcement Section, responsible for the enforcement of the Anti-litter bylaw. KKCH has passed two bylaws, namely the Kota Kinabalu Municipal Council (conservatory and hygiene) bylaw of 1984 and Kota Kinabalu Municipal Council (Anti-litter) bylaw of 1984. Waste generation in KK rises yearly. In December 2003, the total waste collected was 5755 tonnes, which increased to 6045 tonnes in January 2004 (DBKK, 2002).

It is estimated that in 2015 the amount of waste generated per resident will be 647,112 kg, a rise from 371,700 kg per year (2000) (Department of Statistics Malaysia, 2002) 2000). The SUDP study (2000) shows that 50% of residents' waste is recyclable (paper, plastic, bottle and metal); 40% is compostable (food waste and garden waste), and only 5% cannot be recycled or composted and should go to landfill (TABLE 1). The increasing amount of waste has caused problems for the

efficiency of collection. Only 77% of city residents were covered by municipal collection services; this is expected to rise to 94% in the year 2015 (SUDP, 2000). With the estimated waste generated at 6,401 tonnes a month in 2003, the total cost of solid waste management is estimated at RM123.00 per tonne, and most of the solid waste management operation is financed from general revenues such as property assessment rates (Chua 2003, Tunggol, 2003).

TABLE 1- Sources, quantities and type of waste disposal in study area

Source	Waste disposal tonnes/day	Type and quantity of recyclables (%)	
Housing	99.4	Paper	19.9
		Cardboard	1.8
		Metal	4.6
		Plastic	17.5
		Glass	3.0
Commercial and Institutional	116	Paper	19.1
		Cardboard	5.8
		Metal	4.3
		Plastic	16.0
		Glass	1.8
Industry	22.9	Paper	23.4
		Cardboard	4.1
		Metal	2.4
		Plastic	25.3
		Glass	2.4
Total	238.3		

Source: Modified from SUDP, 2000

Research objectives

The objectives of this study are to:

1. Determine public perceptions on waste management in the city
2. Identify the barriers in effort to introduce waste recycling in the city

Methodology

In this study, questionnaire was employed to gather public attitudes to waste management and recycling in the Kota Kinabalu area as it is the suitable approach to collect data from a large population. In a survey, a questionnaire is administered to a selected sample of a specific population. Information can be collected from individuals, households, or larger social institutions.

The public survey was carried out in three main areas: KK (Kota Kinabalu), Menggatal and Telipok. These areas were selected because they form the main part of KK city and are included in the national recycling program. The questionnaire for this study was administered face to face via a brief interview which usually lasted 20–30 minutes. The response was very high (89%). The majority of the questions in the questionnaire were ‘multiple

choice’. It was decided that open-ended questions be kept to a minimum, due to the time required to analyse the results and the amount of time required by respondents to answer this type of question.

This study used the total population of Kota Kinabalu (the study area), (355,435 people) as the sampling frame (DOS 2001). To obtain the sample, the population was divided into strata according to location (three major town areas – Kota Kinabalu city centre, Menggatal town centre and Telipok town centre). Upon completion of the survey, 738 questionnaires had been completed. The sample size was considered satisfactory for the purposes of presenting an overall public view on recycling issues in the study area, and fitted the time and cost constraints faced during the data collection process. Chi-square analysis was used.

Study Area

The area selected for this study is Kota Kinabalu, the capital city of Sabah. The study area covers an area of 351 km² and is divided into four types of land use, namely urban, suburban, rural, and marine (coastline and small islands). The KKCH administration area comprises four state legislative areas; Inanam, Likas, Api-Api, and Sembulan. In 2000 the total population was about 371,700

(DBKK 2002). Kota Kinabalu district recorded the highest population density of 598 persons per square kilometre in 1991 and was declared a city

with Kota Kinabalu Municipal being upgraded to Kota Kinabalu City Hall in 2000.



FIG. 1- Location of study area (Source: SUDP, 2000)

Results

Four questions were asked to determine public opinion towards waste management services in the study area. There is a clear difference between those who were satisfied with their waste management services and those who were not. Over two thirds (67%) of respondents were not satisfied (including very unsatisfied) with the level

of waste management services provided, while only 27% from the total sample stated that they were satisfied or very satisfied. In the city centre more respondents (28.6%) were satisfied than elsewhere (18.7%). The chi-square hypothesis that there is no relationship between location and satisfaction is therefore rejected ($X^2=10.07$, $df=1$, $p < 0.01$). This seems to represent the fact that respondents in the city centre were 0.572 less satisfied than

respondents from elsewhere.

To obtain information on respondent's understanding on recycling, five questions were asked. Even though the recycling program has been promoted since 2000, the level of understanding among the public is considered poor (Kuman 2003). 92% of respondents claimed knowledge of recycling, particularly those with a high level of education. The majority of respondents had a good understanding of the objective of recycling (80.6%), with a high number of respondents mentioning the environmental benefits; 52% of respondents stated that recycling will reduce environmental pollution and, 21.7% of the respondents stated that it will reduce the use of virgin material.

The results indicate that respondents in the study area possess a high level of resistance to the practice of reducing and reusing waste. The low response to the question on recycling intention behaviour is one example of the lack of willingness to practising recycling. In general, personal attitudes are the most frequent reasons quoted as barriers to waste segregation as seen in respondent's answer which indicate only 20% respondents currently claimed to separate their waste. When asked on willingness to practise reuse behaviour, only 19.4% of the respondents are willing to reuse recyclable materials. With regard to recycling behaviour, the result shows that the main reason given by respondents for not recycling was lack of motivation (58.7%), or that they do not consider separating their recyclable waste to be their job (18%).

The final part of the analysis was trying to identify the relationship between knowledge and behaviour. It clearly shows that respondents who know or think they know about recycling (677), 27.2% say they are willing to consider reducing their use of non-biodegradable materials, while 72.8% do not. Respondents who know about recycling are 2.47 times more likely to reduce their use of non-biodegradable materials than those who do not know about recycling ($X^2=5.75$, $df=1$, $p=0.01$).

Discussion

Sometimes there are situations in which the difficulty experienced by urban managers in planning and directing concrete projects in a cost effective way may overshadow the need for technical solutions to municipal solid waste management (MSWM) problems. In other cases, there is a tendency for MSWM decisions to be made without sufficient planning, to take into account only some aspects of a situation, to be based on a short-term view of the situation, or to be

influenced by the interests of political elites. Adequate MSWM is much more than a technological issue – always also involves institutional, social, legal, and financial aspects and involves coordinating and managing a large workforce and collaborating with many involved stakeholders as well as the general public.

The preparation and management of a good solid waste management system needs inputs from a range of disciplines, and careful consideration of local conditions. Municipal solid waste collection schemes of cities in the developing world generally serve only a limited part of the urban population. The people remaining without waste collection services are usually the low-income population living in peri-urban areas. One of the main reasons is the lack of financial resources to cope with the increasing amount of generated waste produced by the rapid growing cities. Often inadequate fees charged and insufficient funds from a central budget can not finance adequate levels of service. However not only financial problems affect the availability or sustainability of a waste collection service. Operational inefficiencies of SW services operated by municipalities can be due to inefficient institutional structures, inefficient organizational procedures, or deficient management capacity of the institutions involved as well as the use of inappropriate technologies. With regard to the technical system, often the "conventional" collection approach, as developed and used in the industrialized countries, is applied in developing countries.

The public survey result indicates that most of the public are still not satisfied with the level of waste management service in Kota Kinabalu. Most respondents mention that collection efficiency is the main reason for their lack of satisfaction with only resident in city area satisfied with the service. This might be related to the failure of a private contractor to deliver the service during the privatisation of waste collection in KK area. The level of recycling knowledge among KK residents is very high, particularly in those with tertiary education and students. This might be related to a fact that these groups have been exposed to this matter at school level. To this end, most respondents believed that the recycling program is a good initiative to protect the environment from pollution. Knowledge and understanding do not necessarily mean that they really know all elements of the program. In general, the actual knowledge of respondents in KK is very low.

Even though many respondents claimed to know about the recycling program from the television, they still could not give a positive answer to recycling questions. This study revealed that a high

percentage (5%) of respondents claim to not separate their waste, and very few are willing to change their behaviour, particularly to reducing their use of or reusing non-biodegradable material. Most respondents believe that this matter is the responsibility of the local authority, and due to this attitude many claim to have a problem separating their waste (38%) either at home or in the workplace. Lack of motivation is the main reason for this. This relates to a low understanding of the importance of the program and insufficient recycling facilities in the housing area, which hinders public participation and leads them to dispose of waste in the usual way.

Conclusion

The results obtained from the analysis identify several important areas for discussion. Providing relevant information will enhance respondents' knowledge and behavior. Respondents with a high level of education also have a good understanding of the benefits of recycling. Apart from the public attitude to the recycling program, contributions from other sectors are also important. Customer satisfaction is an important aspect in the administration of solid waste management in urban areas. Thus, the provision of adequate infrastructure is essential. It can help people to change lifestyles to more environment friendly. Municipal level planning should emphasize methods to increase motivation to carry on recycling.

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