

INTRODUCTION

1.1 Background Information

In tandem with our nation's goal of becoming a developed nation by the year 2020, while ensuring the emphasis on "Sustainable Development", Malaysia needs a complete and clear information regarding the trends in waste generation as well as benefits and effects of source reduction, recycling, composting, land-filling and combustion of MSW. Data on trends in urban-rural differences in attitudes, perceptions, recycling behavior as well as the householders' waste generating behaviors are necessary to design and plan for an effective waste management system in the near future.

Rapid urbanization process and increasing urban population in Malaysia have exacerbated the problem of increasing waste volume, particularly the municipal solid waste (MSW). At an average annual growth rate of 4.82 percent in urban population for the country since 1991 (Department of Statistics, 2002), the country is currently generating more than 15,000 tonnes of wastes per day (Anon, 2001(a)). The demand for urban infrastructure and services and the complex inter-relationship of various economic

and social factors which follow, have caused problems in terms of both financial burden faced by the government in managing the wastes as well the intangible effects of environmental degradation associated with it (i.e., foul odor, aesthetics, degrading property values and health, and environmental pollution) (Agamuthu, 1997; Fadil, 1996, and Mohd. Nassir, 1996). Annually, the Government of Malaysia has to spend an average of RM70 per tonne or RM 26 per person for the purpose of collection and disposal of its solid wastes, while the landfills in the nation are further decreasing in number (Juzhar, 2002).

Sixty-two (62) percent of the population in Malaysia are urban inhabitants (i.e., defined by Malaysian authorities as those places with 10,000 persons or more). The state of Johor belongs to the top four, most urbanized areas after Kuala Lumpur (100%), Selangor (88%), and Pulau Pinang (80%)(Department of Statistics, 2002). Sixty-five (65) percent of the population in Johor currently lives in urban areas. The state population has been growing at 2.6 percent since 1991 giving the total population of 2.7 million in the year 2002, with a population density of 144 persons per square kilometer. The rapid urbanization in the whole state makes the study on solid waste generation crucial and timely. In Johor Bahru District, i.e., the study area, the population stands at 1.065 million (Department of Statistics, 2002). With a total of 176,000 households, the areas generate 1.29 kg per capita per day (Juzhar, 2002). Experts believe a landfill can last 10 years longer if Malaysians recycled 50% of their garbage. The residents of Johor Bahru currently generate 1,300 tons of waste every day. It takes only 3 days to fill the entire length of the Johor Causeway with this amount of garbage (Ministry of Housing and Local Government, 2004). Thus, it is important to look at urban-rural differences in socio-economic background and life styles of residents and analyze how these factors affect the overall waste amounts.

The environmental effects and costs are indirectly related to waste quantities, which are dependent on consumption patterns and behavior of individuals (Park, 1998).

Even though mixed approaches employing more than one particular method have been called for in an integrated management system (White et al., 1995), basic data of waste composition and background information of the waste generators as well as existing management system are equally important. These factors, along with the perceptions of waste generators are prerequisites to developing any management policies as far as future suggestions are concerned (Park, 1998).

Most of these trends and problems originate at the source, namely waste generators. Therefore, an understanding of the public behaviors need to be addressed systematically through more rigorous efforts in future research in related fields to find ways to improve refuse management of a particular country. Studies such as this, along with other waste generation analysis are among a few areas requiring continuous emphasis if a sound management were to be reached.

1.2 Problem Statement

Solid waste management in emerging industrialized and developing countries is closely linked to the public for it is considered as an essential part of proper public health and environmental control. The focus on "fitness for purpose", the need to adapt by the differences between developed and developing countries such as socio-economic background (Azman, 1995; Mohd.Razman, 1994) have further the needs for more elaborate research on similar matters in developing countries. Another important issue in discussing the differences between the different economies includes the understanding of behavior and waste generation.

An understanding of public behavior is considered one of the most essential parts of an integrated waste management. Householders' behavior in waste management has a

critical effect on the overall environmental impact. Communicating with these vital players in the system is essential, for investing money and time in educating households about the effect their own actions in generating and handling waste can have on the environment would seem to be time and money well spent (White et al., 1995). In fact, future strategies for minimization of impacts and developments in urban solid waste management are likely to involve greater public participation, developments of legislation, codes of practice and guidelines, and only to a limited extent, improvements in technology (Anderson, 1999).

The collection and sorting of waste require an appropriate public awareness and participation. Public initiative is needed to generate the appropriate conditions, such as education and infrastructure, for the participation of the citizens in the recycling effort. The effort must be emphasized for the amounts of resources at stake are enormous. The recycling of resources has generated more than 600 million tonnes of secondary raw materials, of which 200 million tonnes were traded internationally (Bontoux et al., 1996). The public has to be informed of the economic benefit of recycling as well as their poor recycling efficiency. Malaysia has to import papers from outside even though the materials can be obtained if our papers were recycled (Juzhar, 2002).

The issue of increasing wastes has been importantly linked to the most crucial aspect of health. Due to the strong link between waste management and health issues, directly and indirectly related to the environmental effects solid waste has on our lives, developing countries are further challenged in finding the best economical and efficient way of resolving the problem. It not only involves a multiplicity of elements ranging from financing, collection and transportation, educational programs, but also of institutional matters. In fact, these factors have been recognized as important prerequisites for an effective Municipal Solid Waste Management (MSWM) in a given country, particularly countries in South-Asia (Bontoux et al., 1996).

In order to achieve an effective integrated waste management in the country several issues have to be tackled. According to the International Environmental Technology Centre (IETC), “.... the greatest impediment to improving planning in MSWM in South-Asia is lack of knowledge: of waste quantities, and characteristics and factors that affect their variations; of generators’ attitudes, behaviors and needs, of how much different operations actually cost; of staff performance; and of sound practices, elsewhere the main handicap is lack of knowledge of the appropriate ways to gather the data that would assist good planning.” (Bontoux et al., 1996, p. 211). Therefore, more research works must be done locally to provide a better understanding of the issues mentioned, particularly waste minimization and recycling.

Recycling is considered a part of an integrated waste management solution. It reduces the amount of waste that needs to be buried in a landfill or incinerated. The reduction in volume not only reduces the disposal costs, but also adds to useful life expectancy of a landfill. According to IETC, next to the role of industry and public authorities, environmental awareness and consumer participation are crucial for the success of recycling operations (Bontoux et al., 1996). However, the efficiency of a recycling program is dependent upon several requirements including the adequate data on contents of wastes, the understanding of recycling activities carried out in both rural and urban areas, as well as the attitudes of residents about recycling, most of which are still lacking in the country. Another issue, which also needs to be analyzed, includes the knowledge of recycling options might best meet the residents’ needs.

In general, the MSW is related to income and socio-economic status, in that as an economy grows, society produces and consumes more on a per person basis. This results in larger amounts of MSW. The attitudes and behavior of the public also play a role in affecting the amounts. The level of recycling behavior determines the amount of waste that finally goes to the landfill sites. Only through public opinion survey or behavioral studies could these issues be analyzed. The planning and designing of future systems may

be made easier if a clear understanding of the public expectations and perceptions of political and institutional practices is achieved as well as the pattern of waste generation and its components analyzed.

Studies involving waste generation and its link with economic indicators, management and environmental policies, and its relationship with behavior and perceptions have been conducted in many countries. Many have indicated the direct linkage between income and economic growth (Li, 2003; Metin, 2003; McCollough, 2001; Agamuthu, 2001; Nemat, 1994; Mohd. Nazri, 1994; Wan Rahim, 1992; Richardson and Havlicek, 1978; Wertz, 1976; Kemper and Quigley, 1976, and Grossman et al., 1970), and biospheric and altruistic values (Davio, 2001; Schwartz, 1994), locational and age factors (Park, 1998), ownership status, educational, socio-economic and environmental awareness levels (Metin, 2003; Irra, 1999; Uche, 1998, Kinnaman and Fullerton, 1997; Ahmad Termizi and Fadhil (1992) as well as lifestyles (Sabarinah, 1998; Saltzman and William, 1993) with the amounts of municipal solid waste. However, little attention was given on recycling and home cooking or dining activities of residents on the amounts of household wastes. The study will look at these areas while testing the applicability of the previous underlying theories described by the researchers on the study area.

Studies, particularly on the public perceptions and behavior in regards to environmentally relevant political behavior and management system and waste data are lacking in this country. It is timely that information be made available to ease managers to make better decisions as to which alternatives to be used in a particular situation with specific waste composition at a particular location and time. There will be a time when the conventional and most commonly used method of landfill may no longer be a cheap and affordable management approach in this country. This is due to the ever-increasing maintenance and operating costs along with costs of land and other intangibles associated with the negative environmental effects resulted (Read, 1997; Serji, 1997, Agamuthu,

2001). Such a phenomenon may require waste managers to sort to waste reduction as the most viable approach in the future. Such studies and researches on waste composition are highly beneficial, for the data gathered can be of very much use to decision makers in the future. Thus, this study (which looks at the household waste generation among various communities of various economic backgrounds, particularly on both urban and rural or village communities) can help provide invaluable data on the trends currently occurring within the study area.

1.3 The Objectives of Study

Wastes are defined as materials considered as unwanted goods or seen as materials for which there are no further use (Peavy et al., 1986; Anderson, 1999), while environmental behavior as activities which are associated with waste minimization practices including reuse, reduce or recycle of wastes before being discarded. Waste generation, on the other hand, involves activities resulting in materials being discarded or thrown away. The study emphasizes mainly on household wastes (i.e., wastes generated in the preparation and consumption of foods, which include garbage, fuel residues like ash, house sweepings, household discards such as paper, glass, plastic or metal containers, garden wastes, and animal dung (Agamuthu, 2001)) generated from both rural and urban communities within Johor Bahru and its vicinity areas. Garden wastes and animal dung are omitted in the study.

Among the issues discussed in this study include the role of education, family income, marital status, family size, recycling activities, and lifestyles (in terms of eating and cooking habits) in affecting the amount of wastes generated as well as the geographical factors (rural-urban locations) in determining the variations in the MSW

being produced. Homeownership factor is another criteria analyzed to see if it has any influence on the practice of waste minimization amongst both urban and rural residents.

The management of solid wastes should be integrated and not only emphasizes on urban areas, but also the need for improvements in rural areas. The objectives of the study include:

1. To study the perceptions and attitudes on the environment, in general, and recycling activities, in particular, of both the urban and rural households living in Johor Bahru and its vicinity areas.
2. To analyze how explanatory variables such as income, age, education, marital status, family size, housing characteristics, cooking and eating habits as well as recycling activities affect the households' waste generation.
3. To analyze the variations in terms of waste composition generated and materials recycled by the residents of various socio-economic backgrounds.

The study is to investigate differences in both urban and rural residents and their perceptions toward environmental and waste management policies and recycling practices currently employed. It also analyzes the variations in terms of the compositions of household wastes generated, and how income and other demographics, recycling behavior, as well as daily dining and home-cooking activities of these two sample groups affect the waste amount. Focus is emphasized on various housing settlements from urban and rural areas and socio-economic backgrounds of residents who stayed in the study areas. The research looks at the area as a whole without referring to specific sites. The whole sample is categorized into either urban or rural.

Among factors or explanatory variables examined in the study include respondents' demographics or 'personal factors', i.e., particularly age, race, marital status, educational achievement, family size, economic indicator such as family income, participation in pre-cycling behavior (or 'source-reduction' or waste minimization practices), and lifestyle (i.e., measured by home-cooking and dining activities). Other factors also include environmental views on the need to recycle and the benefit of recycling among the respondents.

The whole process of the study begins with the analysis of previous studies on the similar issues, definition of the terms and variables used, the collection of secondary data of the study area, and finally, the actual primary data collection and analysis stages. The underlying theories developed by the previous researchers are later used to develop hypotheses and will be tested in the study.

1.4 Scope of Study

The study area covers both urban and rural areas within the southern region of Peninsular Malaysia. It involves established communities within Majlis Perbandaran Johor Bahru Tengah (MPJBT) as well as less developed villages or 'kampung' in the surrounding areas. While the established communities are located within the service area administered by the Southern Waste Management (SWM) Pvt.Ltd., a private company responsible for the management of solid wastes, under the national privatization project, as well as various corresponding local and municipal councils, the less developed villages or 'kampung' lack a properly managed waste collection services. Some of the villagers either have to treat their own wastes by burning or dig special holes into which they throw

their wastes, or bring their wastes to drop off centers at the nearby roads serviced by waste contractors.

“Urban”, as defined by the Population and Housing Census, include areas which are developed, with a population of 10,000 or more and involved in non-agricultural activities (Department of Statistics, 2002), with houses complete with modern toilet facilities. Therefore, the study areas are selected from communities with large population size and are defined as those communities which are well established with adequate waste collection services provided by local councils or waste contractors appointed by the Southern Waste Management (SWM). Residents of the study areas come from various socio-economic backgrounds and live in planned, mixed residential developments. The rural areas are selected based on the socio-economic and employment characteristics of the households living in the communities. The residents in the rural areas are working in agricultural sectors and stay in houses, which are often scattered and have inadequate or no waste collection services.

A sample of 500 is taken from urban communities and 385 from rural areas, giving it a 95 percent confidence level (i.e., a precision level of between 4-5 percent). This is based on the total population of more than 100,000 for the selected urban communities and 6,646 for the rural villages (The actual appropriate sample sizes for both areas, according to the Table, are 400 and 378, respectively - refer to Appendix A; Yamane, 1983). The communities in the urban areas have a total population of include Taman (Tmn.) Permas Jaya, Tmn. Perling, Tmn. Sri Skudai, Tmn.Sri Pulai, Tmn. Mutiara Rini, Tmn. Universiti. They are selected based on the fact that they are among the fastest growing housing areas in the Majlis Perbandaran Johor Bahru Tengah (MPJBT). Most of these developments have been growing at an average of 5-10 percent per year (Southern Waste Management, 1998). The urban communities are selected based on the well-planned development of terrace, semi-detached, bungalow units or flats, which are provided with proper house-to-house or communal collection facilities.

Rural areas, on the other hand, are villages containing traditional *kampung* houses or squatters, rather than well-planned, mixed developments with terraced housing units, flats and bungalows. Majority of the residents in rural areas selected belong to lower income category, i.e., with a monthly family income of RM 1,000 or less), and have lower level of academic qualifications (i.e., primary or high school education), and are employed mainly in agricultural or fishery sectors (Department of Statistics, 2002). Most of these areas lack the adequate cleaning and waste collection services, which the other urban communities have.

The villages selected include Kampung (Kg) Sungai Danga, Kg. Pasir, Kg. Sungai Melayu, Kg. Pertanian, Kg. Jaya Sepakat, Kg. Sri Gunung Pulai, and Kg. Baru Ulu Choh. These areas are chosen based on their housing characteristics and demographic background, such as the socio-economic status of its population and the ways solid wastes are managed (i.e., the use of rural drop off centers and burning, or dumping of wastes in holes). Majority of the homeowners involve in agricultural activities (Maklumat Kampung, 2002).

The study begins with the analysis of the problem situation by looking into previous researches and theoretical developments of the scopes understudied. The background of the study area is also analyzed. The second half of the study period involves the actual survey and data collection from both urban and rural areas, followed by the data tabulation and analysis before making the final conclusion based on results obtained (Refer to Figure 1 for the work flow of the study). The statistics used include descriptive and inferential statistical methods such as mean, percentage, standard deviation, correlation coefficient (R) in multiple and linear regression analyses as well as other tests of significance (t -tests, p values, and standardized correlation coefficients (beta values)).

1.5 Hypothesis Formulation

Proposition and hypothesis are two essential terms often used in any research. While the former is defined as a statement of concepts which may be judged as true or false if it refers to observable phenomena, the latter is when it is formulated for an empirical testing (Babbie, 1986). Research hypotheses are used to predict based on theories of how one attribute has an effect on another and explains the difference between populations predicted by a theory. Several of the factors identified in previous research will be tested in this research.

In this study, the hypotheses included are:

- 1- Residents in urban areas participate in recycling more in comparison to their rural counterparts.
- 2- Recyclers are mostly married, homeowners, have a higher family income, and live in big families.
- 3- Younger and female respondents tend to recycle more.
- 4- Recycling is influenced by educational or academic qualifications and the concern for the needs to recycle.
- 5- High-income families, homeowners, and those who live in a big family generate more wastes.
- 6- Waste generation is influenced by residents' marital status, recycling, home-cooking and dining-out activities.
- 7- Rural areas generate higher amounts of food and organic wastes.

Normality test of distribution is tested using P-P plot method using SPSS software, while the reliability test uses Cronbach's Alpha. Hypothesis testing in the study is conducted using several methods. Firstly, indications of the significant level, such as " $p < 0.05$ " or " $p < 0.01$ " are used to indicate the probability of the results if the null hypothesis were true is less than 0.05 (5 percent) or 0.01 (1 percent), respectively. If this is the case, the null hypothesis is rejected, and thus the result is said to be statistically significant. Other tests include two-tailed tests, due to the non-directional nature of the hypotheses (Anon and Anon, 1997), as well as tests of significance using beta (a standardized regression coefficient in linear regression with stepwise method of elimination), p , and correlation coefficient (R) values (in multiple regression analysis).

1.6 Organization of the Thesis

The thesis begins with statements of the purpose and objectives of the study in Chapter I, together with problems understudied and followed by the importance of the study. Chapter II explores the literature reviews concerning the topics of waste generation, as well as environmental values and behavior, perceptions on waste management, and factors influencing it. It later analyzes previous research works conducted locally and abroad. The overview of the theories provides a basis of all hypotheses developed in the study.

Secondary data sources of existing management and institutional situations in the country are included in the chapter before focusing on the more specific scopes of the study. The secondary data collected include the development trends, geographical background of the area, previous and current waste management and legislative framework as well as trends in the quantity of waste being disposed.

Chapter III looks at the underlying theories on attitudes, perceptions, and environmental behavior as well as theories developed by previous researchers on the topic as well as on waste generation. They are essential in delineating specific variables and factors used in the study. While other primary data and the information gathered about the study areas are discussed in Chapter IV, along with the methodology and approach of the study. The chapter also explains the statistical analyses used. Chapter V covers the analysis of results and Chapter VI, the conclusion of the study and recommendations for future policy and program guidelines based on the findings.

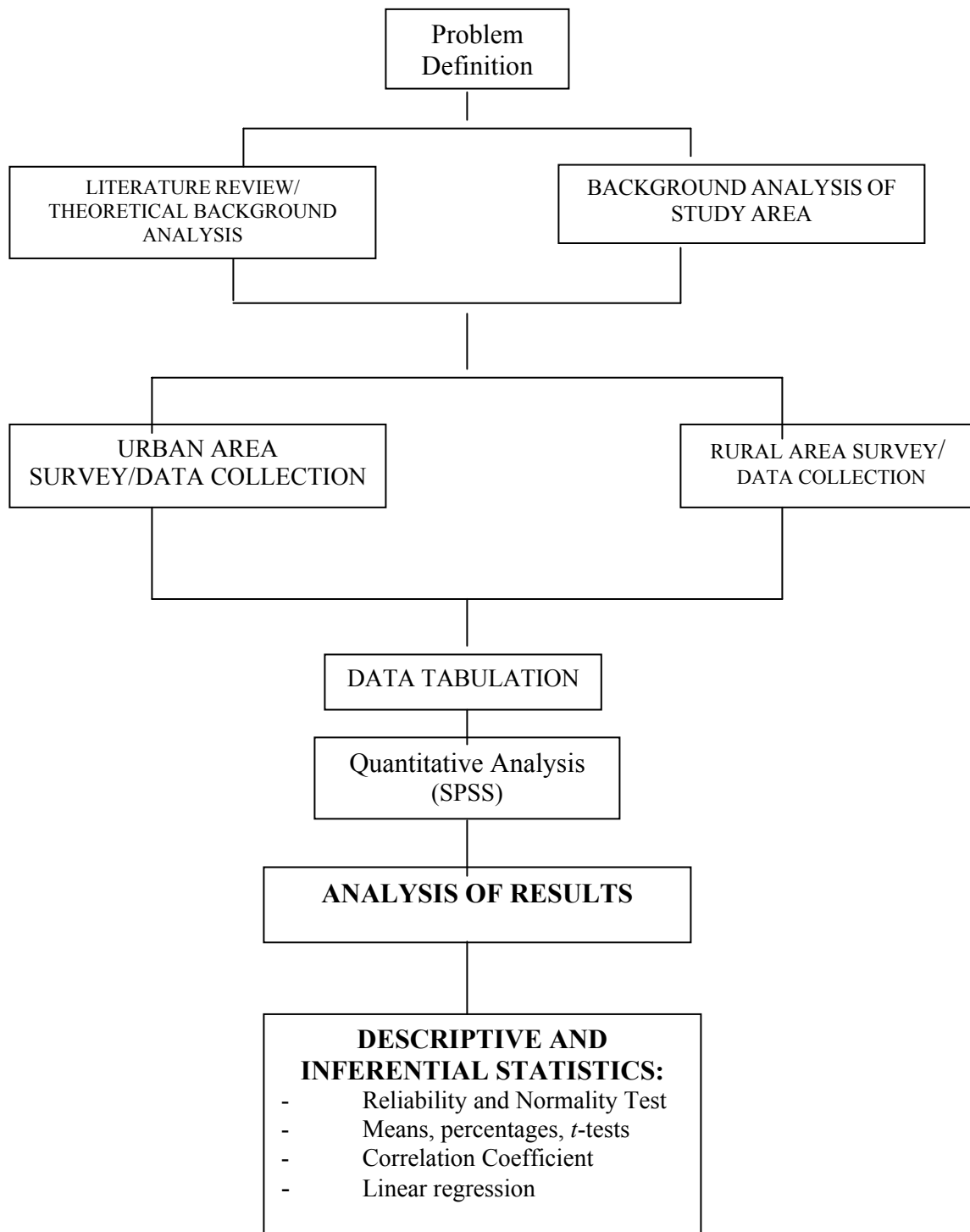


Figure 1: Work Schedule/ Approach of Study