WASTE DISPOSAL AND RECYCLING PRACTICES IN
EDUCATIONAL INSTITUTIONS: A CASE STUDY ON URBAN
AND RURAL SCHOOLS IN KUCHING, SARAWAK

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WASTE DISPOSAL AND RECYCLING PRACTICES IN EDUCATIONAL INSTITUTIONS: A CASE STUDY ON URBAN AND RURAL SCHOOLS IN KUCHING, SARAWAK.

by

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TABLE OF CONTENT

Acknowledgement ii
Table of Contents iii
List of Tables vii
List of Figures ix
List of Appendices x
Abstract xi
Abstrak xii

CHAPTER ONE : INTRODUCTION

1.0 Background C1-1
1.1 Problem Statement C1-3
1.2 Goal and Objectives C1-4
1.3 Scopes of Study C1-4
1.4 Hypotheses C1-5
1.5 Organization of Study C1-6

CHAPTER TWO : LITERATURE REVIEW

2.0 Introduction C2-1
2.1 The Need of Sustainable Waste Management C2-2
2.2 History of Recycling Concept C2-3
2.3 The Recycling Scenario Around the Globe

2.4 Recycling Scenario in Kuching City of Malaysia

2.4.1 Food waste

2.4.2 Green Waste

2.4.3 Paper and Cardboards

2.4.4 Scrap Metal

2.4.5 Glass Bottle

2.4.6 Plastic

2.4.7 Construction Waste

2.4.8 Livestock Waste

2.4.9 Wood Waste from Wood Based Industries

2.4.10 Ceramic Waste

2.4.11 Coal Ash from Sejingkat Coal Fired Station

2.4.12 Used Tyres

2.4.13 Aggregated Summary

2.4.14 Recycling Based on Different Generators

2.5 Existing Recycling Problems

2.6 The Role of Relevant Agencies

2.6.1 NREB (Natural Resources and Environmental Board)

2.6.2 DBKU (Kuching North City Hall)

2.6.3 MBKS (Kuching South City Council)

2.6.4 MPP (Padawan Municipal Council)

2.7 Summary
### CHAPTER THREE: MATERIALS AND METHODS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>Introduction</td>
<td>C3-1</td>
</tr>
<tr>
<td>3.1</td>
<td>Data Collection</td>
<td>C3-1</td>
</tr>
<tr>
<td>3.1.1</td>
<td>Site Observation</td>
<td>C3-3</td>
</tr>
<tr>
<td>3.1.2</td>
<td>Data Sampling</td>
<td>C3-5</td>
</tr>
<tr>
<td>3.1.3</td>
<td>In-depth Interviews</td>
<td>C3-9</td>
</tr>
<tr>
<td>3.1.4</td>
<td>Questionnaire</td>
<td>C3-10</td>
</tr>
<tr>
<td>3.2</td>
<td>Data Analysis</td>
<td>C3-13</td>
</tr>
<tr>
<td>3.2.1</td>
<td>Statistical Analysis</td>
<td>C3-13</td>
</tr>
<tr>
<td>3.2.2</td>
<td>Descriptive Analysis</td>
<td>C3-14</td>
</tr>
</tbody>
</table>

### CHAPTER FOUR: RESULTS AND DISCUSSION

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>Introduction</td>
<td>C4-1</td>
</tr>
<tr>
<td>4.1</td>
<td>Demographic Profile</td>
<td>C4-1</td>
</tr>
<tr>
<td>4.2</td>
<td>General Respondent Attitude Towards Waste Disposal and Recycling</td>
<td>C4-4</td>
</tr>
<tr>
<td></td>
<td>Approach</td>
<td></td>
</tr>
<tr>
<td>4.3</td>
<td>General Respondent Perception Towards Waste Disposal and Recycling</td>
<td>C4-12</td>
</tr>
<tr>
<td></td>
<td>Approach</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td>Hypothesis Testing</td>
<td>C4-22</td>
</tr>
</tbody>
</table>
CHAPTER FIVE : CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

5.1 Conclusion

5.2 Recommendations
   5.2.1 Formal Education
   5.2.2 Recycling Awareness
   5.2.3 Institutional Framework
   5.2.4 Recycling Facilities

5.3 Limitations of the Study and Further Research

BIBLIOGRAPHY

APPENDIX

PLATES
LIST OF TABLES

Table 2.1 Amount of waste from Kuching recycled in the year 2001 C2-13
Table 2.2 Overview of recycled material based on sector in 2001 C2-13
Table 2.3 Estimation of recycling of solid waste based on sectors C2-14
Table 2.4 Waste generation rates for selected Malaysian cities C2-15
Table 2.5 Estimates of per capita and total waste generation in Kuching District-1999 C2-16

Table 3.1 The sample distribution among the schools C3-13
Table 4.1 General demographic profiles of respondents C4-3
Table 4.2 Ways on how respondents dispose their household waste C4-4
Table 4.3 Constraints that hinder the initiative to do pre-sorting C4-5
Table 4.4 Recycling scenario in urban and rural schools C4-7
Table 4.5 Sources of recycling news C4-8
Table 4.6 Preference of recycling materials C4-9
Table 4.7 Reasons for participating in recycling C4-11
Table 4.8 Barriers preventing students from participating in recycling C4-15
Table 4.9 Prompt actions to promote recycling C4-17
Table 4.10 Total waste generated by each individual school in various composition during the period of sampling days C4-18
Table 4.11 Relationship between total wastes generated by rural and urban Schools C4-22
Table 4.12 Relationship between wastes generated in different days C4-23
Table 4.13 Relationship between waste generated in different schools C4-24
Table 4.14 Multiple comparison dependent variable (urban schools) C4-24
Table 4.15 Multiple comparison dependent variable (rural schools) C4-25
Table 4.16 Relationship between different breakdowns of waste generated in different schools C4-26
Table 4.17 Relationship between presorting practices and selected demographic variables C4-27
Table 4.18 Differences between recyclers and non-recycler regarding their perception on barriers that prevent students from participating in recycling C4-29
Table 4.19 Differences between recyclers and non-recycler regarding their perception on types of prompt actions need to be taken to promote recycling C4-30
LIST OF FIGURES

Figure 3.0 The conceptual map showing the locations of the sampling points Kuching City

Figure 3.1(a) Sampling route for Monday to Thursday

Figure 3.1(b) Sampling route for Friday

Figure 4.1 Ways to dispose household waste

Figure 4.2 Percentage of respondents practice pre-sorting according to different types of material

Figure 4.3 Recycling scenario in both urban and rural schools

Figure 4.4 Sources of recycling news among the respondents

Figure 4.5 Preference of recycling

Figure 4.6 Mean scores of reasons for participating in recycling

Figure 4.7 Perception on the main waste generated by school canteen daily

Figure 4.8 Perception towards waste minimization and recycling practice in schools

Figure 4.9 Mean scores for the barriers preventing students from participating in recycling

Figure 4.10 Mean scores for various preferred actions to promote recycling

Figure 4.11 Total waste generated in schools during eight sampling days

Figure 4.12(A) Total waste generated in urban schools

Figure 4.12(B) Total waste generated in rural schools

Figure 4.13 Summary of the total waste generated (sorted) in schools during recess time
LIST OF APPENDIX

Appendix A  Sample of questionnaire  A-1
Appendix B  Letter of reference  B-1
Appendix C  Preliminary statistics of the number of students in the study  C-1
Appendix D  List of contacts  D-1
Appendix E  Sample of form for recording  E-1
Appendix F  Raw data of field collection for urban schools  F-1
Appendix G  Raw data of field collection for rural schools  G-1
Appendix H  Statistic of the number of teachers and students in the selected schools  H-1
Appendix I  Statistics of the monthly Buy-back Campaign by Padawan Municipal Council and sample of distributed leaflet  I-1
Appendix J  Raw data of the statistical analysis  J-1
Appendix K  Raw data of the descriptive analysis  K-1
ABSTRACT

Every year, large quantities of wastes are generated, varies from industrial wastes to institutional wastes. The waste creates environmental problems in many kinds. Ordinary waste treatments such as waste disposal and incineration result in emissions of toxic pollutants and greenhouse gases, and seepage from waste disposal sites pollutes ground water and watercourses. Solid wastes, which are normally solid, can also be defined as all the wastes arising from human and animal activities that are discarded as useless or unwanted by the owner or producer. Therefore, environmental problems would increase in parallel with the increasing number of population. The annual amount of waste being produced by a single sector, namely from institutional sector should not be neglected as it creates the desire to investigate further the total of wastes generated by schools and the level of the recycling rate among the students and educators. The scenario accessed from the study shows the rate of waste generated per capita per day (recess time) was at 60 g with the highest amount of waste recorded was dominated by plastic bags. The recycling rate is at moderate level as many are aware of the recycling concept regardless of their location, age, or education level. Study also showed that the recycling rate in rural schools were higher than urban schools. Therefore, there is a need to reinforce the right concept especially in the younger generation as they perceived that they can conserve the environment through recycling practice. Thus, there is a need for a drastic change in the behaviour of the non-recyclers besides looking into other alternative to promote recycling to them. Formal education with sufficient funds and support from the relevant agencies would be a mean to boost the recycling seed in them. Education should bridge up with proper channel of communication such as through constructive joint-programme with mass media to foster recycling in Kuching city.
ABSTRAK

CHAPTER ONE
INTRODUCTION

1.0 Background

Waste generation and composition are strongly related to the regional socio-economic conditions. With rapid population increase and economic growth in many countries, the environment is becoming more vulnerable and natural resources are depleted faster to meet the basic needs. Socio-economic factors that enable an increase in the standards of living of the regional economy will influence the per capita rate of waste generation and the composition of the waste generated. The per capita waste generation may generally increase concurrently with increased standards of living. The percentage of paper, plastics, and non-combustible materials such as metal and glass will generally increase at the expense of organic waste. In turn, these increases may enhance the calorific value or the recycling potential of the waste.

The yearly solid waste generation from residential areas in Kuching district is estimated at 95,100 tonnes with the average household waste generation per person would be estimated at 0.52 kg per capita per day. In addition, the total generation of commercial waste (includes waste from industrial, institutional and infrastructure) in 2001 is estimated at 52,020 tonnes. The proportion can be divided by ratio of 8:1:1 for commercial:industrial:institutionals. The report of the survey carried out by Sustainable Urban Development (SUD) project in 2003 had determined the composition of collected residual waste from commercial areas. The amount of food waste is high (52%) due to restaurants and food stalls, as compared with paper (4%). It is mostly likely a large
part of paper is taken directly by the private collectors to the recycling industry. Paper and cardboard collected separately from institutions and Small or Medium-sized Industries (SMIs) for recycling amounts to 8,370 tonnes per year. However, the collection and transportation of waste for reuse and recycling is currently not documented as it is usually carried out by private transporters. In Malaysia, the environment began to receive more attention in the early 1970s. At the national level, the Department of Environment (DOE) was established in 1975 to enforce the Environmental Quality Act, 1974. DOE is in charge of environmental management in Malaysia as a whole, including the promotion of Environmental Education (EE). Each state in Malaysia has at least one branch of the DOE. One of the key areas of the Green Strategies outlined in the policy is 'Education and Awareness'. The emphasis on Education and Awareness is in line with the recommendations of Agenda 21. Chapter 36 of Agenda 21 stresses on the following:

'Education, including formal education, public awareness and training, should be recognised as a process by which human beings and societies can reach their fullest potential. Education is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making. Both formal and non-formal education is indispensable to changing people's attitude so that they have the capacity to assess and address their sustainable development concerns'.

Among the strategies for Education and Awareness are to devise and introduce comprehensive formal and informal EE and training strategies and information dissemination programmes by integrating environment and development into educational activities from school to tertiary institutions for which relevant methods and materials will be developed. The other aims are to
establish national centres for excellence in interdisciplinary research and education in environment and development and to review educational curricula at all levels to ensure a multidisciplinary approach in environmental and developmental issues besides actively promoting non-formal educational activities at local and national levels and strengthening the role of the media in disseminating environmental information. Malaysia has developed partnerships with various countries such as Denmark and Japan in terms of research, Environmental Education (EE), capacity building and other efforts (Susan, et. al., 2003).

1.1 Problem Statement

The total amount of solid waste generated by the institutional sector is estimated at approximately 5,300 tonnes per year which collection from schools, stadiums, sport complexes and community halls amounted to 1,350 tonnes per year. A rough estimation showed 280 tonnes per year of the institutional waste collection go for recycling (Trienekens, 2000).

Public recycling schemes are generally scarce and restricted to collection sites for recyclables and to minor composting schemes. The parties involved in commercial recycling include waste generators, waste transporters, scavengers, agents and middlemen, recycling industries and other secondary users. The reuse and recycling of waste according to SUD surveys on middlemen and large industries 2001 mainly can be categorized to food waste, green waste, paper and cardboard, scrap metal, glass bottles, and plastic and construction waste. In the same survey, paper, cardboard and green wastes are the only two waste materials being recycled by institutional sectors.
CHAPTER ONE

The total of waste generated per year for residential, commercial, institutions and infrastructure is 153,350 tonnes while the amount of waste recycled is 13,900 tonnes. This had shown a very low rate, 9% recycled waste as compared with industry, 55% waste being recycled.

Accordingly, the research questions are formulated as follows:

- What is the actual amount of waste generation and its composition from schools as schools are categorized into institutional sectors?
- Is there any difference in waste compositions and waste generation per capita per day between rural schools to urban schools?
- What are the perceptions of students, teachers and canteen operators towards recycling practices?

1.2 Goal and Objectives

In order to understand the problems faced by the educational institutions in its recycling campaign, a detailed baseline study is needed. The objectives of the study are therefore to:

1. estimate the proportion of waste by categories generated daily (during recess hour) from the schools canteen in urban and rural schools.
2. identify the relationship between waste disposal in urban schools and rural schools.
3. identify the different mode of solid waste disposals as practiced by students and their perception towards recycling.
CHAPTER ONE

1.3 Scope of Study

This study consists of two major parts. The first part focuses on assessing the waste disposal in eight secondary schools' canteen. Canteen's waste bins were sampled for quantification in weight of waste materials by categories. Waste materials were categorized based on physical form: organic waste (food waste, vegetables, meat and bones), paper, plastic, aluminium, glass, metal and textile.

The second part were mainly on assessing the students and teachers to develop baseline data of their socio demographic and their perception towards recycling concept and practices in schools. Time estimated for a complete questionnaire was not more than 40 min unless included extra hour of interview.

1.4 Hypotheses

Statistical analysis such as ANOVA and t-test will be used to examine the following hypotheses:

1. \( H_0: \) There is no significant difference between the amounts of waste generated in urban schools and rural schools.
   \( H_1: \) There is significant difference between the amounts of waste generated in urban schools and rural schools.

2. \( H_0: \) There is no significant difference of waste generated by schools in different days.
   \( H_1: \) There is significant difference of waste generated by schools in different days.

3. \( H_0: \) There is no significant difference of waste generated between different schools.
   \( H_1: \) There is significant difference of waste generated between different schools.
CHAPTER ONE

4. H₀: There is no significant difference between the breakdowns of waste by categories by urban schools and rural schools.

H₁: There is a significant difference between the breakdowns of waste by categories by urban schools and rural schools.

5. H₀: There is no significant difference between pre-sorting practice and selected demographic variables.

H₁: There is a significant difference between pre-sorting practice and selected demographic variables.

6. H₀: There is no significant difference between recyclers and non-recyclers on their perception about the barriers in participating in recycling.

H₁: There is a significant difference between recyclers and non-recyclers on their perception about the barriers in participating in recycling.

7. H₀: There is no significant difference between recyclers and non-recyclers on their perception about the types of prompt actions need to be undertaken in promoting recycling.

H₁: There is a significant difference between recyclers and non-recyclers on their perception about the types of prompt actions need to be undertaken in promoting recycling.

1.5 Organisation of Study

This study is organized into five major chapters. Chapter One includes basic introduction and problem statements which initiates the study. It also consists of goal and objectives, scopes and background of study area and hypotheses that highlights the whole study.
CHAPTER ONE

Chapter Two addresses the related literature reviews and references from books, journals on solid waste management especially on waste disposal and information on recycling approach.

Chapter Three highlights the essence of the detailed methodological approach of this study and description of basic statistical techniques in analyzing the collected data.

Chapter Four gives a clear and complete presentation of actual data analyses which includes tables, figures such as pie-charts, graphs and statistical findings.

Chapter Five underlines the conclusion of the study with proactive recommendation. It also put together the limitations, constraints and recommendations for future study.
CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

The Concise Oxford Dictionary defines the word "waste" as something that is no longer serving a purpose or in other word, something that is without value. Generally, waste can be classified as liquid and solid waste. However, sometimes waste also being categorized according to the source of the waste; the domestic waste, municipal solid wastes, industrial waste and commercial waste.

In regard to solid waste, Tchobanoglous et. al. (1993) defined it as all the waste arising from human and animal activities that are normally solid and discarded as useless or unwanted. According to Pfeffer (1992), rejected solid materials comprise of garbage, residues resulted from food marketing, preparation and consumption of food; rubbish/trash, the non-putrescible residues, ashes, residue wastes from any kind of combustion process; and bulky wastes, waste which are of large size. In the past, waste was regarded as a social problem needed to be discarded by its possessor as it has no further use to the possessor apparently. On the other hand, waste was often seen as potential source for the future, as the junk could be sold, given away, or mined for spare parts. The so-called waste materials may still be reuse for other purposes, for example, oily milk packages may be used as fuel or the leftover food may be used to feed domestic animals.
2.1 The need of sustainable waste management

According to Yuan & James (2002), economic growth's resulting environmental degradation is unavoidable. The ever-increasing waste generated as the population increases and industrial progresses had started to create problems of waste management as most of the wastes are still ended up in landfills. Natural decomposition of waste, for example, releases methane gas and sulphur which not only smelly but also pollutes the air and causing the spread of diseases, (MBKS, 2005). But to push on enforcement of environmental regulations by shutting down a non-compliant company or pushing a company to bankruptcy with pollution charges would lead to worker unemployment (Hertsgaard, 1997). Thus, there is an urgent need to opt for alternative options in recovering the value of the disposed waste rather than congesting the landfills, which would come to a saturation point one day.

Nevertheless, when the economy had developed to a particular level, growth can begin to promote the improvement of environment. The increasing awareness on the environmental impacts of waste dumping and the intensified efforts to regulate activities that affect the environment reflect an emerging realization that the advancement of science and technology within a growing human population has the potential to transform the world (Holling, 1978; Ostrom, 1990 and Renn et al 1995). Among the technologies being implemented are through combustion by using incinerators, composting or vermicomposting of waste of high organic matter content which later be useful in agriculture or horticulture (Brinton and Brinton, 1994). Apart from those alternatives, another option which is increasingly capturing the attention of the world is recycling. Recycling not only helps to reduce the landfills problems, but it actually provides income for some of the most trivial urban populations; the homeless, immigrant, and
low-income populations are taking items from trash cans where the materials are then brought to drop-off recycling centres run by the social movement groups for the exchange of a small amount of money.

2.2 History of recycling concept

Recycling by definition is the reuse of materials, either pre-consumer or post-consumer, that would ordinarily be considered waste (Holder, 2005). Modern recycling first emerged in United States in the late 1960s. The original recycling symbol was designed in 1970 by Gary Anderson, which was a design submitted for the International Design Conference. Each of the three arrows of the logo represents one step in a three-step process that forms a closed loop, the recycling loop. The first step represents collection of materials to be recycled. This step takes place when recyclable materials are placed into curbside recycling bin or taken to a local collection center. The collected materials are then cleaned and sorted for sale to a manufacturing facility. The manufacturing process is the second arrow in the recycling symbol. The recyclable materials are manufactured into new products for retail or commercial sale. The third step is the actual purchase and use of the products made from the recycled materials (Earth Odyssey, 2005). Thus, recycling is not a new issue, but rather an old idea which is now getting a better share of attention.

There are wide ranges of waste which are recyclable. Among the recyclable materials are office paper, newspaper, magazines and glossy, old corrugated cardboard, steel/bi-metal cans, aluminum cans, glass containers and bottles, plastics, fluorescent lights, used motor oil, printer cartridges, and books, just to name a few (The Ohio Department of Natural Resources
CHAPTER TWO

Division of Recycling and Litter Prevention, 1999). Furthermore, Holder (2005) also pointed out that recycling not only helps lessen the amount of waste that goes into landfills, but at the same time it also significantly reduce the amount of toxic chemicals absorbed into the earth and, in some cases, reduces manufacturing costs and energy consumption. Thus the phrase, "there's money in the rubbish" seems to be relevant and workable as a mean to push forward the recycling agenda.

2.3 The recycling scenario around the globe

Recycling activities have taken place in many parts of the world. A survey financed by the US Environmental Protection Agency indicates that over the whole country, in 1996, Americans were recycling 27.3% of the municipal discard stream with nearly 9,000 curbside recycling programs in operation (Glen, 1998). The increase in recycling programs has been matched by a corresponding growth in the number of MRFs, in which in New York city alone, the capacity of these MRFs had increased to 64,200 tons per day. MRF is a recycling facility designated to separate and recover the recyclable materials. Thus, the increase in MRF operation reflected the amount of recycling activities that have taken place (United States Environmental Protection Agency, 1998).

Moreover, according to a study done by Ji and Wang (2002) regarding to the environmental awareness in Shanghai residents, the survey showed high levels of awareness, in which 89% indicated that recycling is necessary, 69.9% supported the expansion of the recycle program, and 81.9% were willing to participate in environmental protection activities. Apart from that, The Ohio Department of Natural Resources, Division of Recycling and Litter Prevention and the