

A SOLID WASTE RECYCLING STUDY

*A Report Submitted to
Japan International Cooperation Agency
(JICA)*



J 1163409141

PE Research Sdn Bhd

8M, Jalan SS25/22, Tamar Mayang, 47301 Petaling Jaya
Tel: 03-7042664 Fax: 03-7042863

March 1995

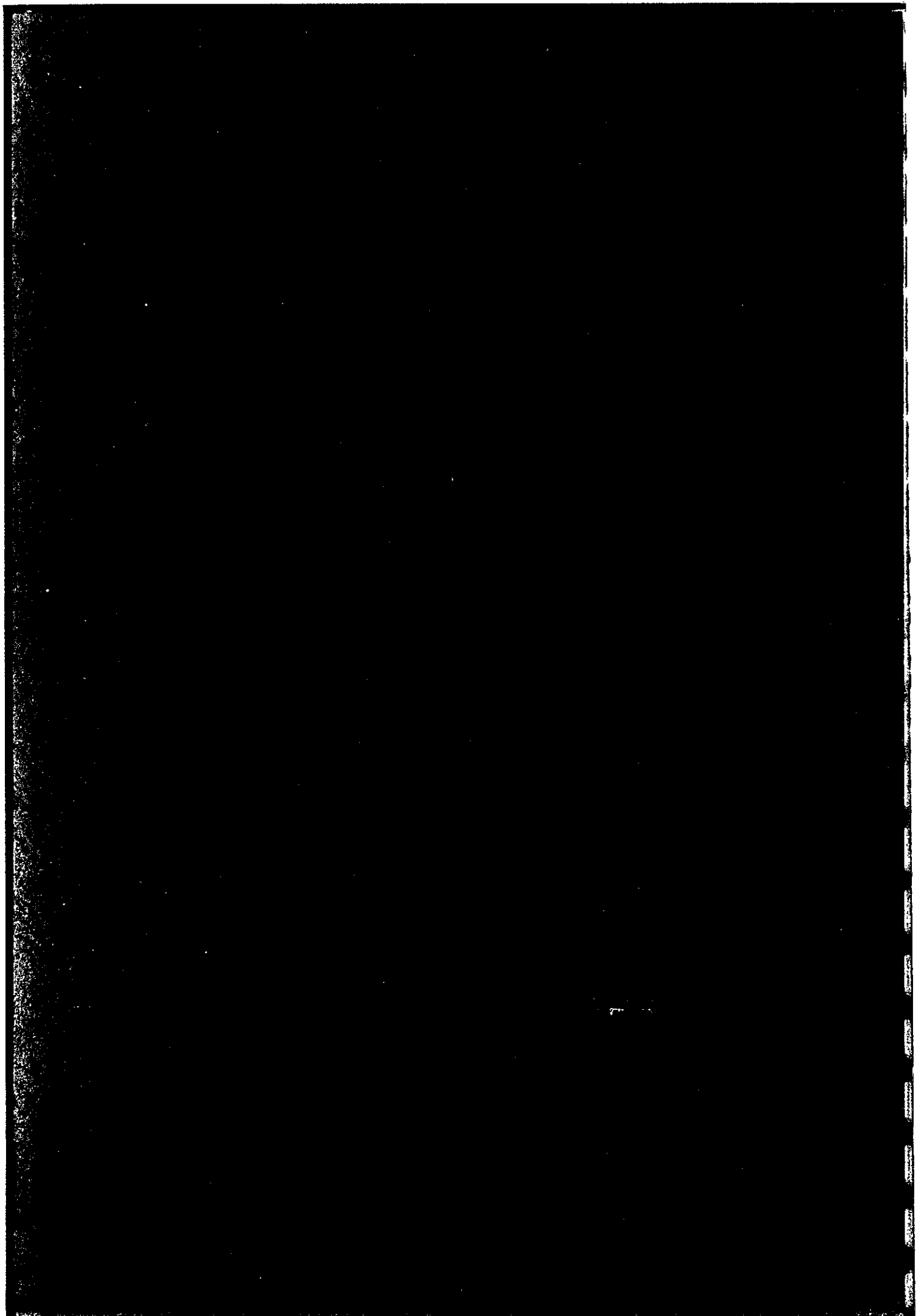


TABLE OF CONTENTS

EXECUTIVE SUMMARY	E-1
LIST OF APPENDICES	v
LIST OF TABLES	v
LIST OF FIGURES	v
LIST OF ABBREVIATIONS AND ACRONYMS	vi
	Page
CHAPTER 1. INTRODUCTION	1-1
1.1 Objectives Of This Study	1-2
1.2 The Study Approach	1-2
1.3 Scope Of Work	1-5
1.4 Layout Of This Report	1-6
CHAPTER 2. ROLE OF GOVERNMENT	2-1
2.1 The Three Tiers Of Government In Environmental Management	2-2
2.2 Solid Waste Management Systems and Situation in Kuala Lumpur & Petaling Jaya	2-4
2.3 Solid Waste Generation by Different Activity Groups	2-4
2.4 The Experience Of Recycling in Local Authorities	2-8
2.4.1 Household	2-9
2.4.2 Door-to-door purchases	2-9
2.4.3 Separation by USD waste collectors	2-9
2.4.4 Collection and separation by scavengers	2-10
2.4.5 Recycled materials taken out from the Kelana Jaya dump site	2-10
2.5 Consultative Committees	2-11
2.6 Government Intervention	2-11
CHAPTER 3. POPULACE AND RECYCLING	3-1
3.1 Introduction: Use of Focus Groups	3-1
3.1.1 Background and Purposes	3-1
3.1.2 Method and Procedure	3-1
3.1.3 Sample	3-2
3.2 Factors Involved in Separating Solid Waste at Household Level	3-2
3.2.1 Group Discussion Climate	3-2
3.2.2 Environmental Consciousness	3-2
3.2.3 Desire for Clean Local Environment	3-4



1163409【4】

3.2.4	Perception of Solid Waste, Local Authorities and Waste Management	3-5
3.2.5	Perception of Recycling	3-5
3.2.6	Willingness to Participate in Recycling	3-7
3.3	Summary of Major Findings	3-10

CHAPTER 4. PARTICIPATION OF COMMUNITIES IN RECYCLING

4.1	Introduction	4-1
4.2	Residential Communities	4-1
4.2.1	Hillside Apartments in Taman Melawati	4-1
4.2.2	SS3 in Petaling Jaya	4-6
4.3	Schools	4-9
4.3.1	International School of Kuala Lumpur (ISKL)	4-9
4.3.2	Sekolah Menengah Perempuan Taman Petaling	4-11
4.3.3	Sekolah Kebangsaan Taman Melawati	4-13
4.3.4	Sekolah Menengah Kelana Jaya	4-14
4.4	Hotels	4-16
4.4.1	Introduction	4-16
4.4.2	Recycling Efforts	4-16
4.4.3	Issues, Problems and Replication	4-16
4.5	Commercial Environment	4-17
4.5.1	Offices	4-17
4.5.2	Property Management Services	4-19
4.6	Summary of Major Findings	4-22

CHAPTER 5. THE RECYCLING INDUSTRIES AND RECYCLING COLLECTORS

5.1	Introduction	5-1
5.2	Glass	5-1
5.2.1	Key Recyclable Items	5-1
5.2.2	Recycling Technologies in Use	5-2
5.2.3	Price of Wastes	5-4
5.2.4	Supply and Demand	5-4
5.2.5	Main Actors	5-5
5.2.6	Extent of Waste Recycled	5-6
5.2.7	Key Problems and Issues with Recycling Post-Consumer Waste	5-7
5.3	Aluminium	5-8
5.3.1	Key Recyclable Items	5-8
5.3.2	Recycling Technologies in Use	5-8
5.3.3	Price of Wastes	5-10
5.3.4	Supply and Demand	5-10
5.3.5	Main Actors	5-12
5.3.6	Extent of Waste Recycled	5-13

	5.3.7	Key Problems and Issues with Recycling Post-Consumer Waste	5-14
5.4		Plastics	5-14
	5.4.1	Key Recyclable Items	5-14
	5.4.2	Recycling Technologies in Use	5-15
	5.4.3	Price of Wastes	5-16
	5.4.4	Supply and Demand	5-18
	5.4.5	Main Actors	5-18
	5.4.6	Extent of Waste Recycled	5-19
	5.4.7	Key Problems and Issues with Recycling Post-Consumer Waste	5-19
5.5		Paper	5-21
	5.5.1	Key Recyclable Items	5-21
	5.5.2	Recycling Technologies in Use	5-21
	5.5.3	Price of Wastes	5-22
	5.5.4	Supply and Demand	5-23
	5.5.5	Main Actors	5-24
	5.5.6	Extent of Waste Recycled	5-25
	5.5.7	Key Problems and Issues with Recycling Post-Consumer Waste	5-25
5.6		Summary of Major Findings	5-26

CHAPTER 6. SUMMARY OF MAJOR FINDINGS

6.1	Introduction	6-1
6.2	Focus Group Findings	6-1
6.3	Participation Of Communities In Recycling	6-3
6.4	The Recycling Industries and Recycling Collectors	6-6

CHAPTER 7. MAJOR RECOMMENDATIONS

7.1	Establishing a Comprehensive Plan for Waste Management and Recycling	7-1
	7.1.1 Goals and Objectives	7-1
	7.1.2 Integrative Strategy for Waste Management and Recycling	7-1
	7.1.3 Measure for Waste Management and Recycling	7-3
	7.1.4 Other Policy Issues and Measures	7-10
7.2	A Proposed National Framework for Recycling	7-13
	7.2.1 Federal Government	7-14
	7.2.2 State Government	7-15
	7.2.3 Local Government	7-16
7.3	Action Plan for Pilot Recycling Project in Bangsar, Kuala Lumpur	7-17
	7.3.1 Action Plan for Pilot Recycling Project	7-18
	7.3.2 Proposed Residential Area for Coverage	7-21

7.3.3	Key Features of Recycling Project	7-21
7.3.4	Specific Features of Neighbourhood Programmes	7-23
7.3.5	Implementation Schedule	7-24

Bibliography		B-1
---------------------	--	------------

LIST OF APPENDICES

LIST OF APPENDICES

Appendix 1	Contacts	Page A-1
------------	----------	-------------

LIST OF TABLES

Table 2.1:	A summary of the average generation for the various type of waste generators in Petaling Jaya Municipal Council (MPPJ) and Kuala Lumpur City Hall (DBKL)	Page 2-5
Table 2.2	Principal components of domestic refuse/residential areas in Petaling Jaya and Kuala Lumpur	2-6
Table 2.3	Waste composition of Kuala Lumpur City (In wet & dry weight %)	2-7
Table 2.4	Projected per capita waste generation rates, Petaling Jaya Municipal Council	2-8
Table 2.5:	Recyclables Collected in Petaling Jaya 1992-94 (In Kg)	2-10
Table 6.1	Barriers to Recycling Efforts	6-15

LIST OF FIGURES

Figure 2.1	Average waste generation rate of residential area in Petaling Jaya and Kuala Lumpur	Page 2-5
Figure 2.2	Components of domestic refuse	2-6
Figure 2.3	Waste composition of Kuala Lumpur (in wet & dry weight %)	2-7
Figure 2.4	Projected population growth and waste generation in Petaling Jaya	2-8
Figure 2.5	Recyclables collected in Petaling Jaya 1992-94 (in Kg)	2-11
Figure 2.6	Options for recycling	2-13
Figure 5.1	Glass waste recycling process in Malaysia	5-3
Figure 5.2	Aluminium waste recycling process in developed countries	5-9
Figure 5.3	Aluminium recycling in Malaysia	5-11
Figure 5.4	Mechanical recycling & plastic waste in Malaysia	5-17
Figure 5.5	Typical reworked plastic process in Malaysia	5-17
Figure 5.6	Paper waste recycling process in Malaysia	5-23
Figure 6.1	Levels of Recycling in Malaysia	6-8
Figure 6.2	Separation and waste collection at Kelana Jaya Dump Site	6-9
Figure 7.1	Strategic policy measures for waste abatement	7-4

LIST OF ABBREVIATIONS AND ACRONYMS

ABS	Acrylonitrile
DBKL	Dewan Bandaraya Kuala Lumpur/ Kuala Lumpur City Hall
DOE	Department of Environment
EPS	Expanded polystyrene
EPU	Economic Planning Unit, Prime Ministers' Department
EQA	Environmental Quality Act
EQC	Environmental Quality Council
HDPE	High Density Polyethylene
IPT	Institut Pengajian Tinggi
KL	Kuala Lumpur
LDPE	Low Density Polyethylene
MIGHT	Malaysian Industry-Government Group for High Technology
MP	Member of Parliament
MPAJ	Majlis Perbandaran Ampang Jaya
MPMA	Malaysian Plastics Manufacturers Association
MPPJ	Petaling Jaya Municipal Council/ Majlis Perbandaran Petaling Jaya
MPWMTF	Malaysian Plastics Waste Management Task Force
NCLG	National Council for Local Government
NGOs	Non-Governmental Organisations
PET	Polystyrene terephthalate
PJ	Petaling Jaya
PP	Polypropylene
PS	Polyvinyl chloride
RA	Residents' Association
USD	Urban Services Department

EXECUTIVE SUMMARY

1.0 Current Status of Waste Management and Recycling in Malaysia

a) The Waste Situation : Statement of Problem

The rapid pace of economic growth of around 8 percent per annum in Malaysia over the past 8 years has been impressive. In that time period, there has also been very strong developments in terms of expanding urban areas, population growth, greater levels of consumption and rising affluence of the urban population.

With that trend consolidating over these years, there has also been greater pressures on serving these expanding communities. Among the more urgent urban environmental problems is the limited space remaining for dumping solid wastes. This problem is getting serious as local governments run out of space in dump sites, and pressure is on them to find solutions spanning across social, land, investment and other constraints.

In urban Malaysia, its population throw out their solid wastes and the local authority is responsible for its collection, and eventual disposal. Kuala Lumpur residents dispose about 3,000 tons of solid waste every day, of which about 2,500 tons are collected and transported to its disposal site. In Petaling Jaya, the estimated tonnage of solid wastes collected at dump site in Kelana Jaya was estimated to be 500 tonnes daily.

Some salient features of waste generated in Kuala Lumpur and Petaling Jaya include:

- Waste generation rises with income
- For shopping complexes and markets, the rates in Kuala Lumpur are approximately 4 times that of Petaling Jaya
- Largest waste generators for Petaling Jaya are the industrial firms

In general, the composition of waste for the two regions are fairly similar:

- Vegetable and other putrescibles (averaging about 35-36 per cent of the total solid waste collected)
- Paper and cardboard (24-27 per cent)
- Plastics (16-17 per cent)
- Textile, leather and rubber wastes and garden/timber wastes (3-10 per cent)
- Metal (3-4 per cent)
- Glass (2-3 per cent)

Over time, the amount of wastes generated per capita is forecast to rise. This is in line with rising incomes and concomitant changes in consumption patterns of a consumer oriented society. Without any doubt, the solid wastes problem of the future will become even more acute than those of today.

The situation of the waste dump sites is critical. Both the Dewan Bandaraya Kuala Lumpur (DBKL) and Majlis Perbandaran Petaling Jaya (MPPJ) dump sites - at Jinjang and Sungei Besi in Kuala Lumpur, and at Kelana Jaya in Petaling Jaya - have exceeded their capacity. The two landfill sites at Jinjang and Sungei were expected to close in 1994. But because there is no other dumping area available, these two dump sites are still operating in June 1995. Both local authorities are waiting for the Selangor State Government to approve their future disposal site at Puchong. Unlike the present dump sites, the proposed/new site is supposed to be based on a sanitary landfill. Given all the social stigma associated with solid wastes, the Puchong site will face problems from existing residents, and thus delay in the sites approval can be expected.

While the other local authorities may not be facing a waste dump problem as severe as that experienced by Kuala Lumpur and Petaling Jaya, early efforts aimed at waste abatement can certainly keep the problem at bay while allowing time for policy makers to develop a comprehensive national strategy to tackle the waste problem on a national basis. Local governments have expressed interest in resolving the problem of too much garbage and solid waste since their disposal sites are beginning to fill up, and suitable replacements are difficult to find because of environmental, social, cost and other factors.

One immediate strategy which has much potential is recycling. It can help to mitigate the problem over both the short and long run. Recyclable materials such as glass, metals, paper, and plastics would comprise about 46-50 per cent of the existing waste stream. Hence, on the face of it, the potential for recycling is good.

b) Waste Management

One way or another, the federal and state governments are directly and indirectly involved with environmental and waste management - predominantly in policy formulation and project approval. However, the responsibility of solid waste collection and disposal falls squarely on the local governments.

This waste management service forms an integral part of the local authority administration. These services include several important aspects of environmental management, provision of municipal services, and public health. The local authorities are also empowered to deal with most kinds of pollution. In return for providing municipal services, they charge their services through house assessment payments.

Both DBKL and MPPJ have an Urban Services Department (USD) which provides municipal services for the operational areas under their jurisdiction. And solid waste management is one of the most important aspects of that operation. For instance, the USD spend almost 60 per cent of their allocation for managing solid wastes. In 1993, DBKL spent a total of RM43.8 million on solid waste management whereas MPPJ in

1994 spent a total of RM12.7 million on solid waste management, including RM2 million for fill layering material.

The most common form of solid waste disposal is controlled tipping at a landfill site. There is no incineration as yet although DBKL has initiated feasibility studies. Other methods of alternative disposal, such as recycling, composting, organised by the government on a periodic or mass scale level is still experimental. Recycling has been practised for some time already, but much of this is done by companies with the resources to collect, and subsequently to recycle wastes useful to them. Also the consideration is very much in terms of economics.

c) Waste Recycling

The government has been involved with the private sector in discussion on recycling activities, i.e. waste separation and recycling programmes. For instance, the MPPJ had worked with the Glass Manufacturers Association of Malaysia, Malaysian Plastics Manufacturers' Association, etc. At the federal level, the Ministry of Housing and Local Government, and including even the EPU and the Department of Environment, are members of various consultative committees, formed to discuss the recycling issue. How useful these consultative processes have been to the recycling effort, we have not been able to assess.

Overall, the public record for recycling schemes have generally been less than effective. The household has been the focus of recycling campaigns by local authorities. The most successful to date appears to be the MPPJ, but even here the success has been limited. MPPJ have organised for several areas in Petaling Jaya, campaigns to separate glass, plastics, newspapers, and aluminium cans.

The Majlis Perbandaran Ampang Jaya (MPAJ) also printed brochures primarily targeted at households to encourage separation of wastes. DBKL had also launched some recycling programmes, most of them on an ad-hoc basis. However, because of poor response, these programmes had already been terminated.

Currently, there are several major channels where post-consumer waste is retrieved and diverted back into the recycling-cum-production system; these include :

- Waste pickers at the dump sites
- Collectors at dump sites
- Municipal garbage collectors
- Middleman collectors (including the agents and traders)

Waste collected by waste pickers and municipality workers is mainly sold to the collectors at the dump site. In the case of the Kelana Jaya dump site, three collectors are stationed there (one for aluminium waste, another for ferrous metals and the third for paper, plastic and glass waste) while in the Jinjang North dump site, only one

collector (a family business) is present and is basically operating as a monopsonist buyer at the site. The scavenging and trading activities of the waste pickers are more prominent at Jinjang North while trading activities of the municipal workers are more pronounced at Kelana Jaya.

The dump site collectors would then resell their waste to either a middleman collector or supply straight to the recycling manufacturers themselves. Waste separation may or may not occur along the way, but when it reaches the middleman, most of the waste would have been separated into appropriate categories. The separation and baling may start as early as at the dump site collector stage. At Jinjang North, the collector has a truck weighing machine, compressor, and baling equipment. But this is not the case with its counterparts at Kelana Jaya.

The usual materials transacted at the dump sites include :

- various types of paper wastes (including cardboard boxes)
- HDPE plastics
- bottles
- aluminium cans
- metals (especially iron products)
- rubber slippers and footwear
- old batteries.

In Petaling Jaya, all types of paper wastes, iron products, aluminium products, car batteries, and rubber slippers are in high demand. Plastics products however does appear to have a fluctuating trend. That more recyclable materials have been taken out from the waste stream indicates that there is a greater collection effort, and possibly a greater use of wastes in today's consumer goods.

The current recovery rate for the various items is insignificant. The overall waste recovery rate for Petaling Jaya of 1.8 per cent - which is probably the best performance by regional standard - is indicative of the extremely poor national scenario. Given that the developed countries could recycle 15 per cent or more of specific waste items (with some items achieving more than 50 per cent), recycling in Malaysia has still a long way to go.

Because of the way the government is currently organised and financed, recycling activities must be national in scope - that is, through a unified effort by the federal, state and local governments - which would comprehensively address the social, institutional, economic and technological obstacles to recycling.

Local authorities by themselves do not have the resources to manage solid wastes properly, much less are able to undertake comprehensive recycling efforts on their own.

2.0 Waste Recycling Experiences of the Industry

a) Supply and Demand Scenario

As far as recycling is concerned, industrial wastes is not a problem but consumer waste is. There is a general preference for factory waste because :

- Homogeneity of in-house waste ensures consistent quality with raw material input
- Ex-factory waste is generally cleaner and non-contaminated

The industrial waste, per se, has already been taken care of; where there is no recycling in-house, factory waste is passed back into the industry for recycling via a tender-bidding system which is in operation currently. What remains to be done is enticing the public at large to recycle.

Recycleable waste is in demand because of its inherent advantage over raw materials; it is generally cheaper than virgin materials and for some product technology, adding more recyclables actually lowers energy usage. For the same amount of energy, more output can be generated using recycleable materials. Glass, paper and aluminium products are typical examples.

Indeed, the current demand for waste far exceeds its supply. The situation can get as desperate as recyclers resorting to importing wastes from overseas, much like the reverse case where aluminium cans from Malaysia are exported to Japan.

Retrieval of post-consumer waste remains relatively low. Contamination of post-consumer waste, coupled with a limited collection infrastructure, has generally resulted in fairly low levels of recycling. Unlike factory waste recycling, the community-based recycling efforts are too few and far between. As such, from the recycling industry point of view, there is a need to enhance more recycling of post-consumer waste

In view of the demand by private recycling industry and the apparent lack of community-based recycling initiatives, the local authority can certainly assume a catalytic role in closing the recycling loop.

b) Recycling of Glass Bottles

In the case of glass recycling, there is hardly any organised door-to-door collection or a "bring" type collecting centre for glass. The ultimate buyer would normally source supplies from a few multi-product collection centres. There is a fair bit of inter-state transport of glass recyclables.

To ensure an adequate supply of glass waste, the recycling manufacturers have also tried to organise community-based recycling projects, appoint private contractors to collect factory waste and build up buffer stocks. The manufacturer will also entertain the occasional drop-in glass waste sellers.

Some of the bottles are reused or crushed into cullets to be recycled, the rest may be sold to a trader who in turn may export it to Thailand where the bottles are converted into lamps for lighting purpose.

The general characteristics of glass recycling are as follows :

- Saves on virgin material and energy
- Quality maintained despite using recycled glass
- Current industry leader uses only 20%-40% glass cullets
- Great potential as industry leader plans to use 70% glass cullets
- Potential areas for recycling include schools, hotels, clubs and households
- Separate collection is needed
- Greater reuse could be encouraged
- Currently, only about 3 per cent of glass waste is recovered recycled

c) Recycling of Aluminium Cans

In the case of aluminium can waste recycling, there are not many collecting agents and household awareness of their presence is limited. The collection agents are normally sundry shop operators who buy cans from drop-in customers. These cans are then resold to a major trader who in turn exports them.

The aluminium trader or middleman may also source directly from communities, via community based recycling projects. On the whole, the trader relies on factory waste for a constant and regular supply, in addition to importing waste.

The general characteristics of aluminium waste recycling are as follows :

- Saves on virgin material and energy
- Recovery is elaborate but with almost 100% recyclability
- For sheet and extrusion products, industry leader uses about 40% of recyclables as raw materials
- All aluminium cans recovered are exported mainly to Japan
- Good potential for recycling because of higher consumption
- Currently, less than 2% of non-ferrous products are recovered
- More waste separation effort is needed from households
- Separate collection is also needed

d) Recycling of Paper

Paper recycling is probably the most systematically organised of the 5 industries studied. Reason, the high price of old newspapers. The hierarchy of agents and traders in this industry is probably greater in view of the spectrum of operational units ranging from sole agents to very large traders.

A substantial amount of household and office paper waste would have been sieved out by the many collection agents before final disposal at the dump sites. At the dump site, the municipal workers would also deliver and sell the paper waste gathered on their rounds of garbage collection.

Manufacturers generally would opt for paper waste in view of the growing shortage of virgin pulp and the associated higher price of the materials.

The general characteristics of paper waste recycling are as follows :

- Greatest sectoral recovery because of high price
- Large number of waste paper collectors are in operation
- Almost all kinds of paper grades can be recycled
- Recycleability degrades gradually; maximum of four recycle times
- More prone to contamination which retards recovery
- Great recovery potential; for example, for producing newsprint which is entirely imported currently
- Leading paper mills use almost 100% waste materials
- Households and offices are potential areas for recovery of paper wastes
- Only 6% paper waste are recovered currently

e) Recycling of Plastics

Waste pickers and municipal workers sell plastic wastes to dump site collectors who in turn resell them to plastics traders. The traders end up selling wastes to numerous small businesses producing recycled resins products and materials.

Some companies use only waste as raw materials and would do their own crushing or shredding. There are also re-compounders who blend industrial plastic waste with virgin material to meet industry standard resin specifications. The recycled resins are then marketed to producers of low cost products and converters using blended resins.

The general characteristics of plastics recycling are as follows :

- Plastic recycling is the lowest of the five sectors studied
- Great product versatility with rising consumption, but low recovery
- Problem appears to be limiting technology and lack of investments

- Cheap virgin materials (for example, PP and PE) hinders recycling efforts
- Environmental hazard because of poor degradability and can be landfill item hazard
- Very limited recovery potential because of cheap raw materials and high labour costs
- Typical recoverable materials include PP, HDPE and LDPE
- Less than 0.7% of plastics are recovered
- High-energy content is suitable for incineration but has high effluent toxicity

f) Major Issues and Problems

There are two major issues as far as community participation is concerned :

- Current community-based recycling programme is too disperse and fragmented to be a major source of supply of recyclable wastes
- Activating a community-based programme is one thing, ensuring that the recycling programme is sustainable is another.

The major recurring problems encountered with recycling efforts include :

- High degree of waste contamination
- Low volume waste at designated collection sites
- High cost of collection

For waste to be readily and economically recycled, collection cost must be low and a strong final demand is vital. It is only when demand for the recycled product is strong enough to cover collection cost that recycling will take place. While the recycling activity in Malaysia has still got some way to go, the general modus operandi for effective recycling is to ensure that there are end uses for the waste collected. In this respect, it is important that recycling efforts be market-led.

3.0 Experiences of Community-Based Recycling Programmes

a) Residential- and School-Based Recycling Programmes

In the case of community-based programmes, the performance of recycling programs launched in residential areas and schools show mixed results. For the successful programmes, some common traits are discernible. These include:

- Baseline awareness and education of participants within a community
- Presence of an external agent to monitor and foster the recycling programme
- Continued education and follow through by external agent and/or other organisers

- Support from management (principals, recycling companies, developers)
- Free collection
- Payment for recyclables
- Incentives such as competition and prizes also play an important role in schools

The common problems of failed recycling campaigns include :

- Lack of groundwork and overall support by organisers
- Failure to properly inform neighbourhood or school about the recycling program
- Participants not properly briefed on the mechanics of the programme
- Importance of recycling and separation not instilled
- Lack of follow-up and motivation
- Lack of the right kinds of incentives

Groups participating in recycling had some recommendations for future recycling campaigns. These include :

- Getting the public excited about recycling and waste separation through sensational means, such as scare tactics (wastes will contaminate your drinking water supply), appealing to their moral obligation (for your children's benefit), or participating in a novel and fun campaign (eg Rakan Muda type programme) or using competitions to stimulate interest. All types of media and promotions should be considered
- Doing proper and thorough ground work before launching of a recycling campaign
- Continued monitoring, education and follow-up throughout the recycling program
- Introduce incentives such as prizes and cash payments
- Secure support from developers, government and recycling companies to the community via programme sponsorship
- Getting Malaysians involved with the least interference to their life style

Malaysians will not pay to recycle. Making them pay extra at an initial stage will kill off any recycling programme.

b) Recycling at Offices, Commercial Complexes and Institutions

As far as the commercial sector is concerned, the hotels are making a head-start in recycling. However, the overall results are not encouraging; there are various problems faced by both the initiator and the collectors. The most prevalent problems being :

- Waste contamination
- Infrequent collection

In commercial complexes, cleaners separate out old newspaper for subsequent sale to collection agents. The cleaners' do this on their own private initiative and is not an explicit policy of the firm they work for.

The private waste collector who collects the daily garbage does not engage in any waste separation or recycling activity.

In the case of the offices, recycling is currently practised on a limited scale. This takes the form of re-use of "clean wastes" like paper and envelopes. Recycling of other solid wastes did not appear to be in the mind-set of these firms.

Nonetheless, the respondents have indicated a willingness to participate in a waste recycling programme and to organise their staff to separate wastes if a workable collection system exist. That being the case, separation of wastes at source could be quite easily instituted.

The most critical factor that needs to be considered is the lack of space in most commercial organisations for storing recyclable items. Collections would have to be regular and consistent. Apathy is another factor to consider. Recycling programmes can only achieve limited success unless such public attitude can be overcome.

4.0 Consumers' Perception and Attitudes towards Waste and Recycling

a) Perception and Attitudes towards Waste

Environmental awareness of the public is generally superficial and limited; much is influenced by issues carried in the media. The media tends to carry sensational stories rather than report the details real. However, localised waste problems have taken more of the public's attention than the over-filled landfill and dump sites.

The majority of the respondents in the focus group surveys are generally satisfied with waste collection in their residential areas though some aspects of the localised waste problem need addressing. Some of these concerns include :

- Rubbish that is not collected and taken away (which recurs now and then)
- Rampant internal littering and indiscipline waste disposal
- Filthy conditions in hawking areas which attracts rodents

The problem of over-filled dump sites is relatively distant to most residents, though higher income residents did accord it some importance, but don't regard it as urgent. Most do not know what happens after the waste leaves their homes. Environmental problems associated to methane gas and leachate do not mean anything to them other than by-the-way comments of dirty, polluting, health hazard, congestion, etc.

b) Perception and Attitude towards Recycling

Few are interested in recycling, if it involves extra effort on their part. They are prepared to do only a limited amount of extra work to recycle. They feel that Malaysians - at their current level of environmental awareness - are not prepared to do extra work to ensure the success of a recycling campaign.

The main reasons can generally be attributed to :

- Apathy or human mentality
- Busy, fast and stressful lifestyles
- Inconvenience and not having the time to do so
- Limited storage space for waste
- Low volume of recyclables generated
- Absence of buyer for waste

This in no way implies that residents are adverse to recycling. On the contrary, they indicated that their interest in a recycling programme can be aroused under certain conditions :

- Sustained publicity campaign on the recycling project in the neighbourhood
- Education on the waste problem and the need for recycling
- Keeping them informed and updated on the programme
- Fixed and regular collection schedule with a buyer for the waste lined up
- Money incentives (an important factor for the lower income residents)
- Convenience factor such as minimal waste separation (especially in voluntary schemes) and door-to-door collection is generally preferred, though "bring" collection would also do if the distance to the collecting site or centre is only a short distance
- Low-cost waste separation efforts

In terms of policy implementations, these would encompass :

- Publicity and project education
- Convenient recycling programme
- Low-cost programme to the residents
- Regular and fixed collection schedule
- Utilising the residents' association to mobilise efforts and create cohesion

As for the enforcement of law - for example, mandatory waste separation - in recycling, the residents are generally ambivalent. It suffices to say that much will depend on the effectiveness of enforcement. While it may have short term effects, enforcement will not foster the necessary attitude changes to ensure long term success.

5.0 Major Recommendations

a) Establishing Concepts for Waste Management and Recycling

The goals and objectives of a comprehensive plan for waste management and recycling are :

- To develop eco-efficient approach to waste management in the country
- To close the loop for waste to flow back into the production system

Policy strategies and measures must be able to comprehensively tackle all possible levels of waste generation problem and management. These levels may be broadly sectionalised into :

- Level 1 : Usage of virgin materials and recycled materials
- Level 2 : From production to distribution and consumption
- Level 3 : From consumption to immediate waste disposal at site
- Level 4 : From waste collection at site to waste disposal at dump site
- Level 5 : Final waste accumulation at dump site

In essence, this entails an integrated approach for waste management and recycling and employing the following:

- "4Rs" strategy - namely reduce, reuse, recycle and recover
- composting
- maintaining quality standards for waste dump and sanitary landfill

From a perspective of minimising environmental impact, the most desirable action is to reduce the amount of waste generated, followed by reusing materials for the purpose it was originally intended. Next comes the recycling of the non-reusable material and finally the recovery of energy from waste that cannot be reused or recycled. The last step, of course, is to dispose of the remainder by landfill or other approved method.

b) Policy Measures for Waste Management and Recycling

Within the integrated waste abatement strategy outlined above, policy measures can be framed according to these broad policy thrusts :

Increase usage of waste as raw materials for production

- undertake a comprehensive review of current industrial policies and incentives which distort market pricing in favour of virgin materials
- introduce remedial policy measures such as removing of subsidies and imposing taxes on virgin materials, and introducing industrial incentives such as allowances and tax exemptions in favour of recycled materials used as production inputs.
- educate waste separators and collectors on need to ensure that recycled materials is free from contamination

Reduce waste generation and increase reuse in production-distribution-consumption

- reduce waste generation at the production-distribution stage by enforcing a packaging reduction programme (for example, take-back waste and minimal packaging) and encourage use recycled packaging materials
- encourage greater reuse of the materials or products by reintroducing bottle deposit scheme or taxing one-way containers
- encourage the consumption of recycled-material end products via "green" purchase policy for public sector and financial incentives for private consumers
- facilitate market identification for products made from recycled materials (especially the plastics industry) and R&D activities on recycling technologies and products

Enhance waste recycling activities within communities

- put a value to waste
- educate and create awareness among the public on a broad front
- introduce and itemised waste collection and landfilling cost in yearly property assessments
- adopt community-based recycling programme at residential areas, commercial complexes and institutions like schools, etc.
- expand the role of the private sector in waste collection and recycling via market-based incentives
- examine policy related to sustaining a market for recycled materials

Promote further waste retrieval and recovery at dumpsites

- rechannel indiscriminate waste disposal back into the formal waste stream for further retrieval via strict enforcement
- establish waste sorting facility at dump site
- reduce waste volume through incineration and composting
- formalise the role of the municipal waste collectors and expand their activities into waste sorting

Establish quality standards for dumpsites

- ensure that quality standards are employed for waste dumps
- be more vigilant about the methane gas emission and leaching at waste dumps and
- be pro-active in implementing remedial measures to control and manage the problem more effectively

Other policy issues and measures

- Legislation such as mandatory waste separation and effective implementation can certainly play a role in ensuring success in an integrated approach towards solid waste management
- Raise awareness is equally important, if not more
- Increase corporate responsibility for preventing waste via the promulgation of waste stewardship offers much potential
- Waste stewardship and shifting part of waste management to manufacturers

c) Proposed National Framework for Recycling

The central features of the federal and state government efforts would evolve around formulating market-based incentives to stimulate the recycling industry. These include :

- Review existing policy measures which inhibits recycling
- Roundtable discussion with private industry, recyclers and NGOs to review relevant issues and problems and to formulate long-term public sector policy measures to mitigate waste accumulation, to promote recycling efforts of the private sector and to induce recycling activities among the public
- Outline the national strategy and policy framework for waste abatement
- Raise public awareness on a nationwide basis on recycling via public education on waste problems, management and recycling
- Extend financial support for recycling as a low-cost waste abatement strategy to local governments
- Compile national data and statistics on waste generation, recovery and disposal
- Set reasonable targets for recycling and waste reduction over time

As far as the local government is concerned, the action plan may include :

Immediate-Term Policy Measures
<ul style="list-style-type: none"> • Enhance or initiate pilot community-based recycling activities • Secure participation of federal, state and local governments, private sector and NGOs in community-based recycling programmes, financing, publicity and public education • Coordinate formal and informal municipal solid waste management practices; need to outline the recycling roles of the municipal and private waste collectors • Understand more clearly the economics of solid waste disposal services within the context of the local authority • Formalise the recycling role of municipal waste collectors • Ensure existing solid waste collection is regular and reliable in all pilot recycling areas • Regulate and improve waste picking and collection at dump site • Establish a waste sorting facility (for example, a shed) • Monitor waste generation, recovery and disposal at the dump site • Explore the adoption of composting at dump site, residential area and backyard for future implementation

Medium-Term Policy Issues
<ul style="list-style-type: none">• Establish a waste data bank at the municipal level• Establish reasonable waste reduction targets• Extend community-based recycling projects to more residential areas, commercial complexes and offices• Explore option to itemise house assessment to collect charges for environmental services• Implement composting project for communities
Long-Term Policy Issues
<ul style="list-style-type: none">• Ensure recycling efforts and activities operates within the national solid waste management framework• Continue expanding community-based recycling projects and sustaining education• Increase recycling rates of all waste generators• Implement environmentally friendly solid waste disposal system

CHAPTER 1 INTRODUCTION

In urban Malaysia, its population throw out their solid wastes and the local authority is responsible for its collection, and eventual disposal. Kuala Lumpur residents dispose about 3,000 tons of solid waste every day, of which about 2,500 tons are collected and transported to the disposal sites. The most common form of solid waste disposal is controlled tipping. For Kuala Lumpur, the two landfill sites at Jinjang and Sungei Besi are already near capacity, and were expected to close in 1994. As of March 1995, these two dump sites are still operating (Star, March 18, 1995)

At present, there is no incineration, although the Kuala Lumpur City Hall (DBKL) is now considering this as a serious option (Star, May 30, 1995 "KL to go ahead with incinerator study") Other methods of alternative disposal, such as recycling and composting are still experimental. Recycling has been practised for some time already, but much of this is done by companies with the resources to collect recyclables, and subsequently to produce goods from them. Such considerations are very much determined by economics.

Several local governments have expressed interest in resolving the problem of too much garbage and solid waste since their disposal sites are filling up, and suitable replacements are difficult to find. Recycling has been the most commonly identified option. However, the public record for effectively implementing such schemes have been dismal. The most successful to date appears to be the Petaling Jaya Municipal Office (MPPJ), and even here the success has been limited (see New Straits Times, January 16, 1995 "Key to success in recycling").

After a four year trial, supported by a multinational firm's contribution of plastic containers, MPPJ came to the conclusion that "the best way" to recycle is to separate wastes into wet and dry types. The dry wastes have been taken to a disposal site where waste pickers sort the materials which could be recycled, and then these materials find their way to manufacturers.

In short, recycling needs to be organized in a complete manner, that is beginning with some separation (wet and dry) at source (households), and then using waste pickers to collect and then sort out the recycleable materials at the disposal site.

But really how much do we understand about recycling in the urban areas? Is there a good understanding about the people who throw out "rubbish"? Are the government's findings from its pilot projects all that is known about recycling? What is known about the manufacturers who buy up "wastes" and then turn them into consumer goods or parts of consumer products. Is there sufficient understanding about consumers, i.e. their preference for buying recycled products?

These are some of the research questions which will be attempted in this study.

1.1 Objectives Of This Study

In the area of recycling of solid wastes, there are altogether four main interest groups. the industries which recycle the wastes, the individual consumers and/or producers of wastes, communities which are likely to initiate some changes to solid waste recycling programmes, and the local government which is responsible for disposal of the wastes. As such, the main objective of this study is to provide insights to:

- a) The recycling industries
- b) Consumers
- c) Experiences of communities which have practised recycling
- d) Local authorities.

It is important to take note that the issue of wastes is a very big issue, spread over households to industrial to commercial sectors. This study will focus only on household wastes. This of course ignores wastes such as oils and grease, or even old tyres generated from motor workshops, or iron & steel products, offices and commercial areas or factory operations. This study will also not cover organic type wastes, such as kitchen wet waste, organic biomass (such as trees, branches, grass, etc). We are primarily interested in wastes which have recycling potential within households. Amongst the types of wastes which will be covered include: paper, plastics, glass, and aluminium (cans).

It is our firm belief that in order for recycling to work, it must be a process which is thought through, beginning from the waste generation end, to its separation, collection, and redirected to those who have a need for them.

As such, the objectives of the project will be as follows:-

- a. To conduct a study of four main groups involved in the recycling process, i.e. individual consumer, community experience, local governments and recycling industries.
- b. To focus on particular communities or localities such that the results of the study could be directly used in the implementation of recycling programmes.

1.2 The Study Approach

As there are a number of different key groups (such as the people, government, solid waste companies, communities, etc) in this study, we intend to adopt a multi-prong approach to examine this problem. The research work for each of these groups are discussed in turn so as to provide a more perceptive insight into the issues which concern them.

a) Recycling Industries

For this part of the study, the intention is to compile a list of firms that use wastes as inputs, and produce consumer products, packaging, from waste products, etc. After a list is compiled, the intention is to carry out a survey of these firms. Key issues to examine include: the nature of products that are recycled, the quantum that is recycled and capacity of such industries for recycling, the recycling technologies which are in use, environmental or health issues, recycling costs, their coverage and frequency of collection, the organization of waste collection, etc.

It is the intention to study closely the problems that they face. By examining the nature and where possible, the trends of such firms, our intention is to identify the factors which could contribute towards its greater distribution, etc. The government may wish to have a policy to encourage its greater proliferation after they understand a bit more about their operations and problems, and they will have a basis by which to formulate such policies. A key issue here is to examine the potential for the expansion of the operations of these firms, both in the numbers, capacity as well as the types involved in recycling.

A questionnaire has been designed to capture the details of the firms, and issues identified above. The key industries which will be examined in this report include: glass, paper plastics, and aluminium.

b) Individual Consumers

Consumers play an important part in the entire process. They determine how much products get thrown away after they have finished with its consumption. They are buyers of products, and their preference for recycled products, the type of packaging, etc. Their consumption patterns and lifestyles make a difference on how much wastes are generated. We postulate that the social class character of consumers also play an important part in the composition of goods they consume and concomitantly the wastes they generate. However, previous solid waste studies may not have paid enough understanding to the social aspects of the solid waste problem. This study intends to gain a better understanding of the social aspects of solid waste disposal, the people's attitude towards "garbage", and the possibilities for change to their attitudes and lifestyle. At this day and age, some people may feel good about recycling, even though they may not have much idea how relevant that may be for the overall environment.

In that respect, we intend to conduct several focus group surveys. Focus group surveys are better at gaining a deeper understanding of perception, attitudes, and their interaction are likely to reveal preferences for environmental quality. We intend also to gain an understanding of their willingness to pay (WTP) for a better quality of life, and their associations with solid waste disposal, and related matters. The focus will be on persons and households, trying to gain an understanding of their attitudes towards reusing products, willingness to separate at source, using proper solid waste procedures laid out by the local authorities, etc.

Theoretically, focus groups will yield best results if a good psychographic profile of the population is available. At the moment, no such profile is available. Hence, we will have to stratify the population into the traditional socio-economic categories: by income, ethnicity, and possibly location of their residency.

A community case study approach will be adopted in the sense that residents from selected communities will be identified to participate in the focus group study. For this report, we report on four focus group studies for high density living: a medium income condominium, a low cost public housing residential area, and two middle to upper middle class housing areas in Bangsar

c) Community Action

It has been the experience of other countries that community action has been a major factor accounting for the success of recycling programmes. It is important for this study to try to understand the groups which have tried to do this locally. What have been their experience, their problems with the communities, governments, waste collectors, etc. Why have they succeeded, and more importantly if they failed, then the major factors.

The study will try to identify communities which have tried and are trying to implement recycling programmes. Interviews will be carried out with these groups to identify the issues involved, and get a better understanding of the factors which are critical to the success of recycling programmes.

Among the communities which were studied include schools, a residents association's effort, a medium income condominium residence, and management corporation of a major office and commercial complex.

d) Local Authorities

Local authorities are the managers of post-consumer wastes. Once the consumer throws out the "garbage" bags, it becomes the responsibility of the local authorities to collect them, transport and then dispose them. Although most consumers do not know, they pay for this service through the house assessment, to the local authority.

Understanding their problem with respect to solid wastes, getting a better insight into the resources they have at hand to address such problems, learning from their recycling experience and the resources they have put into pilot projects and programmes, organizational and other components. Although the large local governments are the ones with more resources, they are also the ones with bigger problems. The scale of problems may rise disproportionately with the resources needed to resolve them. How do local authorities view recycling? Do they think that such alternative methods could help them reduce their problems or resolve them? What policies are in place to help them? What are the government's present thinking about resolving the solid waste issue. A clearer understanding of these issues will be useful for the study.

Here, apart from DBKL Urban Services Division, we have interviewed the MPPJ USD as well. We have also visited the waste dump sites of both DBKL and MPPJ. However, our efforts to seek cooperation from the MPAJ were not successful. It should be noted that the MPPJ has been the most successful in terms of recycling. This much was acknowledged by the agencies and firms who were interviewed.

An interview survey was also carried out with other agencies such as the Ministry of Housing and Local Government (Local Government Division, solid waste programmes). Again, we were not successful with the EPU because they are currently evaluating the 26 bids for the privatisation of the national solid waste program.

1.3 Scope Of Work

The following scope of work was carried out:

- i. Literature review of the major studies on solid wastes in Malaysia. This review covered recycling also. The purpose of this review was to provide as much background information on recycling and solid waste as possible, so that this study will benefit from the context which it is able to establish.
- ii. For the recycling industries survey, it was limited to only paper, plastics, aluminium cans, and glass. For this part of the study, a listing of recycling firms was compiled, an interview questionnaire was designed and used to record the data and information of the firms. We carried out 12 interviews or 3 per sector, stratifying the firms by the nature of products they recycle, size (labour) and possibly other variables.
- iii. Focus group surveys proved to be more difficult to handle but the usual stratifying criteria of income, ethnicity, and type of residency had to be consented by DBKL. Eventually, it was agreed that Bangsar was to be the place where most of the focus groups were to be held, since then they may have better information to design a recycling program for a particular area. Materials for focus group surveys were developed and conducted for 4 focus group sessions, distributed by
 - Low income housing area; high rise high density flats
 - Middle income housing types, condominiums
 - Upper income residential types
- iv. Communities which have been involved and/or are involved in recycling projects were identified. In all, there were only two communities which we were able to contact and interview, although we intended to interview five. In the end, we decided to rope in other types of non-residential communities such as schools, hotels, etc. Interviews were carried out with the heads or initiators of these groups. All the groups selected willingly shared their experience and provided detailed insights.

- v Interviews with local governments were also carried out. Sessions were conducted with various officers of Dewan Bandaraya Kuala Lumpur (DBKL) and the Majlis Perbandaran Petaling Jaya (MPPJ). We were not successful with Majlis Perbandaran Ampang Jaya (MPAJ) We managed to interview the persons who were directly in-charge of solid wastes management. We had also wanted to conduct a group session with the DBKL USD staff on what they understood to be the recycling concept and what was achievable, but we did not achieve this due to various reasons.

Another key government agency was interviewed -- the Ministry of Housing and Local Government. They provided some information on the recycling program for local authorities. The Ministry is very concerned about the lack of success of recycling efforts, and they have been keen to explore other avenues than the traditional means to see how recycling activities could be expanded.

- vi. An office survey was carried out with administrative managers of firms in a small area within Kuala Lumpur. Here we decided to interview firms which were housed in an office complex. We chose the Pertama complex along Jalan Tuanku Abdul Rahman, and a block of two storey shophouses nearby to examine whether there were any differences between individual firms and the corporation which managed the building services.

1.4 Layout Of This Report

Chapter 2 of this report discusses the role of the government. It examines the three tier structure of Malaysian government, and discusses solid waste management and recycling efforts of the DBKL as well as MPPJ. Chapter 3 reports on the results of the focus groups, and outlines the issues which are of concern to the individuals who were interviewed. In Chapter 4, we discussed the experiences of various communities in recycling and their experiences. And in Chapter 5, the industries and their recycling efforts were examined in detail. Chapter 6 provides a summary of the major findings and major recommendations can be found in Chapter 7. Appendix showing the list of firms, communities, and groups interviewed.

CHAPTER 2

ROLE OF GOVERNMENT

The rapid pace of economic growth in Malaysia, averaging over 8 percent per annum, over the past 8 years is impressive by any standard. During that period, there has also been very strong developments in expanding urban areas, rising affluence of its population, population growth, and greater levels of consumption

With these trends consolidating over time, there has also been greater pressures the urban environment. Emerging problems include the haze which, though sparked off from offshore sources, are being generated by mobile sources in the greater Klang Valley area. Other hazards being reported are polluted rivers and waterways, indiscriminate dumping of chemical wastes, soil erosion resulting in floods, and an increasing problem with solid wastes.

Among the more urgent urban environmental problems is the very limited space remaining for dumping solid wastes. This problem is getting so serious that the local governments have to resort to using dump sites which were scheduled to close last year. The sad part is that there does not appear to be any other short-term solution in sight.

In this chapter we want to explore the role of governments in solid waste management, for instance, resources and options available to local governments to manage solid wastes in a more comprehensive manner. We are of course aware that the federal government has called for bids to privatise the solid waste collection and disposal at the national level. That aside, the recycling option should nevertheless be explored in depth as it is one way in which the volume of the waste stream to dump sites could be reduced.

First, we shall discuss the role of various levels of government in environmental management. Next, we will discuss and analyse the situation with solid waste management at the local government level. Following this discussion, we will analyse the recycling option, and examine their experiences, and discuss issues relating to their failure or success.

The role of government in environmental management in Malaysia is fragmented into various sectors (see Institute of Advanced Studies, University of Malaya, 1992). In the area of solid waste management, the entire responsibility falls on the local government. However, other government agencies are also involved. For instance, at the end of 1994, the Privatisation Taskforce of Economic Planning Unit (EPU) had invited private firms to make bids for the privatisation of solid waste collection and disposal for all local authorities in Malaysia (Business Times, 1995). Other environmental aspects of the solid wastes, e.g. incineration, leachate treatment, etc., would intrude into the Department of Environment's territory. If one were to include aspects such as consumption, which is the source of solid waste generation, then the Ministry of Domestic Trade and Consumers would be involved. And the Ministry of Housing and Local Government whose portfolio the local government's administration fall under is another very important agency which deals with the policy aspects of local government administration. Notwithstanding this, the Ministry of Finance is probably the most powerful ministry in terms of its role in financial resource allocation, and the determination of whether local governments get the budgets which they ask for.

In this respect, the role of government should be clearly understood. This chapter attempts to provide an overview of the role of government in environmental management. Next, the experiences of local authorities with regards to solid waste management and recycling situation, especially with respect to two local governments in urban Malaysia: Kuala Lumpur and Petaling Jaya. In the case of Kuala Lumpur, the Dewan Bandaraya Kuala Lumpur (DBKL) is the principal authority in-charge; for Petaling Jaya, it is the Majlis Perbandaran Petaling Jaya (MPPJ).

2.1 The three tiers of government in environmental management

Malaysia has three tiers of government, namely the federal, state and local authority.

Lam MP (1984:36-48) documented the Malaysian government structure in a general manner. At the federal level, the Prime Minister is the head of the executive arm of the federal government; and the government is divided into different portfolios each headed by a Minister. A secretary-general heads the civil section of each ministry. The functions and responsibilities of the federal government are listed out in the Federal Constitution, Ninth Schedule, otherwise known as the Legislative List. They include eight (8) main areas -- external affairs, defense, internal security, civil & criminal law, federal citizenship, Finance, Trade, Commerce and Industry, and federal government machinery (eg elections, federal services, pensions & compensations, federal government contracts, etc).

It ought to be mentioned that in addition Sabah & Sarawak have the above and various other rights than those for the states in the Peninsula. A more detailed exposition of this can be found in the Federal Constitution, in the Ninth Schedule.

At the federal level, the Ministry of Science, Technology and Environment is the principal ministry in charge of environment. Under the Ministry, the Department of Environment is the principal agency involved in environmental protection and management. Although the Minister has three portfolios under him, the Environment portfolio is the largest, and presumably the most important, at least for the time being. The environmental portfolio was started since 1975 when the Environmental Quality Act (EQA) was adopted, and a minister was appointed to take charge of affairs. A more detailed description of the Department of Environment (DOE) is contained elsewhere in this study.

The Environmental Quality Council (EQC) was established under the EQA, and is charged with advising the Minister on matters pertaining to the EQA or any matter referred to it by the Minister. The EQC has also assisted the DOE in terms of providing guidance in the formulation of policies and strategies related to environmental management. Due to a change in 1980's, the EQC was enlarged to include representatives from non-governmental organisations (NGOs). The EQC is mainly an advisory body.

The DOE formulates various kinds of emission and effluent standards for the country which are supposed to regulate pollution and abatement. By these standards, the principal component of control is actually at sources of emission or discharge. However, the DOE has been given a very important role, more especially so since the Sixth Malaysia Plan. "The DOE is the principal agency entrusted with the responsibility to monitor the state of the environment and effectively enforce laws, rules and regulations governing the environment" (6MP:409).

At the state level, the *Mentri Besar* or Chief Minister is the executive head. The State Executive Committee (Exco) is made up of State Ministers, heading various portfolios, eg Housing & Local Government, Land, Housing, etc. The State Secretary is normally the top civil servant in the state, coordinating various branches of state and federal government agencies. Amongst the important areas of jurisdiction for the state government are land, forests, local government, state works and water, various types of state machineries, eg markets, licensing & boarding houses, etc, turtles & riverine fishing, creation of offenses, etc. It is usually the State Governments that appoint persons to key posts of the local governments.

State governments have their role defined quite clearly within the Federal Constitution, and these have been stated above. It remains to be said that because the states have control over land, forest, water, and other landbased resources, it has a very powerful role in the final approval of projects. In most states, there are State level committees established specifically to handle issues related to the environment. For instance, in Penang and Johor, a State Exco Committee member is in charge of an Environment portfolio. This is probably the practise in most other states.

In addition, there is also a concurrent list, where both federal and state governments are consulted, *inter alia* on, town & country planning, public health & sanitation, drainage & irrigation, rehabilitation of mined over land (Federal Constitution, Ninth Schedule).

Then, the third tier of government is the local authority, which is incorporated under the Local Government Act, 1976 for Peninsula Malaysia, and under different legislations for East Malaysia. The local government is responsible for local authority administration of areas gazetted by each state government. These include also several important aspects of environmental management, provision of municipal services, and public health. The Act was adopted by all state governments; although not all states adopted the Act in toto (Norris, 1980). Local governments report directly to the state government.

Local authorities (LAs), by virtue of the Acts which they are in charge of, have tremendous powers to deal with local level environmental problems. In addition, LAs also provide municipal services for which they charge their services through the house assessment payments. Under the 1976 Local Government Act, local authorities deal with various types of pollution.

A National Council for Local Government (NCLG) is also provided for in the Federal Constitution. This Council has as its members the representatives of state as well as the federal departments. The principal aim of the NCLG is to formulate policies as well as operational mechanisms. It is a consultative body for both federal and state governments, and is the link between the federal to local government. The Minister for Housing and Local Government heads the NCLG.

2.2 Solid Waste Management System and Situation in Kuala Lumpur & Petaling Jaya

Kuala Lumpur City Hall (DBKL) and Petaling Jaya Municipal Council (MPPJ) have an Urban Services Department (USD) which provides basically municipal services for the operational areas under their jurisdiction. And solid waste generation is one of the most important aspects of that operation. For instance, the USD spend almost 60 per cent of their allocation for managing solid wastes (Chong, 1994). In 1993, DBKL spent a total of RM43,824 million on solid waste management whereas MPPJ in 1994 spent a total of RM12.766 million on solid waste management, including RM2 million just for purchasing of fill layering material (Chong, 1994).

In 1992, it was estimated that about 2,500 tonnes of solid waste was generated daily in Kuala Lumpur, with a per capita rate of about 1.55 kg per person per day (Chan, 1993). In Petaling Jaya, the estimated tonnage of solid wastes collected at their dump site in Kelana Jaya was estimated to be 500 tonnes daily (Chong, 1994).

The situation with the waste dump sites can be considered to be critical. Both the DBKL (at Jinjang and Sungei Besi) and MPPJ (Kelana Jaya) dump sites are already considered to be over-capacity, and both local authorities are waiting for the Selangor State Government to approve the Puchong dump site for their future disposal site, which is expected to be based on a sanitary landfill concept. However, this situation has been delayed for some time by the State Government ¹

2.3 Solid Waste Generation by different activity groups

Studies conducted by DBKL and MPPJ have shown that there are different types of waste characteristics generated by activity. Table 2.1 shows the different types of waste generators for both DBKL as well as MPPJ.

Waste generation rises with income (Figure 2.1). For instance, in the low income residential areas, it was estimated that on average they generated 2.1 kg/house/day in Kuala Lumpur, and 2.76 kg/dwelling unit/day in MPPJ. For the high income residential areas, both DBKL and MPPJ recorded about 3.1 kg/house/day.

For shopping complexes and markets, the rates in Kuala Lumpur are approximately 4 times that of those measured for the same activity in Petaling Jaya: 0.13 kg/m²/day versus 0.04 kg/m²/day for shopping complexes; and 17.3 kg/unit/day versus 3.92 kg/stall/day for wet market.

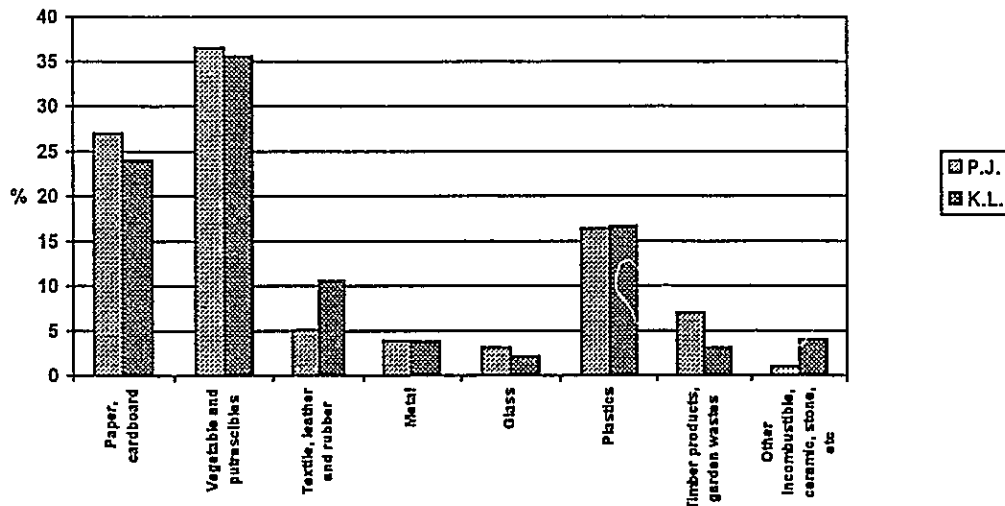
¹ In the meantime, the Privatisation Taskforce of EPU has called for bids to undertake solid waste collection and disposal. A total of 26 bids were submitted for four different regions covering Malaysia, and it is under process.

Table 2 2 Principal components of domestic refuse/residential areas in Petaling Jaya and Kuala Lumpur

	Composition	PJ	KL
a	Paper, cardboard, paper products	27.0	24.0
b	Vegetable and putrescibles	36.5	35.6
c	Textile, leather and rubber	5.1	10.6
d	Metal	3.9	3.8
e	Glass	3.1	2.2
f	Plastics	16.4	16.7
g	Timber products, garden wastes	7.0	3.1
h	Other incombustible, ceramic, stone, etc	1.0	4.0
	TOTAL	100.0	100.0

Source Chong (1994), Chan (1993)

Figure 2.2 Components of Domestic Refuse



For Kuala Lumpur's wastes, their composition by different types of urban activities are shown in Table 2.3. As can be seen, in the residential setting, the amount of garbage (household wet wastes) are much higher, compared to a higher percentage of paper and plastics in a more commercial or institutional setting.

In total, if we were to base on the materials which could be recycled from the waste dumps, i.e. glass, metals, paper, and plastics, they would be comprise about 46-50 per cent of the waste stream. However, at this stage, it may be important to bear in mind that there is already a very significant collection of the paper wastes because of their high prices (e.g. old newspaper), while the potential for plastics wastes may be somewhat more problematic because of the chemical composition of plastics.²

²

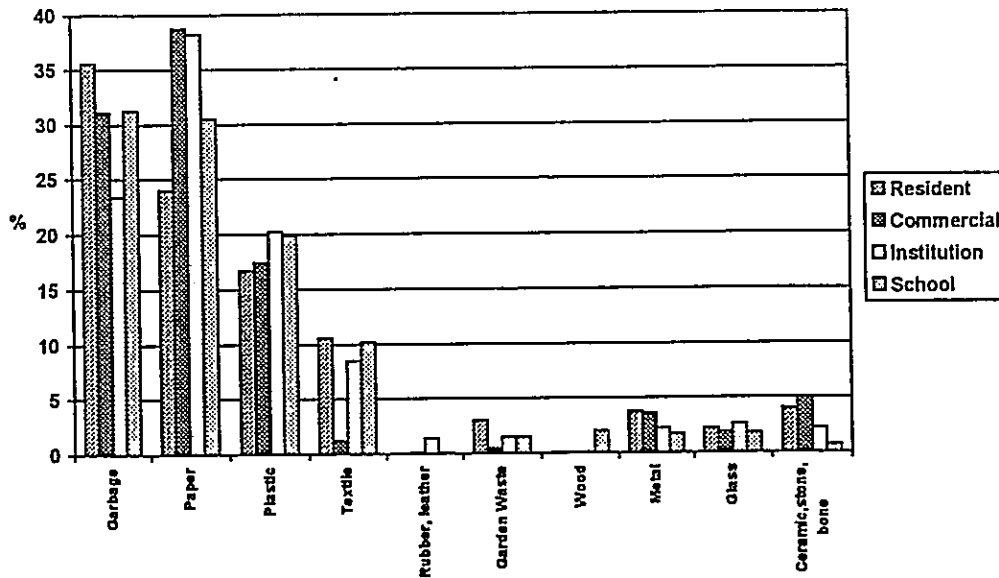
It is not the composition of plastics that is the problem, but plastic products are normally made of more than one plastic resin, and hence the recycling prospects are diminished. Another problem appears to be the possibility of contamination, and this requires special efforts at cleaning the waste before recycling could take place.

Table 2.3 Waste composition of Kuala Lumpur City (In wet & dry weight %)

Composition	Resident	Commercial	Institution	School	Whole
<u>Combustible</u>					
Garbage	35.6	31.1	23.4	31.3	32.5
Paper	24.0	38.8	38.3	30.5	28.4
Plastic	16.7	17.4	20.2	19.8	17.7
Textile	10.6	1.2	8.5	10.2	9.5
Rubber, leather	0.0	0.1	1.4	0.1	0.3
Garden Waste	3.0	0.5	1.5	1.5	2.4
Wood	0.1	0.1	0.1	2.0	0.3
<u>Non-combuustible</u>					
Metal	3.8	3.6	2.2	1.7	3.3
Glass	2.2	1.9	2.6	1.8	2.2
Ceramic,stone, bone	4.0	5.0	2.2	0.7	3.4
Total	100.0	100.0	100.0	100.0	100.0

Source : Chan (1993)

Figure 2.3 Waste Composition of Kuala Lumpur (In wet & dry weight%)



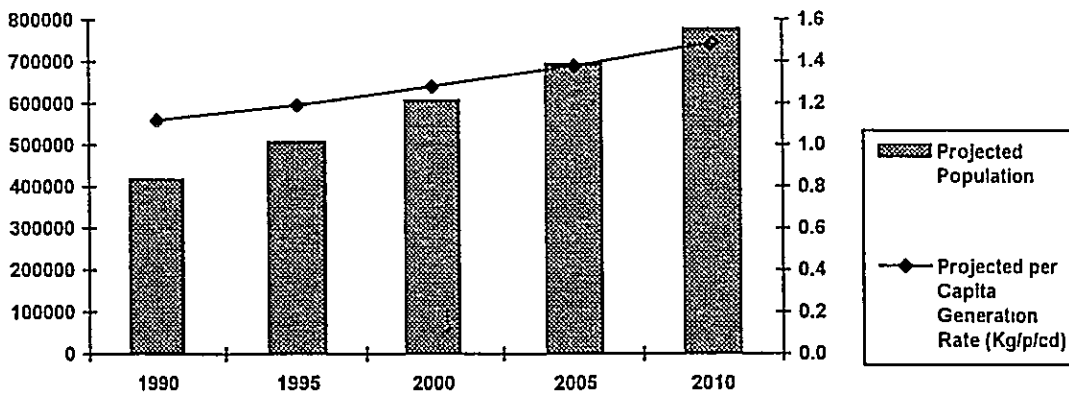
Over time, the amount of wastes generated per capita is forecasted to rise. This is in line with rising incomes and concomitant changes in consumption patterns of the Malaysian society. Table 2.4 and Figure 2.4 show the forecast of population growth with per capita generation rates, and consequent estimates of wastes generated per day for MPPJ. Over the next 20 years, total wastes generated is expected to rise from about 600 tonnes per day in 1995 to about 1,160 tonnes per day. The population projection is expected to rise concomitantly from 0.42 million to about 0.78 million by the year 2010. Per capita generation rates are to also expected to rise from 1.12 to 1.49 kg/capita/day.

Table 2.4 Projected Per Capita Waste Generation Rates, Petaling Jaya Municipal Council

Year	Projected Population	Projected per Capita Generation Rate (kg/p/cd)	Total Waste Generated (tonnes/day)
1990	419,000	1.12	469.3
1995	508,000	1.19	604.5
2000	607,200	1.28	777.2
2005	695,000	1.38	959.1
2010	777,700	1.49	1158.8

Source: Chan (1993)

Figure 2.4. Projected Population Growth and Waste Generation in Petaling Jaya



Without any doubt, the amount of solid wastes which is expected in the future will become even more acute in the future.

2.4 The Experience of Recycling in Local Authorities

The details of the recycling experience of various communities which participated in the MPPJ campaigns is discussed more succinctly in Chapter 4. Here, suffice for us to discuss only the broad characteristics of the recycling exercise.

In order that recycling be practised, wastes must be separated. This can take place at a number of levels:

- * by households
- * collection by door to door purchasers
- * during collection
- * separation by scavengers

2.4.1 Household

The household has been the focus of recycling campaigns by local authorities. For instance, the MPPJ have organised for several areas in Petaling Jaya, campaigns to separate glass, plastics, newspapers, and aluminium cans. MPPJ launched their first campaign with the Glass Manufacturers Association to collect glass separately in January 1991. The pilot scheme was launched in SS4, SS24, SS25 and SS26 residential areas. The basic feature of their program is to get these households to separate glass, with a competition for the pilot project areas. Later in April 1991, the glass recycling program was extended to shops. Other recycling programmes were launched in 1992 for plastics, paper, metals and aluminium. A special recycling program was launched for plastics in 1993.

The Majlis Perbandaran Ampang Jaya (MPAJ) also printed brochures primarily targetted at households to encourage separation of wastes. However, we have not been able to obtain more information of the performance of their programmes.

DBKL had also launched some recycling programmes, most of them on an ad-hoc basis. However, because of poor response, these programmes had already been terminated.

2.4.2 Door-to-door purchases

Door-to-door purchases of wastes are carried out on specific item basis by private collectors. These purchasers make periodic rounds to collect specific items. The most common of these are for newspapers and glass bottles.

Some of these collectors are actually private operations linked with specific industries. For instance, KL Glass has a special contractor which does all their glass collection from all sectors: condominium type management units, hotels, office buildings, and also factories. Needless to say, the factory operations are actually bigger waste generators, and they produce homogenous type of wastes. This is also the same situation with aluminium and paper.

For metals, the collectors are actually private individuals. However, these private individuals also collect recyclable materials for a variety of companies. There is a thin layer of waste buyers which act as middle men as well. A better description of these layers is contained elsewhere in this report.

2.4.3 Separation by USD waste collectors

USD waste collectors are supposed to collect household wastes. Because of arrangements made at the dump site by waste buyers, USD workers sort out the recyclable materials and with hanging bags sacks, and compartments from the waste trucks. The collection programme practised by the local authorities is kerbside collection. At both the Jinjang North and the Kelana Jaya dump sites, waste buyers standby to purchase waste from the USD workers.

2.4.4 Collection and Separation by Scavengers

At the waste dumps, there is a host of scavengers, who are individual operators, and who scavenge for materials which are eventually sold to waste collectors at the dump site.

The usual materials purchased include various types of paper wastes (including cardboard boxes), HDPE plastics, bottles, aluminium cans, metals (especially iron products), rubber slippers and footwear, and old batteries. The nature of the waste buying operations is different for both the Kelana Jaya as well as the Jinjang North sites. For instance, in the Kelana Jaya site, there are 3-4 separate buyers; each of these buy different types of wastes. At the Jinjang North site, there is only a single buyer, which buys different types of wastes.

2.4.5 Recycled materials taken out from the Kelana Jaya dump site

Tables 2.5 show the recyclable materials which have been taken out from the waste stream at the MPPJ dump site between 1992-94. The largest items (measured by weight) which are taken out are:

- * paper (including computer paper and old newspaper)
- * bottles
- * iron
- * aluminium cans and alloys
- * plastics

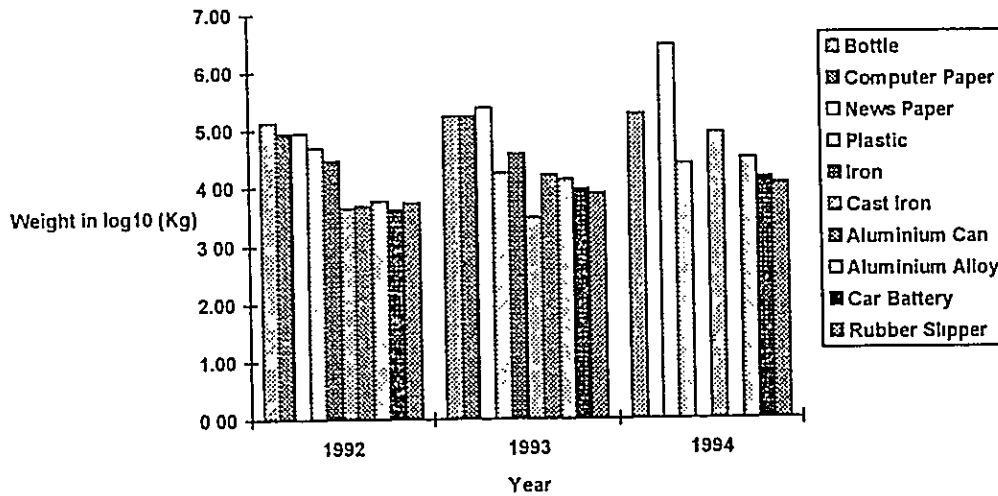
Items where the rise has been very significant are: all types of paper wastes, iron products, aluminium products, car batteries, and rubber slippers. Only for plastics products does there appear to be a fluctuating trend. The rise of such recyclable materials taken out from the waste stream is indicative that there could be a higher waste collection effort, and greater use of waste products in today's consumer goods.

Table 2.5. Recyclables Collected in Petaling Jaya 1992-94 (In Kg)

Materials	1992	1993	1994
Bottle	137,772.0	175,415.0	189,983.0
Computer Paper	89,478.0	177,489.0	
News Paper	88,875.0	245,192.0	2,932,101.0
Plastic	49,363.0	18,133.0	25,455.0
Iron	30,013.0	39,228.0	
Cast Iron	4,451.0	3,071.0	88,199.0
Aluminium Can	4,829.9	16,885.5	
Aluminium Alloy	5,912.1	13,809.5	31,833.0
Car Battery	4,189.2	9,426.5	14,386.0
Rubber Slipper	5,457.5	8,005.0	11,342.0

Source: Chong (1994)

Figure 2.5: Recyclables Collected in Petaling Jaya



2.5 Consultative Committees

The government has been engaged in discussions with the private sector on the implementation of separation and recycling programmes. A few of the examples which MPPJ has been involved in are with the Glass Manufacturers Association of Malaysia, Malaysian Plastics Manufacturers' Association. At the federal level, the Ministry of Housing and Local Government, and including even the EPU and the Department of Environment, various consultative committees have been formed to discuss the recycling issue.

How useful these consultative processes have been to the recycling effort, we have not been able to assess.

2.6 Government Intervention

There are three main ways in which the government can influence the process of recycling. First, they could make people pay for the amount of garbage that is thrown out. Second, they could use more innovative ways of imposing a tax to "encourage" recycling. Third, they could tax the manufacturers who use virgin materials.

First, making people pay for the garbage they thrown out is problematic in Malaysia. Although this is intended to make people think of the kinds of wastes they throw out, the likely scenario is that the people may resort to the most convenient, but socially unacceptable way of just throwing rubbish anyway that they please (without the authorities knowing, of course). The terrible solid waste pollution in the rivers around urban areas is a testimony that the existing

the likely scenario is that the people may resort to the most convenient, but socially unacceptable way of just throwing rubbish anyway that they please (without the authorities knowing, of course). The terrible solid waste pollution in the rivers around urban areas is a testimony that the existing situation of unwanted rubbish disposal may get worse. At this point in time, we do not have enough data to predict what would happen if such a policy were to be implemented

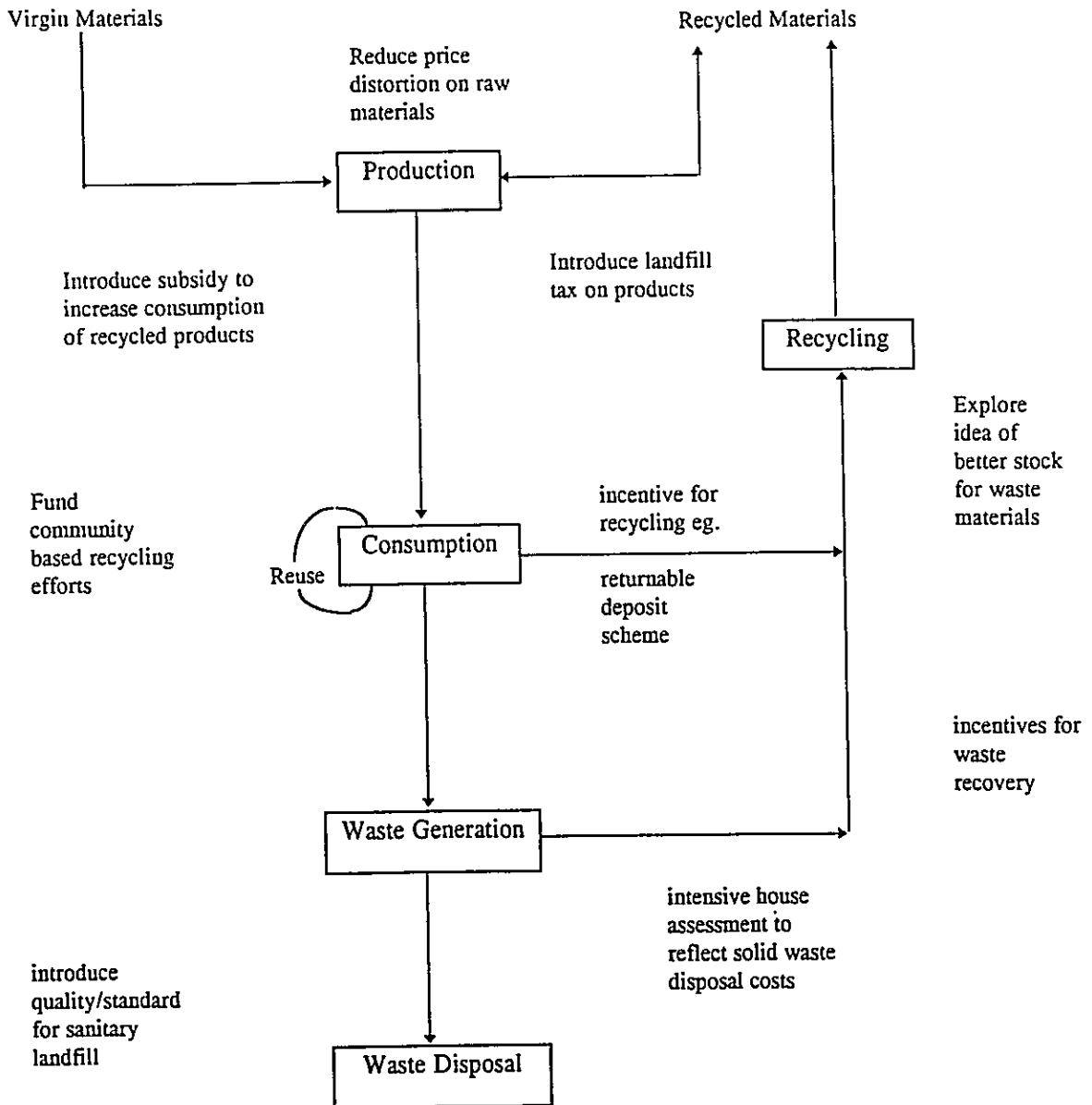
Nonetheless, the aspect of enforcement has to be part and parcel of any new policy on recycling.

Second, putting a "tax" to encourage recycling has been tried in many forms. Deposit refund schemes for bottles was an idea which was previously practised (perhaps up to the mid 1970s or thereabouts), but this was stopped because other forms of less expensive packaging came into the consumer markets, e.g. tin and aluminium cans, plastic bottles, plastic-carton boxes, etc. At this point in time, when the disposal incomes of urban households have grown so much, the deposit schemes may have to be suitably priced before it could effect any significant change. Certainly, putting a value on rubbish will make it attractive to encourage recycling, especially amongst the poorer sections of society. It could be that the poor may feel the brunt of the recycling attempts, but if designed intelligently, the poor could get back what they pay out, and perhaps even "cash in" on the recycling effort.

Third, taxing virgin materials has not been tried in Malaysia so far. This is a novel idea in the sense that the cost of disposal is collected upfront. The government can then choose to tax products to achieve a certain environmental effect, e.g. taxing plastics which is used as bags, and then contribute that tax to local authorities so that they are able to solve their solid waste problems. In many ways, such a system saves on the cost of keeping tabs on products, and the market will find a way to adjust itself.

Of these ways, the third is probably the most difficult for Malaysia, since it involves coordination effort between the local authority and the federal government, even though conceptually it may appear to be the most efficient. A schematic of the various policy options which other governments have experimented and implemented is shown in Figure 2-6.

Figure 2.6: Options for Recycling



CHAPTER 3

POPULACE AND RECYCLING

3.1 Introduction: Use of Focus Groups

3.1.1 Background and Purposes

This section explores the perceptions and views of communities with regards to waste management and recycling. This qualitative approach is used to assess how people relate to and perceive wastes in the course of their daily routine and lifestyle.

This qualitative research provides the basis for an in-depth understanding which is not possible in “survey” research. It is not a question of whether the information is “more” or “less” valuable; it is just different. The advantage of this approach is that it allows for the kind of interaction that can be used to uncover basic motivations, both consciously and sub-consciously.

Specific areas covered in the focus group discussions include:

- How respondents perceive their environment in terms of cleanliness? What problems do they face in keeping their environments clean? What do they feel about the existing waste collection system?
- What will motivate them to recycle? Is financial incentive a strong enough motivating factor?
- How do they feel about their community’s capability and capacity to organise recycling activities? Do they require outside assistance?
- What is the nature of recycling they prefer?
- How do they perceive legislative enforcement such as penalties and the current set of laws in expediting recycling activities at the community level?
- What, in their opinion, are the major drawbacks in a recycling programme within their community?

3.1.2 Method and Procedure

A focus group is a small, temporary group of people formed solely for the purpose of this collaborative research. At the outset, residential communities were identified, from which the respondents were subsequently selected. The selection of participants was initially based on a general announcement by the residents’ representative and this was subsequently followed up by further contacts and calls. The potential participants were invited to a discussion but were not informed of the actual topic (that is, recycling), except that it is about “the environment”.

The respondents may or may not be acquainted with each other before the discussion but were nevertheless encouraged to share their individual opinions with each other during the session. They were informed of the need to be honest and frank with their

3.2.3 Desire for Clean Local Environment

The desire for a cleaner environment is fairly strong among the participants. But they generally take a "live and let live" attitude towards litter - a typically Malaysian mentality. They consider that it is local government's responsibility to see to these problems. Public education programmes focusing on health and social responsibility of individuals needs to be an integral part of efforts to change such Malaysian attitudes.

a) *Sri Pahang Flats*

Most of the Sri Pahang participants ranked 5 for their residential area in terms of cleanliness (1=very satisfied to 10=not satisfied at all). Littering is a major problem as rubbish is littered all over the place. Typical complaints include rubbish thrown from upper floors of the flats or indiscriminately swept aside into various corners, in the lifts, near the staircases and along the corridors.

Resolving the problem is inconceivable at this point in time; the participants are unable to see how the situation could be improved. The reasons given include the non-civic mindedness of the residents themselves, a clear lack of cooperation, lack of discipline and the convenience to throw rubbish as and when they like. One resident indicated that while the common compound is being taken care of by a contractor, keeping the place clean proved to be impossible. It was pointed out that the contractor was fined not because he did not do his job, but rather, he could not cope up with the littering - he literally had to work round the clock to clear the mess.

A leadership system was started for each floor but this did not work out either. Despite knowing their leaders they chose to ignore his warning. To make matters worst, most of the leaders also did not carry out their duties. Time and again, complaints are made. Even weekly meeting with the local authority are held, but to no avail.

b) *Hillside Apartments*

The participants are generally very satisfied with their immediate surrounding, except for indiscriminate waste disposal in a nearby river bank nearby and dust pollution from construction activities.

c) *Bangsar*

As for the Bangsar residents, there is a strong desire for clean a environment and they generally feel that the immediate environment is satisfactory, though certain aspects like irresponsible households, undisciplined disposal of rubbish by businesses, rats and smell exuding from large waste bins at supermarket are perceived to degrade the environment. Other than that, they are generally complacent.

3.2.4 Perception of Solid Waste, Local Authorities and Waste Management

In so far as the problem of waste disposal and dump sites are concerned, the participants generally feel that they take partial blame for the rapid accumulation of waste at the dump site. They consider themselves as part of the problem. That being the case, it is also worth noting that this can also serve as a rallying point that they can also be part of the solution to waste abatement.

The other equally important point relates to the issue of maintaining effective waste management. Regular waste collection is very important if recycling programmes are to be successfully implemented. It is vital that these are properly carried - otherwise the residents would be preoccupied with the bigger problem of poor waste management to be concerned with the relatively minor need to recycle.

a) *Sri Pahang Flats*

The participants in Sri Pahang see themselves as the main contributors of rubbish accumulation at the dump. They often cook at home and would throw waste away for the daily collection by local authority truck.

b) *Hillside Apartments*

The Hillside Apartment residents - when asked if they felt they were contributing to the solid waste problem - agreed that it was only natural: as population grew so will the amount of trash. Other reasons cited for the growing amount of garbage are the lack of recycling facilities and over-packaging of products, especially plastics and non-biodegradable packaging materials. Common wastes generated: food waste (3), paper waste (5), plastics (4) and packaging (2). The residents are generally satisfied with waste collection at their condominiums.

c) *Bangsar*

The Bangsar residents are generally quite happy about the waste collection system. The area that is serviced by a private contractor enjoyed daily collections, while the areas serviced by the local authority have pickups two to three days per week. However, there is the occasional complaint of non-collection which occurred now and then. Overall, the main concerns of the participants are the occasional break down in rubbish collection, waste problems from eating or food outlets and at supermarket, and problem of missing rubbish bins (Bangsar Park area).

3.2.5 Perception of Recycling

Participants are generally aware of recycling and may support such activity. But very few of them actually practise it. Most of the participants are not enthusiastic about recycling. Whether there is a programme or not is of little consequences to them.

Nonetheless, at one time or another, most of the participants recycled their old newspapers by selling them to door-to-door collecting agents.

a) *Sri Pahang Flats*

The Sri Pahang residents are aware of recycling, i.e. separating recyclable items such as papers, bottles, cans, etc from other wastes. However, there was negligible recycling except for newspapers. For newspapers, collectors would come without any fixed schedule, going from door-to-door buying from the residents. A palm-length thick of newspapers could fetch as much as 80 sen. In addition, the residents bring down their empty chlorox bottles and resell at 10 sen each back to the downstairs shop from whom they bought the bottles previously.

Convenience is not a point of contention for the Sri Pahang residents. Any system is fine, either door-to-door "collect" or a "bring" system of waste collection. The overriding concern is the monetary incentive.

Recycling bottles and aluminium cans had been carried out in the past but has since been discontinued. The residents are not sure why this is so. Where there is no market for recyclables, they get thrown away into the rubbish bins. But, they notice that a resident would go around collecting cans and selling them to a collector in Jalan Ipoh. Apparently, he would take all that he could find.

b) *Hillside Apartments*

There is an existing recycling campaign at the Hillside apartments. Most agreed that it had started off well. Shortcomings of the program were discussed. Some noted that the material collected for recycling (glass and aluminium) did not make up much of their waste stream. Several participants cited the inconvenience of the barrels, too far away. They not only had to walk an extra distance but mostly they had to make a conscious effort to drop recyclables off in the bins on their way out. A few wanted recycling bins to be placed next to the trash bins for the inconvenience. One resident commented that this probably would not work, as residents would throw more trash into the bins.

c) *Bangsar*

There had been no previous recycling programme at Bangsar, except for an ad hoc project at a petrol station. They had a collection bin for cans. However, they did not know the organiser or the specifics of the programme. Their awareness of its existence came not from publicity but from the conspicuous location (that is, the petrol station). Only one participant brought cans to this centre. But this programme has since closed.

One resident made the effort separate garbage for collection by garbage collectors. But for the majority who separated waste, they did so because of "wanting things to be neatly packed away and disposed off" and "not wanting things to be wasted when they

could be reused or recycled". Nonetheless, most of them sorted out their old newspapers for sales to collectors who come round the place regularly.

3.2.6 Willingness to Participate in Recycling

Major factors inhibiting recycling at the household level are apathy, "fast" and "hectic" lifestyles, "tedious to separate waste", limitation of storage space, absence of interested buyer for recyclables, "collection site or centre too far away" and lack of community cohesion.

However, certain motivational factors are vital as they emerge from the discussions. These factors include convenience of the programme, presence of buyers for waste, financial incentives, reliable and regular collection schedule, programme awareness, educational and awareness raising activities, and publicity.

a) *Sri Pahang Flats*

In the focus group discussion proper, several factors were brought out as to why there was no separation of waste at Sri Pahang. Space limitation, convenience, fast moving lifestyles and low level of consumption for specific items. However, when asked what would motivate them to recycle, the participants indicated that incentives, preferably cash, would be a very strong motivating force in getting them to separate the waste. However, if solid waste collections are not regular, recyclables would also be thrown into rubbish bins as there is no place to store them away.

When asked about the desired type of collection system for recycling, the Sri Pahang residents listed the following aspects: a scheduled collection time with money paid on the spot - no credit. They did not agree to have the RA manage the sale of recyclables.

As far as enforcement is concerned, the participants felt that it can not be sustained. How would the authorities know who did or did not separate their waste. Any recycling message must be effectively communicated to the entire community - launching a campaign where each household is given brochures.

They mentioned that community programmes that had not been really effective. Most community-based programmes such as gotong-royong was not encouraging because they lacked an adequate level of publicity. The participants attributed this to a lack of cooperative spirit and absence of a sense of belonging. One of them noted that the neighbourhood spirit was low as some of them hardly meet with their neighbours.

b) *Hillside Apartments*

Although the Hillside Apartment residents professed support for recycling, only a few actually take the trouble to practice it. The common reason was "no time" to separate waste.

PJ's SS3 recycling experience was presented to the participants in order to elicit their views on participation in a recycling programme. The PJ story ran something like this: pre-project surveys show a potentially high level of participation in recycling. But actual level of participation was miserable. The focus group tried to rationalise why this may be the case. The participants reasoned that the human mentality was a problem and that the environment concern was lacking. They argued that Malaysians are generally selfish people; they may have good intentions but they are not willing to make the effort needed. Others suggested that the SS3 residents were burdened by other factors such as traffic jams, working wives, uncooperative maids and space constraints

For both the SS3 and the Hillside recycling programs, the participants emphasised the need for regular reminders and follow-up throughout the campaign. Going house to house to speak to residents would be ideal. Circulars and pamphlets would be useful. Participants stressed that concern and awareness for separation and recycling is needed. A few participants also felt that Malaysians do not see the "big picture" in the sense that they think they are generating only a small amount of waste, and hence no necessity to recycle. Competition and other incentives were also cited as a means to generate more support and enthusiasm for neighbourhood recycling.

All participants agreed that more information has to be disseminated to the Malaysian public to make them understand the importance of separating and recycling waste, and other environmental issues. This awareness could be generated through talks and recycling programmes at schools or public campaigns through the mass media. This raising of awareness should be done on a national level, as well as on the local level.

While the participants felt that enforcement of the law may be necessary to a certain degree, they did not feel that it was the answer to a successful recycling programme. First, they felt the government was already facing problems enforcing environmental laws. Endeavouring to enforce recycling on a massive scale would only put greater burden on the government. Participants also noted that should the enforcement slow down or stop, people would stop obeying the law. Participants cited Singapore as an example of strict enforcement that only worked for them within the confines of the island; once the Singaporeans were outside the country, they would start to litter all over the place. Enforcement does not stimulate the necessary attitude change needed to ensure long term success.

c) *Bangsar*

Bangsar residents cited time constraint, distance of collection centres and the negligible amount of recyclable waste as reasons why they did not and would not separate waste or participate in such recycling programmes.

Nonetheless, they did express a sense of keenness to participate in a recycling programme if it were properly planned and administered. Convenience for them would be a critical issue.

As far as waste separation is concerned, they are not prepared to separate waste into numerous components. "Wet" and "dry" waste separation is preferred. Some are prepared to put different waste into different bins and even prepared to pay for separate containers and bags. However, others preferred not to have separate bins; for them it would be ideal to put the different bags for "wet" and "dry" waste into one bin. Limited places for the rubbish bins (both within the gate column and by the road side), rubbish scavenging among roadside bins by animals and unsightliness are reasons why there cannot be two bins. That being the case, a good compromise may be to have one bin for "wet" and "dry" waste, except that the "dry" waste would be put into a different colour bag.

Curbside collection is the preferred system. The participants favour regular "recyclable" collections alongside the usual waste collection schedule. They do not want to store up waste any longer than necessary. One group was receptive to a fixed schedule where specific recyclables are collected on a particular day of the week while some others were not enthusiastic about it.

On the other hand, their revealed preference appears to conflict with their keenness on "paper lama" collection schedule. Here they were willing to keep aside and sell specific recyclables to individual collectors on their scheduled collection rounds, contrary to their apparent lack of enthusiasm.

These conflicting positions viz their willingness or reluctance to store recyclables is not so much due to fickleness, but rather, highlights an even more important factor in recycling participation - that is, the importance of having a fixed and regular schedule for collection so as to enable the participants to manage their housing space effectively. The issue is not so much as to whether they are prepared to store the recyclable waste but rather whether the collection schedule is regular and reliable. As was mentioned, there is no point setting aside the waste if the collectors do not come round to pick them up. Hence, the apparent contrasting stance of the participants can be reconciled as follows: while the participants want to have regular and frequent collection services, and they are prepared to set aside their recyclable waste for short period only.

That being the case, it may be possible to have routine "wet" and "dry" waste separation (administered by the local authority) be complemented by the less frequent collection of specific "sought-after" recyclables demanded by private collectors. Under new and assured circumstances households may be prepared to separate waste beyond the "wet" and "dry" categories.

Monetary incentives are not perceived as being critical to the participation in recycling. The residents are prepared to get involved in recycling programmes without such incentives. However, they do feel that such incentives can increase recycling rates among the residents.

All the participants subscribed to the idea that enforcement of the law to get people to separate the waste is an effective measure.

As for an external agent, they perceived that the RA would be an effective organisation to get the recycling project going because of its rapport with the community.

Overall, the participants believed that effective promotional campaigns, consistent collection schedule and proper follow-up work are essential to ensure success in recycling programmes.

3.3 Summary of Major Findings

It seems that Malaysians are not willing to do much to aid in a recycling campaign. At their current level of superficial environmental awareness, any recycling campaign must be tailor made to entice them to participate.

As far as garbage or waste collection is concerned, they are generally satisfied with waste collection in their area. And what concerns residents of a high density low income community is not that rubbish is not collected and taken away, but the rampant littering that goes on in their flats. The middle class condominium residents are irked by the indiscipline of squatters dumping their waste into a river which flows by their apartments.

The problem of dumpsites is remote from most of the participants. One participant highlighted the putrid smell of a dumpsite. But this is because he passes by a dumpsite on his way to work. The participants, except for the professional with environmental experience, do not appear to know the environmental consequences at the dumpsite. Environment problems associated with methane gas and leachate do not mean anything to them other than the physically offensive nature of degrading organics, which they regard as dirty, polluting, a health hazard, etc.

One concern of some with respect to the dumpsite is the rapid accumulation of waste and the associated space constraint. However, that concern arose not from spontaneous discussion but after prompting by the moderators by way of visual material and verbal exchanges. Otherwise, the problem of dumpsite is not an environmental issue to the participants.

Nonetheless, most participants feel that they are partly to blame for the rapid waste accumulation, attributing in part to population growth, lack of recycling facilities, over-packaging of products and inability of townsfolk to bury rubbish as in the rural areas.

Only a few participants agreed that recycling helps to reduce waste accumulation. Only one Hillside Apartment participant raised the issue of the lack of recycling facilities. Hence, even though they agree that recycling would reduce waste, they don't practise it. Motivation to do something positive about the environment is weak amongst urban Malaysians.

Some of the reasons for non-participation in recycling include: general lack of interest, inconvenience of climbing up and down stairs to deposit recyclables, no time (because of the need to rush off to work early in the morning and coming back late in the evening), too stressed out from work (to perform any chore), almost all residents work (including the ladies and mothers) and space constraints (the kitchen is too small to separate waste).

Such lifestyle constraining factors are also echoed by the residents at Sri Pahang. But for the more well to do, their concerns are somewhat different. Convenience is a key concern. But they are also concerned with aesthetics, regularity of solid waste collection, and need to maximise use of their housing space.

As far as motivational factors are concerned, the participants at Hillside Apartments overwhelmingly feel that the current Malaysian mentality needs changing. They believe that the following actions are indispensable to ensure success in recycling programmes:

- Need to create awareness among the general population
- Inculcate concern and care for the environment
- Inform the public of the importance of waste separation and recycling
- Shock the public with deadly consequences of ineffective waste disposal system
- Generate awareness through talks and recycling programmes at schools
- Launch campaigns through the mass media
- Introduce competitions and incentives as a means to generate more support and enthusiasm for neighbourhood recycling

In the case of Sri Pahang residents, monetary incentives play a more critical role as a motivational factor to induce recycling. The participants' proposal include the following:

- Have a fixed and regular schedule for the collection of recyclables
- Money to be paid on the spot
- No explicit indication of preference for door-to-door collection or bring-down collection (currently, newspapers are collected door-to-door while chlorox bottles are brought down to collector shop located downstairs)
- Not interested in credit transaction
- Residents must be informed of the recycling programme and message (for example, running a publicity campaign and handing out brochures to every household)

The residents are at best ambivalent about the role of the residents' association in recycling. For instance, the current recycling programme at Hillside Apartments is managed without any direct involvement of the residents' association. Nonetheless, they agree that the RA is probably the most suitable body to reach the community. So even though it is not the best choice, it is still the second best choice.

Without doubt, while the residents' association can provide the platform to organise community-based projects and mobilise residents, it is not a necessary nor sufficient condition to get recycling programme moving or much less make a success out of it.

Nonetheless, the general cohesion among residents may be a better indicator of success for any recycling programme. Unless there is a community spirit, all it takes is only a person to spoil the cleanliness of an entire community.

Finally, nearly all the participants see enforcement of recycling as unlikely to work. At best, it is a temporary measure without long-term sustainability. Enforcement does not stimulate the necessary attitudinal change needed to ensure success in recycling.

CHAPTER 4

PARTICIPATION OF COMMUNITIES IN RECYCLING

4.1 Introduction

This chapter documents the experience of eight communities in recycling. These communities include schools (such as Sekolah Menengah Kelana Jaya, Sekolah Kebangsaan Taman Petaling, Taman Melawati (2) and the International School of Kuala Lumpur), residential communities (Hillside Apartments in Taman Melawati with 600 residential units and SS3 neighbourhood in Petaling Jaya with about 2,400 houses), hotels (under the auspices of the Hotel Association of Malaysia) and offices (along Jalan Tuanku Abdul Rahman in Kuala Lumpur).

Some communities do not have any formal recycling programme while others do, some have had moderate success in their recycling efforts, while others have failed or at least done poorly over time. In this section, we will examine their status, the nature of the recycling programme and campaign and review their experience. We will also review the success factors as identified by each community.

Through these community experiences, we will attempt to highlight the common elements and lessons of their respective experiences and how these could be applied to programming future recycling activities.

4.2 Residential Communities

4.2.1 Hillside Apartments in Taman Melawati

a) *Introduction: Background*

The Hillside Apartments is a newly developed area. Residents began moving into Phase 1 in 1989. Phase 1 consists of 9 blocks of four storey walk-up flats. The final stages of Phase 1 were completed 1990/1. Construction of additional blocks were recently completed consisting of 7 blocks for Phase 2. Residents have begun moving in.

Hillside Apartments is a mini-Malaysia, as all of the major ethnic groups are represented here. There is even a community of expatriates because of the close proximity of the International School of Kuala Lumpur (Elementary Campus).

b) *Community Cohesion*

The community feeling is quite strong. Children and their parents gather at the playground in the evenings. This playground has helped to foster the community spirit as residents faced the possibility of losing the playground to an unwanted community hall (A community hall was in the original plans of Hillside Apartments and the in sales and purchase agreements of only a few owners. Because of legal obligations, the developer, Negara Properties, felt they must complete the hall in order to pass the strata title to the owners.)

On several occasions, the residents got together to work out a solution to the potential development of the playground: this included a few emergency meetings in the evenings, meetings with the press, talking to their Member of Parliament Encik Fuad and dialogues with the developer. After hearing that the community hall was not in the sales and purchase agreements of more than half the owners, Encik Fuad told residents the project would be cancelled. However, the residents are still awaiting confirmation in writing from his office.

c) *Recycling History*

Established in January 1994 by one resident, the recycling project began with glass collection with 4 bins provided free by KL Glass, a glass manufacturer. A few months later, KL Glass provided 2 more bins. Negara Properties also sponsored an additional 14 bins. Hillside Apartments now has 20 bins; 10 for glass and 10 for aluminium. The additional 14 bins were sponsored by Negara Properties.

Also, one other resident has joined in the project in October 1994, after a flier was sent out asking for more residents to assist in the co-ordination of the programme. Together they formed a green committee at Hillside Apartments.

On December 11, 1994, a family recycling day was organised by the green committee and friends. This day launched the 14 new bins and the recycling was also made available to the newly open phase of the Hillside Apartments as well as the older units.

d) *Recycling Programme*

The 20 centralised bins for glass and aluminium collection are 55 gallon oil drums. In addition, newspapers are also collected by the maintenance staff and cleaners on an unofficial and unpublicised basis.

During the first year, the project was open to Phase 1 residents (350 units, 9 apartment blocks). Starting in December 1994, bins were provided for the newly opened Phase 2 of Hillside bringing the maximum number of possible participants to 600 units, or 16 blocks.

The recycling program is still continuing. It has been over one year since the program was initiated and there are plans to expand further. Starting in mid-April 1995, the green committee will establish paper collection with the assistance of the cleaners at Hillside Apartments. There are further plans to start composting facilities, again with the help of the maintenance crew.

The general design of the current programme is 20 bins, paired (glass and aluminium) and placed in common areas close to the apartment blocks but not near the trash bins. Bins are situated near exits so that the residents can drop their recyclables on their way out of the apartment complex.

Once several bins are full or at least more than half-full, the collectors are contacted to collect the material. Currently, KL Glass collects the glass and GMS Purnaimpex collects the aluminium. Both companies do not charge for the collection; on the other hand, they pay for the materials collected. Current rate for glass is 13 cents per kg and aluminium is RM1.20 per kg.

The money raised from these recycling efforts is currently being held by Negara Properties (as Hillside Apartments does not have a strata title and is still under the developer's wing). While the amount does not warrant a separate account, the money is being kept in track of and will be used for future green projects (expansion of recycling, etc.).

e) *Recycling Statistics*

There have been three collections since the inception of the programme; there were all glass collections:

- May 2, 1994 = 61kgs, RM8.00
- Aug. 17, 1994 = no money was passed (amount probably too small)
- January 26, 1995 = 258kgs, RM21.70

The total money collected was RM29.70 and the total weight involved was 258 kgs of glass waste. There was no aluminium waste for collection. However, within the next few weeks from the time of interview, the residents expected their first collection of aluminium and another round of collection for glass.

f) *Education and Participation*

Fliers were sent out periodically to all residents to inform them about the recycling bins. These fliers were photocopied and distributed to every resident's mail box by Negara Properties. Four rounds of such fliers have been sent out since the introduction of the campaign. Also, questionnaires were sent to residents for their input to the programme. About 300 questionnaires were distributed but less than 10 were returned. The distribution of information was as follows:

- flier in January 1994 when the first batch of bins arrived
- flier and questionnaire in April 1994
- flier in October 1994
- flier in February 1995

While there are no exact figures, participation rate has steadily improved in the old phase of apartments. Although there are still odd bits of trash now and then, people seem to be using (or not using) the bins responsibly. Rate of filling of the bins seems to have increased. Most responsive people seem to be the westerners who were already accustomed to recycling.

Blocks in the new phase of Hillside Apartments still has lots of trash and the occasional glass or aluminium can. But a second notice has been posted in the new phase to generate greater awareness.

There were no incentives offered to the residents but information on the importance of recycling was included in the first flier.

Most of the residents are supportive of the recycling and are pleased with the facilities. Many of them want to see it expanded. Some feel the central bins are inconvenient and would prefer bins next to the trash bins but the green committee is reluctant to do this because this would most likely lead to more trash in the recycling containers. However, this is not an impossibility and the green committee may do so in the future, as the residents become more responsible in using the recycling bins.

g) *Family Recycling Day*

This was a day designed to bring the community together and to introduce the 14 new collection bins donated by Negara Properties. The day's activities included a barrel painting party where the children painted all 14 bins yellow or green for glass or aluminium, respectively. There was also a table with information on what can and cannot be recycled and where the bins would be. Finally, there was a treasure hunt, emphasising on recycling and the environment at Hillside Apartments.

The overall participation was good (approximately 40 children and 10 adults) and the children enjoyed themselves. The main weakness was the fact that few parents and adults participated. Also, the long term message about the bins did not seem to get through. While the children enjoyed themselves painting the recycling barrels and were well aware of what each bin was for, many kids did not pass this message back to their parents.

All expenses for the Family Recycling Day were paid for by Negara Properties. Organisers included the two "green committee" members and their husbands plus three Malaysian Nature Society members

h) *Positive Points*

Recycling efforts got the support from the developer. Their commitment can be seen from their sponsoring of 14 additional bins and the Family Recycling Day. The company is also keen to have more such "Days" and to see the project expanding.

Hillside Apartments now has facilities to recycle which it never did have before. Although the items for recycling are only a small portion of the waste stream, it is a start.

There are plans to expand the recycling programme. Efforts are underway to get the cleaners more involved. Since they are already recycling some old newspapers, the green committee wants to use the cleaners to expand the paper recycling. The cleaners will get all the revenue from the sale of the papers but will also be responsible for the collection of the papers. The green committee will help with the overall organisation and generating the awareness among the residents.

If the paper recycling succeeds and the cleaners are happy with their new responsibilities, the green committee hopes to get the cleaners and residents to be involved in a composting programme. Residents are generally supportive of the program. Many would like to see it expand.

i) *Issues, Problems and Replication*

Items which are being collected are not the major part of the garbage. However, glass and aluminium are among the easiest for residents to recycle at the moment.

Trash (plastics, food) and wrong items (light bulbs, tin cans) are still being put in the recycling bins despite numerous efforts at education. However, trash problem has decreased significantly in the old phase. The bins are monitored and garbage is cleaned out at least once or twice a month.

Response is not as strong as hoped. Participation is estimated at 33% of residents (in the old phase).

Keeping the money for community use has some difficulties. Issues like who should hold the money, what will it be spent on and who can make the decisions, are problematic. At the moment, the Hillside Apartments has collected very little money and this has not pose a problem yet. The developer is holding the money on good faith. On what and how the residents should spend the money have yet to be determined although the green committee hopes to put it back into the programme.

This particular system would work well for any apartment or condominium complex where there is common area and a management committee. Such centralised bins may not

work so well for linkhouses unless the co-ordinator is determined and committed to make it succeed. Much efforts would probably be needed.

The Hillside Apartments recycling programme started because the co-ordinator needed someplace to recycle her trash. The green committee is doing it on a totally voluntary basis. However, other individuals may need some incentives to start such a program in their neighbourhood. Voluntary basis does not come by easily. It may be more appealing for the individuals co-ordinating the recycling programmes to keep the money earned to themselves. Alternatively, the money may be given to the cleaners, who will be responsible for the monitoring of the bins. The money is not much but it may help make the task seem less daunting, as there is a bit of work involved in maintaining the recycling bins. The extra cash would be particularly appealing to cleaners or maintenance people, as their wages are low. The co-ordinator should still be able to get sponsorship for the fliers from the developers or recycling companies or maintenance company - at least until the program gets off the ground.

Having an agent to monitor the program has been crucial to its success. Regular reminders, clearing trash out of the bins, expounding visions for the future have all been done by the internal agent (that is, the green committee). It is highly recommended that all recycling projects have an agent (be it individual or committee) to oversee the program, especially during the initial years of operations.

4.2.2 SS3 in Petaling Jaya

a) *Introduction: Background*

SS3 has an active Residents' Association (RA). The neighbourhood is made up of well-to-do, literate families, comprising approximately 2,400 houses. Established in 1992, the RA is 3 years old and has 20 committee members and 75 members. The committee and the RA members are on a volunteer basis. Members pay a subscription fee of RM10 per year. It endeavours to foster community spirit via annual dinners and addresses local issues such as traffic problems, hawking, parking bays, road bumps, etc.

b) *Community Cohesion*

The RA is active at the community level and provides the residents with a communication conduit to the local authority, Majlis Perbandaran Petaling Jaya (MPPJ). The RA has taken up the traffic problem in SS3 and advocated MPPJ to put in speed bumps. The RA is currently trying to relocate hawkers as they do not have proper facilities (running water) and they cause traffic jams.

c) *Recycling Programme*

SS3 was earlier involved in a pilot recycling project run by the MPPJ. A set of special plastic bags was given to each household. This set of 10 bags was to be used for all recyclable material. Into these bags, the people were supposed to separate items such as cardboard, bottles, food remnants, tin or metal waste, plastic and rubber, garden waste and harmful substances. When full, they were to be put out with the regular trash for the collection.

Once the initial set of special bags were used, the residents were expected to buy new sets at RM1.50 per set of 10. The recycling campaign, however, was not very successful. Exact figures are not available, but best estimates put participation at around 5-10% of the community

d) *Education and Awareness*

The SS3 RA was informed by the MPPJ that its neighbourhood had been chosen as the pilot area on the day of the launch. The MPPJ handed over the bags and informational pamphlets. The RA was asked to distribute the bags and explain about the program to their neighbourhood

A few articles on the launch and recycling appeared in the newspapers and some publicity were generated. After a one-month review of the campaign, the MPPJ felt the residents were not well informed. Consequently, the MPPJ tried to organise a high-tea dialogue session with the housewives of the area. However, after several postponements, at times beyond anyone's control, the interest in the campaign dissipated and fizzled out.

e) *Issues, Problems and Replication*

The accepted view is that proper ground work was not done. The RA had minimal time and limited resources to organise awareness campaigns to inform the 2,400 odd households of this recycling programme. While the RA is willing to help generate community participation, the members could only volunteer their spare time and were thus severely constrained given the large number of households and small number of volunteers.

Because of its limitations, the RA did only some house calls. In the end, few residents knew about the project or knew very little about how the project was to be run. Also, the value of separating waste for recycling was not addressed.

Evaluations conducted after the first and third month suggested that the response from the residents was unsatisfactory. Reasons for the failure of the recycling campaign were:

- There were no ground work done with the community at large. Hardly any publicity and education of the residents were carried out and as a result, the community was not taken into confidence.
- The committee felt that while they were honoured by MPPJ's selection of SS3 for the pilot project, the task at hand was a herculean one. The MPPJ did not consult with the committee before launching the campaign. By and large, everyone was caught unprepared with the task at hand.
- Information dissemination and community mobilization were difficult to expedite because the majority of the members are working on full-time jobs and hence, were in no position to carry out house-to-house briefing.
- There were also some unease among the residents on the recycling project. First, as there are also other communities like Section 16, SS1, SS22 and SS24 with similar socio-economic profile as SS3, why was SS3 selected? Why not others? Second, the residents felt that they were being asked to do half of the MPPJ's waste collectors' work. Third, the issue of having to pay for the plastic disposal bags did not go down well. The residents felt that if the recyclers were benefiting from the residents' efforts in waste separation, why not ask them to pay for the plastic bags? Fourth, space constraint in storing various types of waste posed a potential problem. This is because the individually separated waste will need to be accumulated until sufficient amount had accumulated. There were just too many bags lying around the house. Fifth, the RA felt that the MPPJ workers were not tuned to whatever recycling efforts made by the residents, quoting that the workers would collect only one or two bags even though there may be more garbage bags lying around. Under such circumstances, the households did not find their waste separation into numerous bags worth their while.

Such reservations prevailed throughout the campaign. According to the RA, the project was done in a hurry without explaining the benefits of the recycling idea to the residents. The media coverage and publicity of the launch involved the media but not the SS3 community. The launch was limited to representations from MPPJ, the Residents' Association and other organizations. The spokesman suggested that this is inadequate as public relation exercises with the residents need to be undertaken to complement the MPPJ's efforts.

Indeed, the government must sell the idea to the residents by instilling the value of separating garbage and the need to recycle. The residents' impression of the recycling situation, rightly or wrongly, can be summarised as follows: since they pay house assessment, they expect the MPPJ to collect and dispose of their garbage. They see recycling as part of the solid waste issue, and therefore separating useful products from the waste stream is considered to be MPPJ's duty. Hence, they see recycling as doing MPPJ's work for them. Since the recycled items are useful, there is a value to them. As such, the residents feel rather cheated when they are asked to pay for special plastic bags, do MPPJ's work (separating useful product from the waste stream), and then have benefits go to someone else (recyclers, collectors, etc.)

Given this kind of impression, the MPPJ and other local authorities will need to think seriously about how to effectively convey the true picture of recycling to the general public. In many sense, trying to correct ingrained mistaken impression is more difficult than developing a good new image for a product/service. It means trying to change social attitudes.

4.3 Schools

4.3.1 International School of Kuala Lumpur (ISKL)

a) *Introduction: Background*

ISKL is an international school based on the American system of education. The Secondary Campus has students ranging from age 13 to 18. The students are generally of affluent, educated backgrounds.

b) *Community Cohesion*

Although the students at ISKL are constantly changing, as parents are sent to other parts of the world, there is a strong sense of school spirit. Students are active in a variety of events - Green Week, sport events, etc. - which help cultivate that community spirit. Also, the students are all in the same predicament (in a new country), and this certainly helps to bond the students further.

c) *Recycling Efforts*

ISKL has two recycling campaigns going on at the school. One is for paper recycling which is organised by the middle school and the second is for aluminium can recycling, organised by the high school.

The paper collection was started in 1991 by the middle school environment club SAVE (Students Against Violating the Earth). Initial collection was done by a paper manufacturer, Theen Seng Paper company. Students were paid an average of 11 sen per kg for paper they collected. Along with the regular trash bin, two additional bins were set up in each class room, for re-use and recycling. When the recycle bin was full, a student from the class would empty the bin into a larger green paper recycling bin in the hallway. These larger bins were placed in each corridor of the school. The cleaner then emptied the green paper bins into the recycling shed. Parents and teachers were also encouraged to drop off papers from home at ISKL recycling shed directly. Once the recycling shed was full, the students would call Theen Seng to collect.

Money raised from the paper sales went into the SAVE club funds. On average, there have been three collections a year and the proceeds averaged RM90.00 per collection. This is a continuing programme.

Aluminium collection was started by the school's environment club, Earth Club. It began in late 1993-early 1994. BP petrol company supplied a few of its large collection bins for the school to use. Students, parents, and teachers would drop off cans immediately at the recycling shed. Other cans come from the school cafeteria and are brought to the shed by the cleaners

In the shed, the students sort out aluminium and non-aluminium cans so as to fetch a higher price for their waste. The rate for aluminium averaged RM1.20 per kg. There has been one collection so far of about 75kgs which fetched RM90.00. Money raised goes back to the Earth Club. This, too, is an on-going campaign.

d) *Education and Awareness*

Many of the students come from countries which are already incorporating recycling. Therefore, most students have at least a surface understanding of why they should recycle, so awareness is already there. The bins are clearly marked as "re-use" or "recycled paper". Also, the larger hall bins have directions explaining what is or is not acceptable (no staples, fax paper, etc.) Both recycling campaigns have clubs to constantly monitor the situation and take action when other students start to mis-use the bins, or if enthusiasm starts to dwindle.

Regular green campaigns (such as Green Week) and talks or other activities are organised by both of the clubs.

e) *Issues, Problems and Replication*

For both paper and aluminium, the collectors are not always reliable. The school has gone through several different collectors for both. Most recently, the school has changed cleaning companies. The new company said they could buy back and re-sell ISKL's paper and aluminium. So the school is trying them as new collectors for both recyclables.

For paper collection, the cleaners get a percentage of the money raised from the paper sales. There have been some problems with the cleaners not doing their job properly and spending work time separating the paper to get more money. The SAVE club is trying to come up with a new scheme to pay the cleaners; perhaps a large, free meal once a month.

Trash is still thrown into the green bins in the hall for paper collection despite the clear labels. The large aluminium bins also have trash thrown in them.

Sorting out the aluminium cans from non-aluminium (for disposal) is done by the students and can be troublesome. This sorting is done by hand. Also, the cans are not crushed when deposited in the bins and therefore take up more space for less material

The recycling efforts seem to be successful at the ISKL. Staff and students alike are generally co-operative and responsive to the project. However, reminders in the form of green events and activities as well as posters and signs have to be organised and posted to keep the student on their toes.

4.3.2 Sekolah Menengah Perempuan Taman Petaling

a) *Introduction: Background*

This is a secondary all-girl school. The student population comprises mainly middle-class students - mainly Chinese (60%), Indian (30%) - with some students from Subang Jaya and Taman Tun Dr. Ismail. The school has an active Nature Club which is in charge of the on-going and short-term recycling programmes.

b) *Community Cohesion*

The Taman Petaling Girl's School is very fortunate. They have a dynamic principal who gets active in all of the school's activities. As a general rule, when the support is strong at the top management level, the project will succeed.

The school has beautiful gardens throughout its grounds. These gardens are maintained by students groups and outside organisations. They have an annual "Family Day" in which all the classes must prepare for.

The school has a strong sense of community spirit. Often, there are inter-school competitions organised, with prizes given to the best individual and class. These prizes are given at school assemblies, to further the sense of school pride.

There is currently one other event which is also pooling the people together; this is the plastic recycling campaign. In this project, the principal got the support and involvement of all the teachers. Art classes made posters for recycling and the principal even brought in recyclables and "donated" them to classes which needed a boost during the various competition.

c) *Recycling Efforts*

Taman Petaling School was involved in the Plastic Task Force of Malaysia Plastic Manufacturing Association (MPMA) and MPPJ plastic recycling efforts. This project began in 1993 (Sept.) and is on-going. The school got 2nd place in 1993 and 1st place in

1994 for most kg of plastic collected; for January-June 1994, the school filled up 77 1/2 bins

Initially, MPPJ collected few times a week. Now, the trucks only come once a week at the most. Parents of the students were encouraged to bring recyclables, but the school has not opened the recycling as a drop-off centre for the neighbourhood.

The school also has other on-going recycling programmes. Newspaper collection is on-going and was the first recycling programme introduced at the school. Later, the school began collecting aluminium cans. Money is a big incentive and currently there is competition between classes to raise the most money to use for stalls during "Family Day". Plastics is the most recent addition to the school's recycling efforts.

d) *Education and Awareness*

For the launching of the plastics recycling, teachers were invited for a 2 day workshop. This was very informative and teachers were able to share the information they learned from this workshop with other staff and students. Incentives included school to school competition and essay competition with prizes. There was also a school assembly to explain the plastic recycling programme. This was all provided either by the MPMA or MPPJ.

Taman Petaling went further and organised inter-school competition among the students and between classes. The school gave its own prizes and further incentives to get students to participate. The competition was based on 1 container = 1 point award system; the student and class with the most points will win prizes. The Nature Club monitored the collection and point-giving system.

e) *Issues, Problems and Replication*

School spirit is very strong at Taman Petaling. One of the prime reason for this is that the teachers and even principal get very involved in all the programmes.

Raising money through recycling is an important incentive for its success in the schools. Newspapers do particularly well because it can raise cash quickly. However, compared to organising a car wash, the cash from recycling is low. The efforts for plastic recycling was more to raise awareness and change attitudes. Nevertheless, some form of incentives appear to be an important factor in a successful school recycling campaign.

While encouraging recycling at school is good, too much of the burden is put on the schools to get community recycling moving. Carrying recyclables to school can be a burden for the students. It is best to get separation and recycling going at the homes. However, recycling at school does help the students understand the moral obligation that they have to take care of the planet.

4.3.3 Sekolah Kebangsaan Taman Melawati

a) *Introduction: Background*

SK Taman Melawati (2) is a new school, only about one year old. It is a primary school, with students coming from the surrounding areas. Generally, the students are of middle-class upbringing.

The school has a low trash policy in that there are very few facilities at the school to dispose of rubbish. Students are told to bring their own plastic bag to school everyday to hold their trash until they get home for proper disposal.

b) *Community Cohesion*

There was an earlier newspaper recycling campaign at the school which was a big success. Students were very active in collecting waste newspaper. This success was attributed to the competition between participating schools with prizes for the best schools; all schools got paid for the newspaper they collected. However, the campaign was short term (few months only). This campaign was sponsored by a petrol company.

c) *Recycling Efforts*

The school has four large containers at the edge of the parking lot for the collection of glass, metal, plastic and paper. The bins were provided by the Majlis Perbandaran Ampang Jaya (MPAJ). The MPAJ is in charge of collecting the recyclables. The school is not paid for the material they gathered.

While this is an on-going programme, there has been no collection by the MPAJ since its inception in February 1994. The bins have never been even close to being full.

The rationale behind it was to have recyclable materials sourced from the waste generated by the school as well as from the students' and teachers' homes. The school had informed the parents of the recycling facilities and told the parents that they could bring items from home when dropping off or picking up their children.

d) *Education and Awareness*

The programme was launched sometime in February 1994, in conjunction with the school's "Clean Week". Puan Sunami was under the assumption that this campaign was launched in all schools in Taman Melawati.

The MPAJ provided the bins and pamphlets for the launching. The launch was not very big. The MPAJ also came to the school and gave a talk to the children on the importance

of recycling. In addition to the school's private launch, there was supposed to be a public launching but Puan Sunarni was not informed about this event, if there ever was one.

e) *Issues, Problem and Replication*

Aside from the initial launch done by the MPAJ, all subsequent awareness, follow-up work and motivation had to be done by the school.

Recyclables such as glass and metal are dangerous for small children to handle and the teachers never encouraged the children to collect such materials. For small children, paper and plastics could only be collected. Glass and metal may be collected by secondary schools.

The school itself produces very little glass and metal waste. For all other trash, the students are encouraged to take home. The children probably do not associate the school as a place to dispose of trash.

No incentives were offered to the school. The students were not made to see any value for the recyclables. Payment in exchange for the material was not even offered to the school.

Incentives of some sort are important in motivating the students to collect recyclables, be they prizes, cash payment, goals in collecting or some forms of competition. This will motivate the students and also help the children associate a value to the "waste". Generating awareness through talks and pamphlets is also important.

Finally, short term recycling campaigns are effective option for maintaining interest and participation among students.

4.3.4 Sekolah Menengah Kelana Jaya

a) *Introduction: Background*

Sekolah Menengah Kelana Jaya is a secondary school, with students from mixed backgrounds. Many student have previously attended Chinese or Tamil schools before. Puan Napsiah noted there is a slight discipline problem at school.

Waste disposal and littering is not too much of a problem at the school as there are large, obvious bins for garbage. Recycling and other environment issues are taught at school, mainly in English and Bahasa Malaysia classes, where students read and discuss articles on the environment.

b) *Community Cohesion*

The cohesion within the school is comparative weaker than those found in the other schools. The different background of the students, coupled with the relative problem of indiscipline, would certainly make efforts aimed at building community spirit a bit more trying.

c) *Recycling Efforts*

SM Kelana Jaya was involved in the Plastic Recycling programme organised by the Plastic Task Force of MPMA with the assistance of the MPPJ. The programme was launched in Sept 1993 and is still going on. The MPMA provided bins, educational material, and organised informative workshops for the teachers and the launching for the programme. MPPJ was in charge of collecting the plastic from the schools on a weekly basis. The MPPJ still comes to collect the plastic but only once a month now. Amount is very small at present. Exact collection figures are not available.

Puan Napsiah, the teacher overseeing the project, did not know what sort of incentives were offered to the schools and students to participate (as she only recently joined SM Kelana Jaya). However, some sort of competition with prizes was offered by the MPMA. The first month of the programme response was strong by the students. Idea of prizes and competition was still fresh in the students' minds and the teachers kept reminding students to recycle.

d) *Issues, Problems and Replication*

After the initial month, response died down. Napsiah cited burden of transporting and carrying the plastics as one of the factors. Also, teachers' enthusiasm started to die down and eventually, they stopped reminding students to bring in plastics for recycling.

Short campaigns seem to do better in the schools. Napsiah said that the school has an annual newspaper collection competition within the school which gets very good response. This event is short (about one month) and the student who brings in most kgs of newspapers gets a prize. Incentives are very important to the success of the programme.

For both short and especially long term recycling programmes, education, regular reminders and follow-up is a must to ensure the success of the campaign. Napsiah said there was no follow-up activities (talks, pamphlets, etc.) during the plastic recycling programme by the MPMA or MPPJ. Long term maintenance of programme was left entirely to the schools.

Once again, short campaigns are recommended. This may be extended to a neighbourhood collection centre at the school to raise funds, perhaps for a few months. Otherwise, the project becomes a burden for students to transport their recyclables to school.

4.4 Hotels

4.4.1 Introduction

In January 1995, the Hotel Association of Malaysia (HAM) decided to embark on a recycling programme with several recyclers. While there were originally 11 hotels agreeing to participate in a recycling project, only nine effectively got involved. When the idea was mooted, it was the general understanding of the HAM that the programme was on a trial run basis.

4.4.2 Recycling Efforts

The programme involves providing bins for specific waste such as paper, glass and plastics. The nine hotels which participated were Holiday Inn On The Park, Equatorial Hotel, Hilton International, Shangri-la Hotel, Holiday Inn City Centre, Hotel Grand Continental, Crown Princess Hotel, Ming Court Hotel and Melia Kuala Lumpur. It was agreed that the collection will be undertaken twice a week and the money received will go to charity.

4.4.3 Issues, Problems and Replication

However, since its inception, numerous problems surfaced and at the point of the interview, the HAM was reviewing the project to ascertain as to whether it would continue with the programme.

Infrequent collection has resulted in rubbish accumulating and waste spillage. The problem is compounded by the fact that there is not much space at the waste depository site.

Further, the volume of waste is rather unpredictable. Sometimes there would be a lot of waste while at other times, it may be little. At some hotels, their individual sports clubs are already doing recycling and earning money themselves. And there was little incentive for the clubs to participate in a charity project. Besides this, the volume of waste generated is also dependent on functions held in the respective hotels and this would vary from time to time.

In certain hotels, the waste depository bins are inconveniently located. For instance, there are two hotels where the waste bins are located on upper floors and this poses much difficulties and inconveniences when moving the waste around.

Contamination of waste is quite widespread with wet waste and other types of waste are found with the recyclables in the bins. It does not make sense to the waste collectors to

collect the waste and sort out the contamination. Manually sorting out the waste is time consuming and opportunity cost to the collector is high. However, if they do not sort it, the buyers will not be interested. In the end, after factoring in the labour time spent in sorting the waste, there may be very little economic justification to collect such waste

4.5 Commercial Environment

4.5.1 Offices

a) *Introduction : Background*

Ten commercial establishments were approached for an interview to determine the amount of solid wastes each of them generated and their attitudes towards recycling and extent of participation. These establishments were located in one of Kuala Lumpur's busiest commercial districts - along Jalan Tuanku Abdul Rahman.

Half of these establishments were housed in office complexes while four occupied shophouses. One was a hotel along the main road.

All the establishments are service-oriented firms offering construction and property development services, property investment services, legal services, banking and financial services, and accounting, secretarial and business advisory services. One establishment is the administrative (head) office of a manufacturer of couplings for oil pipes.

Three firms were fairly new, having been established less than two years ago. The oldest establishment was more than forty years old, with the majority being ten years or older.

The biggest firm had 80 employees while the smallest employed two workers.

Two of the shophouse premises were owner-occupied as was the hotel, the remaining seven establishments were occupying rented floorspace. Monthly rental ranged from RM1.39 - RM4.28 per sq. ft., although the latter included building maintenance charges.

All the establishments were locally owned. All but one of the establishments had a cleaner to see to the upkeep of the premises. Pay for the cleaners ranged from RM50 to RM500 per month. The insurance firm hired a building maintenance firm to maintain its eight floors of office space for RM20,000 per month

b) *Consumption of Materials*

Paper is the major material consumed by the respondent companies. The amount of paper consumed was dependent on the size and business activity of the firm. The small firm with two to four employees consumed about two reams of paper per month while the large

firm of 75 employees used 70 reams in the same period. A bank (with 30 employees) consumed 88 reams in one month. Within the same time frame, an insurance firm of 9 workers used up 20 boxes of computer paper. As for newspapers, the number of newspaper subscribed daily ranged from nought to as many as six.

The only significant consumption of other materials was plastics in the form of laundry and garbage bags by the hotel establishment. Usage of these materials was dependent on the number of guests staying at the hotel. In the month of February 1995, about 50 laundry bags and 300 garbage bags were consumed.

c) *Solid Waste Generation*

It should be expected that a substantial amount of waste paper would be generated by most of the establishments. However, only three establishments could provide any figure. The property investment firm generated 20 kg of waste paper per month while the insurance firm said it produced 50 boxes in the same period. One of the two legal firms estimated that their production of waste paper amounted to 100 kg each month.

No bottled receptacles were apparently used by any of the respondents, hence no waste bottles were generated. As far as wastes of plastics and aluminium were concerned, most respondents did not know how much was generated; if at all, they were minimal in quantity. The hotel establishment proffered some guesstimates - a minimum of 150 waste cans was generated each month. One of the two legal firms disposed off between 40 - 60 waste cans each month.

d) *Solid Waste Management*

All the respondents practised some form of recycling activity. This took the form of re-using paper as scrap for note taking and/or draft printing or photocopying. Envelopes were re-used, mainly for internal purposes. Besides the re-use of paper and envelope, no other significant form of recycling activity was undertaken by any of the firms. The only exception was one establishment which sent its used ink jet cartridges to the manufacturer.

All but one of the establishments did not appear to have any policy with regard to the sale of newspaper. Newspaper were either discarded as part of the daily office rubbish or taken away by staff members. In one of the two establishments where old newspaper was sold, it appeared to be an initiative taken by staff members. The employee that sold the newspaper kept the proceeds of the sale. In the other establishment, the staff were encouraged by management to sell the newspaper.

Everyone except one of the respondents was encouraging its employees to show concern for the environment. Such encouragement usually took the form of exhortations to avoid wastes or verbal encouragement to re-use paper.

Separation of solid wastes was not practised by any of the establishments. This could be due to various factors which namely are.

- that wastes generated, other than waste papers, were too minimal to warrant any separation effort
- that lack of storage space precluded such a move
- that recycling was not viewed as a profitable or worthwhile activity
- apathy

e) *Attitudes to Solid Waste Collection Programme*

All respondents said they would participate in a solid waste collection programme and that they were willing to organise the collection of wastes among their employees if there were someone to collect the wastes. Three of them added the proviso that there must be regular (once a week) collection as storage space was a premium. One respondent pointed out that it may be necessary to educate and motivate employees to separate wastes for collection. The local authorities and/or recycling company could help kick-start the recycling programme by offering support in terms of information dissemination, waste recycling receptacles and competitions to inspire the recycling spirit.

Most of the firms did not expect to be paid for organising the collection of waste products. Of the four that expected to be paid for their effort, one said it should be paid only if the volume of wastes was large.

f) *Reasons for Participating in Solid Waste Collection Programme*

The most common reason given for the respondents' willingness to participate in such a programme was that it "was good for the environment" or themes along that line. Other reasons given were that (i) it was "very wasteful to throw away "materials that could otherwise be put to good use", (ii) it could bring in some income for the firm and (iii) it could enhance the firm's image.

4.5.2 Property Management Services

a) *Introduction: Background*

Pertama Complex is a 16-storey office block along Jalan Tuanku Abdul Rahman, one of KL's busiest commercial districts. The complex management company, Pertama Komplek Management Sdn Bhd, engaged two organisations to handle its waste disposal and cleaning services. The Building Supervisor had contracted the waste disposal services to Douglas Engineering Sdn Bhd of Shah Alam and the cleaning services to Harta Maintenance Sdn Bhd. The company charged the tenants RM0.90 per sq. ft. per month for building maintenance services.

b) *Pertama Komplek Management Sdn Bhd*

There was not much waste separation or recycling-related activities in the complex except for two observations. (i) the company's Sports Club collected discarded corrugated boxes and piled them up at the complex's waste disposal area for sale to the agents, and (ii) the cleaning ladies collect old newspaper. The money received from the sale of the boxes by the club went into the club's funds

The Property Manager was generally in favour of some waste separation and recycling-related activity for one major reason - the waste depository is small. The lesser the waste that had to be accommodated, the easier would be the management of it. While not exactly sure how the system should be operated, the company would support the activity provided:

- it was clear who would separate the waste
- who was willing to shoulder the extra cost of waste separation
- the activity took into the space constraint of its waste depositing site
- execution of the waste separation and recycling activity be done peacefully

The company felt that forcing people to separate waste would not be effective. To facilitate waste separation, the company believed that it should not incur extra cost on the tenants, that such activities be proceeded item by item, and that the tea ladies would be ideal to assist in waste separation.

c) *Harta Maintenance Sdn Bhd*

Harta provided cleaning and maintenance services to both private residences and commercial complexes. Harta had 1,500 employees. At Pertama Complex, the services were provided daily. Wastes were collected by the cleaners from individual office lots and deposited at the complex's rubbish disposal area. This was also the site of a waste compressor equipment found in a small enclosure by the side of the building, next to a road. The bags of waste were compressed so as to enable greater storage space for waste deposits.

Harta did not separate wet from dry wastes. However its cleaners did undertake some separation of wastes, particularly of newspaper removed from the offices of individual office tenants. This separation of newspaper was done at the cleaners' own initiative and was not an integral part of Harta's operations.

Harta had not thought of being involved in waste separation activity because it wanted to stick to its core activity. Besides it did not see such activity as economically viable. As Harta envisioned it, an automated process that can separate the different waste item was the solution that would facilitate such an activity.

d) *Douglas Engineering Sdn Bhd*

Douglas Engineering provided waste disposal services to Pertama Komplek Management. It was also providing such services to some ten other complexes in Kuala Lumpur and a few in Petaling Jaya. Douglas collected the waste from the complex and transported them to the dumpsite daily. The wastes were disposed off at the DBKL dumpsite in Sg Besi and the MPPJ dumpsite at Kelana Jaya. Most of the wastes were not separated. Douglas was not involved in any form of recycling activity because of costs factor. If the facilities were available, Douglas could become involved in recycling activities. The separation of waste at source would also assist with its involvement in such activities. The lack of space at the complex was a definite constraint to the implementation of a waste recycling programme.

4.6 Summary of Major Findings

In the case of community-based programmes, those recycling programmes launched in residential areas and schools offered mixed results. Nonetheless, while all the recycling campaigns faced some sort of problem, the most successful - based on participation and continuation of project - were those undertaken at S.K. Taman Petaling, ISKL and Hillside Apartments.

Some of the common traits these recycling programmes include: baseline awareness and education cultivated within community; presence of an agent to monitor the recycling program; continued education and follow-up maintenance throughout the project by the agent and other organisers; support from management (principals, recycling companies, developers); and free collection and payment for recyclables. Incentives such as competition and prizes also played important roles in the schools.

Common problem faced by all recycling efforts was the inconvenience of the programme. Inconveniences include making residents buy special bags to recycle and separate into 5 plus different groups, as in SS3. Or placing the waste bins a distance away from residences, as in Hillside Apartments. All of the schools cited carrying recyclables to school was a burden for the students.

Some common problems in recycling campaigns that failed or did poorly over the long term (SS3, S.K. Kelana Jaya, S K. Taman Melawati) include the following: the lack of groundwork and overall support by organisers to inform neighbourhood or school about the recycling program being launched in that area (SS3 and Taman Melawati); participants in recycling program were not properly briefed on the rationale and mechanics of the program (SS3); the importance of recycling and separation not instilled on participants (SS3 and Taman Melawati); lack of follow-up to keep participants motivated (SS3, Kelana Jaya and Taman Melawati); and lack of incentives to inspire participation (S.K. Kelana Jaya and Taman Melawati).

Every group participating in recycling had some recommendations for successful recycling campaigns in the future. Most prevalent was to get public more informed and concerned about recycling and waste separation. These could be undertaken via mass media - T.V., radio and newspapers on a national level; workshops and open dialogues on a local level.

The importance of doing proper, thorough ground work before the launching of a recycling campaign was also stressed. The MPMA's two day workshop for its plastic recycling campaign at schools is a good example. The MPMA invited one teacher from all participating schools to the workshop which thoroughly explained the importance of recycling. Whether this information was properly passed from the teachers to the schools is not known. But at least during the first month of plastic collection, most schools were responsive.

Continued monitoring, education and follow-up throughout the recycling program was also cited as an important step to ensuring the campaign's long term success. For example, the plastic collection started to decrease in S.K. Kelana Jaya because teachers and other organisers stopped reminding students to participate after the initial competition. Whereas plastic recycling has remained strong in S.M. Taman Petaling because the teachers and principal made extra efforts to ensure its long term success. This continued monitoring and education has contributed to the success of ISKL and Hillside Apartments recycling also.

Most all groups interviewed cited the importance of incentives to ensuring success. Incentives such as competition, prizes and cash payments help inspire the desire to participate while they also help participants put a value on their waste. Incentives could also include support from developers, government and recycling companies to the community by giving free collection containers, duplication and distribution of information to community, sponsoring community gatherings, etc. Such incentives helped the Hillside Apartments recycling programme reach its participants.

Interviewees also stressed the importance of convenience. Getting Malaysians involved with the least interference to their every day life is also important, especially at the Malaysians current level of awareness and concern. Schools often cited that the burden of community recycling had been pushed onto them. Although they felt recycling was an important habit to cultivate at school, community recycling should be done on a large scale at home. Malaysians can not be expected to pay to recycle. If the idea is to inspire a recycling habit among Malaysians, making them pay extra at this stage of their awareness would be suicide to the recycling programme.

As far as the commercial sector is concerned, the hotels are making a head-start in recycling programmes. However, the overall results are not so encouraging; there are various problems faced by both the initiator and the collectors. The most prevalent problems being the contamination of waste and the infrequent waste collection. These two problems are related and they reinforced each other and it is important that they are resolved soonest possible as it could mean an end to the recycling efforts.

In the case of the other offices, recycling is currently practised on a limited scale by the enterprises in the study. This takes the form of re-use of "clean wastes" like paper and envelopes. Recycling of other solid wastes did not appear to be in the mind-set of these firms. The only waste separation or recycling related activity was observed in the office complex where corrugated boxes were collected by the complex's sports club and sold to agents and the separation of newspaper by the complex cleaners. The cleaners' activities were done at their own initiative and did not form an integral part of the cleaning firm's operation. The cleaners that were currently removing wastes from individual office lots would remove the separated wastes to the rubbish disposal area for collection once a week.

Nonetheless, the respondents have indicated a willingness to participate in a waste recycling programme and to organise their staff to separate the wastes provided a collection system exist. That being the case, separation of wastes at source could be quite easily instituted. The most critical factor that needed to be considered was the lack of space in most commercial organisations for storing the recyclable items. Collections would have to be regular and consistent. Apathy is another factor to consider. Recycling programmes can only achieve limited success unless such public attitude can be overcome.