

## **CHAPTER 5**

### **THE RECYCLING INDUSTRIES AND RECYCLING COLLECTORS**

#### **5.1 Introduction**

This chapter will attempt to map out the current status of the recycling industry in Malaysia. As secondary references are lacking in this area, this study endeavours to sketch out the scenario based on direct interviews and first hand information. The industrial waste groups covered are: (a) glass (especially glass bottles), (b) aluminium (especially aluminium cans), (c) plastics, and (d) paper. In each of these industrial groups, three companies were identified and the relevant executives interviewed. The interviewee companies comprised two groups - that is, the middleman collectors or traders as well as the manufacturers who utilise recyclable waste in their production. This is further complemented by interviews with waste pickers and collectors at the dump site in Jinjang North and Kelana Jaya.

This section does not pretend to give a comprehensive coverage of the subject matter. It is beyond the scope of this project to undertake an extensive survey of the entire recycling industry; but only through the survey findings and interviews to shed light on the going-ons within the recycling infrastructure which is somewhat lacking in documentation. In the final analysis, the ultimate goal of this section is rather modest; it endeavours to lay out some basic understanding of the recycling industry particularly in the KL and PJ area. In doing so, major recycling issues and problems concerning the industry are also explored.

#### **5.2 Glass**

##### **5.2.1 Key Recyclable Items**

Glass is 100% recyclable. They are generally classified into glass bottles and flat glass waste. The glass bottles consist of post-consumer waste as well as unwanted bottles from the factories or warehouses whereas flat products comprise mainly industry waste.

Recyclable glass can be categorized into flint glass, mixed (broken) glass and reusable glass bottle. Flint glass is used to produce new flint glass while mixed coloured glass is used to produce green containers.

Some bottle types such as soft drink bottles are reused in bottling drinks and making lamps for lighting purposes.

Clear flat glass waste are recycled into new similar products within the decorative glass industry.

### 5.2.2 Recycling Technologies in Use

Unlike many other industries, glass recycling is a necessary and integral part of its overall production technology; a major attributive factor being that glass is 100% recyclable. Kuala Lumpur Glass Manufacturers Company Sdn Bhd (or KL Glass), for example, has incorporated recycling - at least in-house waste - since its incorporation in 1968. Presently, the company produces about 200 tons of flint glass containers and 50-70 tons of amber glass daily.

Bottle waste and recyclable glass delivered at the company's premise are separated into two major groups - flint and mix glass. They are then sent for crushing and cullets are churned out as raw materials for glass production. Caps and other unwanted waste like paper are sieved out.

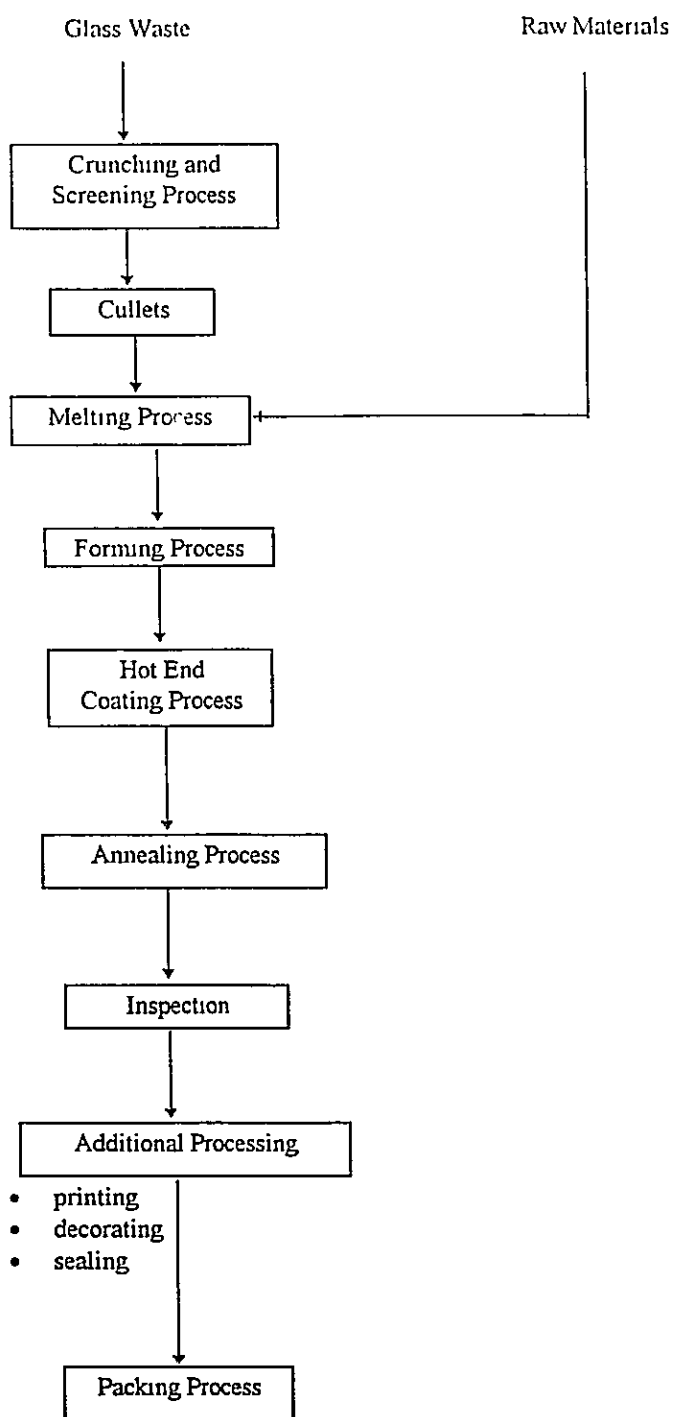
The cullets, together with sand, are subsequently melted down before being moulded into glass products. Other raw materials include sand, soda ash, limestone and a decolourising agent. Adding more cullets will lower the melting point and consequently less energy is consumed in the production process. Greater energy efficiency can be obtained from a higher usage of cullets; for the same amount of energy, there will be a larger output of glass products. In the case of KL Glass, they intend to upgrade their recycling technology which would not only increase production capacity but also improve on efficiency.

The existing production line can accommodate different product specifications by readjusting and modifying the production process. An allowance of half a day is needed, and this includes production stabilisation for a newly-specified end product.

The production technology of flat glass is similar to that of bottles. The production process begins with batching that is sand, dolomite, soda ash and salt cake are measured and mixed in fixed to attain homogeneity before the mixture is melted down. Recyclable glass (which have been washed, dried and crushed into cullets) are added into the furnace for melting. This is followed by refining, drawing, annealing and washing. Any glass rejects following the wash will be recycled. Figure 5.1 summarises the recycling process of glass waste in Malaysia.

According to Malaysian Sheet Glass Bhd or MSG, the use of glass waste lowers energy consumption by more than 20% energy as compared to a situation where only sand is used.

Figure 5.1 Glass Waste Recycling Process in Malaysia



Overall, the quality of product manufactured using recyclables is comparable to those made from virgin materials. There is no problem with product image. The buyers of glass containers, for example, the food and beverage and the pharmaceutical companies, bottle well known consumer brands such as Nescafe, Horlicks, Ribena, Kimball Chili Sauce, Maggi Ketchup, etc and medical products such as prescriptions, pills, syrups, etc. The product quality remains excellent as reflected by the demand of its products. This is complemented by its quality control which is an important aspect of its production process.

### 5.2.3 Price of Wastes

Glass is transacted at various levels. At the dump sites, the waste could be bought from 2.5 to about 10 sen per kg from waste pickers and municipal garbage collectors. Waste pickers at the Jinjang North dump site, for example, sell sorted beer bottles for 5 sen per kg and flint bottles for 10 sen per kg. In the Kelana Jaya dump site, the municipal workers sell bottles of various assortments without any separation to a collector for 2.5 sen per kg at the dump site.

The waste is subsequently sold to direct users or traders. The collector at the Kelana Jaya dump site resells recyclable glass at about 3.5 sen per kg and reusable bottle for 4.5 sen per kg (ie. after sorting). For direct users like KL Glass, they buy flint glass recyclables from collectors or traders at RM150 per ton (about 15 sen per kg) and other mixed glass at RM110 per ton (about 11 sen per kg). The company also organizes its own sourcing through its own contractor, paying him RM25 per hour for collecting glass from its networked sites like residential areas, sport clubs, etc. and RM50 per load per trip for a 5-ton lorry to collect unwanted factory glass waste from various sites.

In the case of a flat glass manufacturer like MSG, the waste is collected from glass dealers free of charge. For collection, the company appoints a contractor to collect waste glass from glass dealers. The contractor is paid in the range of RM50-RM100 per ton, depending on market conditions and negotiated agreement.

The economics of waste glass recycling is highly dependent on the cost of collection, and in particular, the cost of specific urban transport.

### 5.2.4 Supply and Demand

There is still plenty of room for the glass recycling industry to grow. Currently, about 20-40% of the raw material input for KL Glass comes from cullets (ie. recycled glass); about 10-15% are from its own production lines and the rest from suppliers. The company intends to increase cullet input to 70%. In terms of value, the overseas raw materials amounts to approximately 60% of total raw materials input cost.

Recyclables are sourced from dump sites, hotels, sport clubs, supermarkets, apartments and schools. The company's customers - that is, the buyers for its glass products - also supply the company with recyclables broken glass.

While there exists some collaborative effort between local authorities and glass manufacturers, most of the waste sourcing are formalised on a one-to-one basis, that is, the latter striking an understanding with an individual sports club, supermarket or apartment community

However, in the case of hotels, an agreement was struck with the Hotel Association of Malaysia which resulted in a collection agreement with 9 participating hotels

As for the schools, some educational extension work had been undertaken by the company but no recycling programme has yet materialised

There are also other "outstation" private contractors or collectors supplementing the supply of recyclables. Contractors with their own collection network would supply recyclables from as far as Ipoh, Kuantan and Malacca. Such supply are not contractual but are generally entertained by the company as and when recyclables are available.

As for flat glass recyclables, MSG can absorb more flat glass waste provided they meet quality standards. The flat glass industry can potentially absorb recyclable glass waste to an amount equal to 15% of the total flat glass production in the country. Notwithstanding this, MSG envisages a reduction in glass waste used in the long run. This is because its in-house waste is expected to decrease substantially because of projected efficiency and lower glass rejects. Notwithstanding this, MSG plans to increase its usage of outside recyclables.

### 5.2.5 Main Actors

KL Glass sources recyclables from dump site collectors, its own contractors and external contractors.

The bulk of wastes collected by dump site collectors come from municipal garbage collectors with a smaller amount from waste pickers. Trucks from MPPJ and Majlis Daerah Petaling would come around to the collection shed and unload bags of waste.

The recycled glass are heaped together for sorting into three main groups: reusable glass, mixed (amber, green, etc.) glass and clear flint glass. The flint and mixed glass will be used by KL Glass while the reusable glass will be sent to a trader who subsequently passes them onto a recycler who would clean and sanitise the bottles for reuse as food bottles. A portion of the used glasses are exported to Thailand which are subsequently manufactured into lamps.

KL Glass's appointed contractor is a transport company owned by Ah Seng whose main activity is to deliver products to their KL Glass's customers. The contractor is also given the task to collect glass waste from hotels, apartments and factories. At present, there are 9 hotels in Kuala Lumpur and 2 apartment residences participating in

these recycling project - Hillside Apartment in Ampang Jaya and City Garden Orchid Court in Kampung Pandan Dalam. KL Glass provides each hotel or apartment residential area with 2-6 bins (44-gallon drum) with carrying load capacity of 60-70 kg glass per drum.

Collection is about 3 to 4 times a month for the hotel (averaging once a week) and "as and when the bins are full" basis for the residential areas. As for factory collection, the waste are mainly flint. Collections are undertaken 6-7 times per month. Factories selling glass waste are Yeo Hiap Seng, Cold Storage, F&N, Kickapoo and Sunkist. The bulk of F&N and Sunkist glass waste are supplied to Malaya Glass.

In the case of MSG, its contractor collects glass waste from industrial sources. There is a closed loop within the sheet glass industry for recyclables. Glass dealers - to whom MSG supplies flat glass products - generate a lot of glass waste in their production of decorative glass products. Glasses that are cut off are put aside for the daily collection of the MSG contractor.

MSG started systematic collection of glass recyclables about 7 years ago. A sole contractor is specially appointed to collect glass waste daily. And that is the contractor's sole business activity. Before that, glass waste input was uncertain and is dependent on as and when these waste are available.

Currently, there are 5 regular dealers providing glass waste to MSG and they are all located in Kuala Lumpur. Since transport costs are high, sourcing from elsewhere is not economically justifiable. The supply of glass waste is very much dependent on the suppliers' response to MSG's demand for wastes. Glass dealers within the vicinity have been informed of the MSG's waste collection.

The glass waste are picked up by the MSG contractor without any payment made to the dealers. They are happy to let the contractors have them free of charge as this service solves their waste disposal problem. In the present circumstances, MSG has a monopoly in flat glass production and is a monopsonist "buyer" of flat glass recyclables.

### 5.2.6 Extent of Waste Recycled

In KL Glass, about 20%-40% of total output is made from recycled materials. But it has a much larger capacity to use recycled glass. Its maximum recycling capacity is 300 tons per day while the current level is about 100 tons per day.

To produce 200 tons of glass products, about 205-210 tons of raw materials is required. Culletts account for usually 10% of input but this can easily double. The 10% culletts used comprise 3%-4% in-house rejects and 7% recyclables sourced externally.

However, post-consumer glass waste does not feature in MSG waste input for sheet glass production. For the production of sheet glass, MSG requires glass waste of similar types. Glass bottles and containers are not suitable because of different quality

and chemical mix. While the production of glass bottles can use recyclable sheet glass, the converse is not true for the production clear sheet glass.

As flat glass waste is an insignificant item of the household waste stream, it is not economically viable to undertake a household collection exercise. The flat glass product has a much longer life cycle and is seldom thrown away unless it is broken.

For MSG, total glass waste sourced from outside and used as raw material amounts to about 200 tons per month. This represents about 5%-10% of the total raw materials used. Recyclable glass waste generated internally within the company makes up another 15%-20%. In all, glass waste accounts for about 20%-30% of raw materials inputs.

### 5.2.7 Key Problems and Issues with Recycling Post-Consumer Waste

The major obstacle to increasing glass recycling comes not from industry demand but from the supply side. While the industry is inclined towards greater recycling efforts, there is insufficient supply of glass recyclables. The supply of recyclable glass is primarily determined by the cost of collection, i.e. transport and labour cost.

Contamination of recyclables is another major problem. There is also the general problem of mixed or unsorted wastes. The hotels' bins, for example, would contain other types of waste e.g. ceramics mixed with glass. During marathon runs the public would throw all kinds of rubbish into the glass recycling bins, despite being placed next to the existing rubbish bins. Another example is with a supermarket. A special drum for recyclable glass at the supermarket was filled with all kinds of throw-away materials apart from glass. As such, the experience with the public on voluntary separation has been very dismal and totally unsuccessful. The company has subsequently re-strategised and embarked on collaborative work with councils, hotels and schools.

Collection sites can be a collection problem. The experience of hotel recycling project illustrated this point quite well. The depository and collection sites of the glass waste may not be at the same location. This problem is encountered with two hotels where the glass waste are deposited at 8th or 9th floor while the collection bins are located at the ground floor at the back of the building. And this poses great difficulty in moving the waste around the hotel without creating a public nuisance out of the collection efforts.

Expansion of operations for KL Glass is not a problem. It is willing to organize and set up funds for 12 regional collectors in Klang Valley to collect old glass. Central sorting areas would also be a good option from the company's point of view.

## 5.3 Aluminium

### 5.3.1 Key Recyclable Items

The major aluminium recyclables include aluminium cans, extrusions, cables, strips and miscellaneous items. However, unlike other aluminium scraps, cans are not recycled locally because the existing recycling technology operates at a high economies of scale. Instead, can scraps are exported overseas for recycling. Japan is the major importer of aluminium cans from Malaysia. The wastes are reprocessed and recycled into ingots or semi-finished products for both domestic consumption and exports.

### 5.3.2 Recycling Technologies in Use

In Malaysia, the production technology exists for recycling extrusion and other aluminium product waste but not for aluminium cans. As such, these can scraps are exported abroad and are not recycled locally. Figure 5.2 shows the typical technologies in use for recycling aluminium cans in developed countries. There is also no demand for cans from extrusion and flat product manufacturers because aluminium cans contain impurities which make it unsuitable for their material inputs. Higher grade wastes like aluminium extrusions, cables and foils are used instead.

Quality control of the aluminium waste products is important as scraps can create problems at the furnace-melting stage. The relative strength of the aluminium, for example, is influenced by impurities and the amount of other metals like magnesium, copper, iron and manganese present in the alloy.

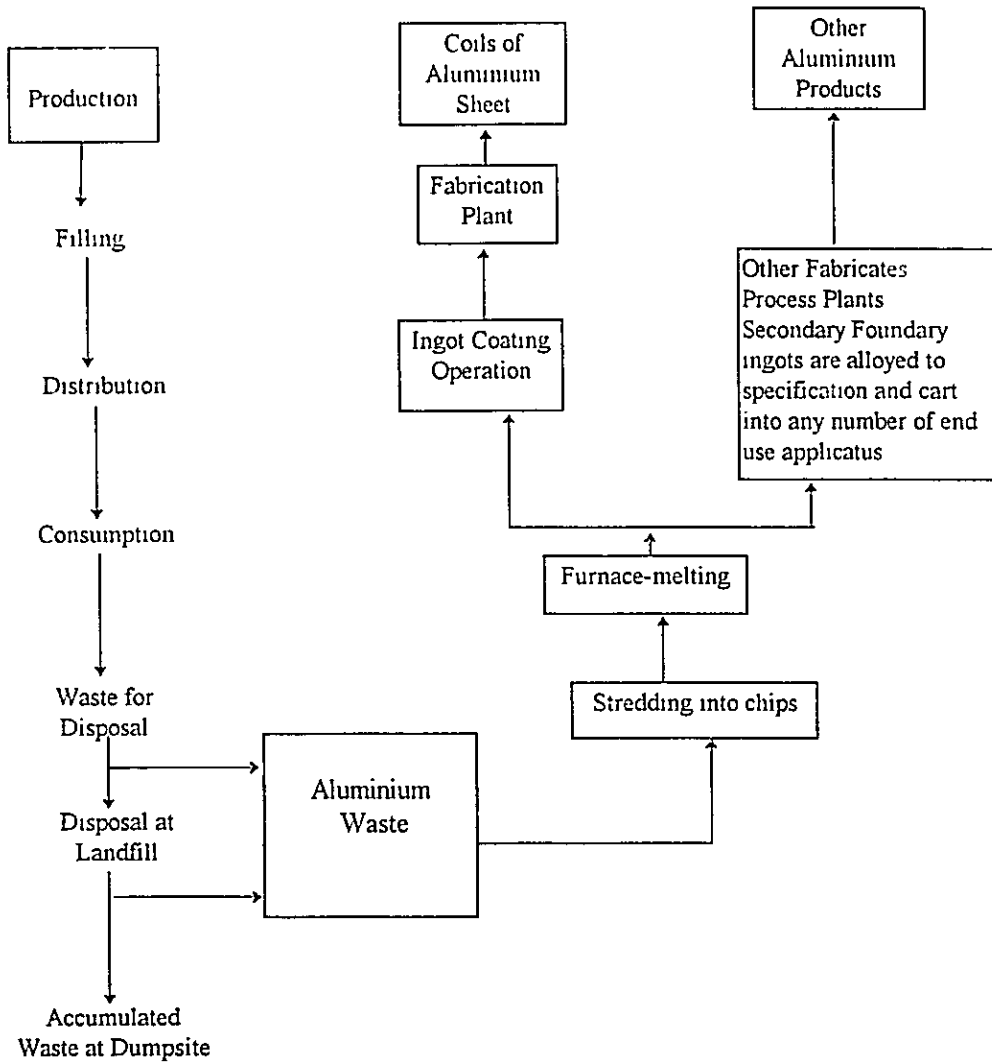
For extrusion production, imported aluminium ingots, coupled with internally-generated factory waste and recyclable waste supplied by traders, are fed into the furnace to be melted and transformed into billets. These internally-produced billets, coupled with imported billets, are then passed onto the press machine for shaping. Rejects from the post-shaping process would be fed back into the furnace for re-melting. Extrusions are used mainly in the construction industry.

As for flat products, the ingots and waste are also melted down before being rolled into semi-finished coils. These are then fed into the rolling mills to mould them into products with certain specifications. Rejects from the production process are fed back into the furnace for reprocessing. The final products are used as materials for vehicle bodies, sign boards, packaging industry, electronics industry, construction industry and air-conditioner parts. Figure 5.3 shows the recycling process of aluminium in Malaysia.

Product quality is not compromised even if recyclables are used. Alcom's products for example, are sold domestically as well as exported to Brunei, Hong Kong, Indonesia, Japan, Philippines, Singapore, Sri Lanka, Taiwan, United Arab Emirates. About 22%-30% of its production served the Southeast Asian market. In the case of sheet product, as much as 48% of the output are channeled to licensed manufacturing warehouses and free trade zones.



Figure 5.2 Aluminium Waste Recycling Process in Developed Countries



As far as the recycling of aluminium cans is concerned, it entails a separate investment decision altogether. As the capital investment is enormous, the business of recycling aluminium cans could only be viable provided it can reap economies of scale. According to Kian Joo Can Factory Bhd (or Kian Joo), the volume of aluminium cans consumed in the Malaysia - and hence, the associated volume of post-consumer waste - is not sufficiently large enough to warrant a venture into such recycling business. Currently, Kian Joo produces about 700-900 million aluminium cans a year. In terms of weightage, this is equivalent to 11,000-14,000 tons of output per year. The company manufactures aluminium cans using semi-finished product such as aluminium coils as its raw materials. These coils are imported from Japan, Australia and Germany.

### 5.3.3 Price of Wastes

Recyclable aluminium waste are sold for RM1.00-RM2.50 per kg at the dump site. At the dump site in Jinjang North, the collector pays about RM1.00 per kg of aluminium cans delivered by the waste pickers. However, the collector may pay as much as RM1.60 per kg for the waste delivered at its collecting centre. At the dump site in Kelana Jaya, the major items transacted include aluminium cans and other aluminium products, which the collector pays RM1.80 per kg and RM2.50 per kg respectively from the municipal truck workers at the dump site.

The collector would then sell the waste to a trader. The dump site collector, Lim Ah Lian Hardware, for example, resells the aluminium cans to a trader for RM1.80-RM2.00 per kg.

According to GMS Purnaimpex Sdn Bhd (GMS), a trader who also goes around to source waste, they are prepared to pay RM1.20 per kg for "clean" aluminium cans and RM1.00 for "dirty" aluminium cans. There is also the occasional individual who wants to sell a small number of cans. For small items, the trader offers 2 sen per can. Can scraps are destined for exports.

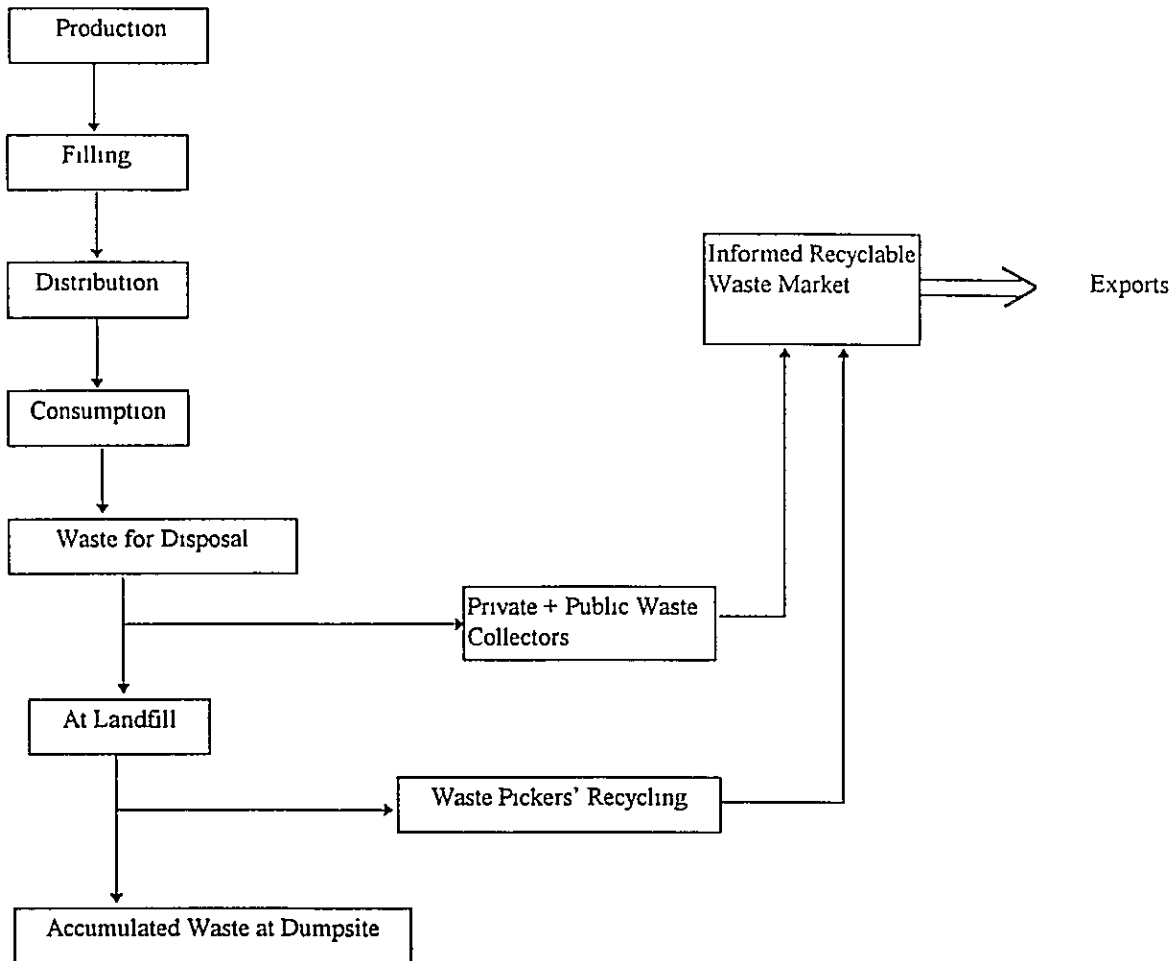
As for extrusions and other aluminium products, they are demanded locally by manufacturers of extrusions and flat products. The recyclable materials were purchased by recycling firms from waste traders at RM3.80 per kg onwards depending on the quality. Cable scraps would cost about RM4.80-RM5.00 per kg while extrusions and sheet scraps around RM4.50-RM4.80 per kg. Foil scraps, on the other hand, cost RM3.80 per kg.

### 5.3.4 Supply and Demand

There is no local demand for aluminium can waste but there is a growing demand for such recyclables from overseas, especially from Japan. GMS exports on average about 30-40 tons of aluminium cans per month. All recyclable cans are exported to Japan under a trading contract agreed upon by the both exporting and importing parties. The company also handled aluminium strips and scraps, but these are generally smaller in volume. Most of the supply of aluminium cans come as rejects from factory like Kian Joo and also from other collectors.

As for extrusion and flat product, the demand for recyclable aluminium waste is pegged to the price of aluminium ingots i.e. the main virgin raw material. To this extent, the relative proportion of ingot and aluminium scrap is based on their relative costs. Ingots are supplied by three vendors and cost around USD1,900-USD2,000 per ton in March 1995. This is generally competitive to compatible aluminium scraps whose price ranges from RM3.80 to RM5.00 per kg depending on the quality. Hence, the price of aluminium scrap varies in direct proportion to the spot prices of aluminium ingots on the London Metal Exchange.

Figure 5.3 Aluminium Recycling in Malaysia



It should also be noted that the demand for aluminium waste is also dependent on the operating cost of the furnace-melting activity. According to Alcom, in instances where it becomes costly to melt down the raw materials - as in the case where the furnace is old and hence inefficient - imported billets would be preferred. Hence, the use of ingots and aluminium scraps will be reduced or eliminated.

Alcom sources aluminium scraps from its distribution networks as and when they are required. Currently, the company has contracted GMS to supply it with recyclable aluminium extrusions for its use. According to GMS, recyclable extrusions are mainly consumed locally and not exported, partly because there is sufficient local demand to absorb the supply. Local extrusions compete well with imported ones.

Can scraps are not used in extrusions or flat products because of the level of impurities. Aluminium cables, besides the extrusion waste itself, make excellent recyclable waste because it has very little impurities. Quality control of the aluminium waste is important as the scraps can create control problem at the furnace. The relative strength of the aluminium is influenced by the amount of other metals like magnesium, copper, iron and manganese present in the aluminium alloys.

### 5.3.5 Main Actors

The major players in aluminium cans recycling include waste pickers, dump site collectors, small dealers, traders and overseas buyers. Post-consumer aluminium waste is retrieved by waste pickers at the dump sites and is subsequently sold to collectors located at the site. There is not much sorting undertaken by the collectors themselves. The collectors may or may not compress and bale the can waste before selling it off.

As for trader like GMS, recyclable aluminium cans are mainly sourced from the collectors, factories, small dealers and their own recycling network. The waste may or may not come sorted and baled. This activity is generally left to GMS. For the bags of loose cans received, contaminated are sorted out manually before compressing and baling them for export.

Dump site collectors like Lim Ah Lian Hardware would sort out, compress and bale the aluminium cans before selling them whereas no such activity was observed in the case of the Kelana Jaya dump site collector.

As for factory rejects, major can producers like Kian Joo send all their rejects to GMS. Presently, GMS workers are stationed at Kian Joo to help compress and bale all rejects. The baled waste is then stored until shipment.

There are quite a number of small dealers, such as those operating sundry or grocery shops, supplying GMS with can waste. The growth of these dealers came as a result of GMS abandoning their previous collection system. Kian Joo and GMS launched a one-year long "Cash for Can" campaign in 1991-1992, setting up some 100 collection centres all over the country, including Sabah and Sarawak. About 15 of them were located in the Klang valley. A telephone number was provided through the TV media and the public was directed to a nearby centre to exchange cans for cash.

Nonetheless after a year long campaign, GMS decided to dismantle the entire structure in favour of small dealers operating on their own. During the campaign, GMS handled the entire operations - from buying to cleaning, pressing and baling. However, with the restructured operations, the small dealers do their own collection, buying, cleaning, pressing and baling before sending the waste to GMS. This restructuring was seen to be more cost effective from GMS's point of view.

Besides Peninsular Malaysia, GMS also sources aluminium cans from Sabah and Sarawak.

GMS has also organized recycling projects with hotels, schools and residential areas. The company goes on direct collection twice a week. For residential areas, like Hillside Apartments, the company will collect the waste when the bins are filled. The resident-in-charge will inform the company when the bins are full.

Occasional drop-ins by individuals are still entertained. However, such volumes are very small.

In the case of recyclable extrusions and other aluminium waste, they are readily available in the scrap market. Alcom buys aluminium scraps from 3 approved vendors. The company specifies the volume and types of scraps required and the suppliers are expected to meet the demand. Most of the scraps are industrial products, not household waste. Traders like GMS have their own network of suppliers and collectors to meet the demand. Its principal buyer, Alcom, provides a standard guide on what are the acceptable recyclables. This is used as a reference for GMS to sort and separate the waste accordingly.

Extrusion wastes come in various shapes and sizes. Upon delivery, they are sorted into usable and non-usable materials. They are then cut into uniform lengths and tied up into bundles using "thrown-away" aluminium cables before being sold to the user company.

### 5.3.6 Extent of Waste Recycled

Aluminium can wastes, factory rejects and post-consumer aluminium cans are equally important sources of wastes. While factory rejects are sourced directly from the factory, post-consumer waste comes from the network of collectors and dealers and trader's organized sourcing. GMS Purnaimpex, for example, has collection agreements - both formal and informal bases - on aluminium cans with some hotels, residential areas and schools. Aluminium can waste traded by GMS averages about 30-40 tons of cans per month.

Can manufacturer like Kian Joo is not recycling any aluminium waste because it uses only semi-finished product like aluminium coils as raw materials. These coils are purchased from Japan, Australia and Germany. It does not incorporate recycling technology because that would entail a separate investment decision altogether. The transformation of raw materials and scrap aluminium into semi-finished goods is a stand alone business on its own. The capital investment is enormous. And the production process itself has to reap economies of scale for such a project to be viable. The bauxite and aluminium waste in Malaysia are not adequate to economically justify the melting cum production of aluminium coils for the subsequent production of aluminium cans.

As for the other recyclable aluminium waste - that is, the non-can waste - it comes predominantly from industrial sources. For Alcom, on average about 40% of raw materials come from recyclables. The company produces about 700 tons of extruded products a month and 2,000 tons of flat products per month.

Overall, the potential for aluminium scraps usage is strong. Malaysia's current consumption of aluminium is about 10 kg per capita compared to 80-90 kg per capita for the US.

### 5.3.7 Key Problems and Issues with Recycling Post-Consumer Waste

The lack of manpower and consequently the cost of labour poses some problem for expansion of the aluminium recycling industry. This is particularly true of scrap collection. GMS, for example, say it is difficult to employ staff to handle its overall operations. At certain times, the shortage of manpower affects their own waste collection in the city. Because of the preoccupation with the storing, sorting, packaging, shifting, cutting, compressing, baling, bundling and trading activities, collection at certain sites were not manned. It has about 27 employees handling general office management and administrative work and site work.

Another major problem encountered is the indiscriminate and indiscipline manner of waste thrown into recycling bins. For example, even where special bins are provided by GMS - there is a lot of contamination. Other waste, including wet waste, is indiscriminately thrown into the bins together with the aluminium cans, resulting in added cleanup costs. The cost incurred in separating contaminated waste and cleaning it is an impediment to an effective and efficient recycling programme.

Finally, for scrap collection to be viable, each collection station should have at least 20 kg of aluminium can waste for collection in Kuala Lumpur or 50 kg outside Kuala Lumpur. Associated with this issue is the importance of economies of scale. Transportation cost is high and hence, the collection network and coverage has to be cost effective.

Infrequent collections is detrimental to recycling efforts. The experience of tin can recycling project launched some time ago started off on a promising note. Bins, which were provided at petrol stations, were filled up quickly without a corresponding rate of clearing. As collections were irregular and infrequent, waste tin cans started filling up the bins. Cans overflowed The bins and littered all over, leading to owners of petrol kiosks abandoning the programme altogether.

## 5.4 Plastics

### 5.4.1 Key Recyclable Items

According to the Malaysian Plastics Manufacturers Association (MPMA) and the Malaysian Plastics Waste Management Task Force (MPWMTF), while virgin resins are currently favoured, there is a growing use of imported plastic waste in Malaysia. They are used mainly for the manufacture of lower-end products such as pails and chairs for domestic consumption or diverted as a commodity for regional trading.

The major raw materials consumed include low and high density polyethylene (LDPE and HDPE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), acrylonitrile-butadiene-styrene (ABS), expanded polystyrene (EPS), polyethylene terephthalate (PET), etc. Over 82% of raw materials are imported in 1992. However, it is foreseeable that with the completion of large scale resin plants - such as

Polyethylene Malaysia Sdn Bhd - there will be a lesser dependence on raw material imports.

As an indication, LDPE can be found in bags, bin liners, toys and flexible containers while HDPE is present in industrial wrappings and film, sheets, containers, bottles and even toys. PP is found in snack wrappers, automotive parts, electrical components, microwave-proof containers, medical packaging, etc. and PET in bottles and food packaging. PS is used to make dairy product containers, electrical appliances, tape cassettes, plates, cups, and the like, while PVC is a material used for flooring, insulation, piping, wallpaper, packaging film, medical products, etc. ABS is used for general appliance mouldings.

For Efficient Growth Sdn Bhd, a recycler who produce pellets, its major waste include PP, LDPE and HDPE. Of these, sheet materials are favoured.

It should be noted that not all types of materials are suitable for plastics recycling. PET bottles, for example, is not popular and is costly because the need to separate its various components such as the bottom base, the body, the PVC label and the cap as they contain different chemical resin compounds composition. For efficient recycling, clear plastics, not mixed blended plastic resin are essential. Single material containers are most cost effective to recycle.

Certain plastic wastes cannot be recycled from an economics point of view. These include plastic bags and plastic laminated paper. HDPE plastic bags are not viable recyclables. They soil easily and is not cost effective from the buyer's point of view. The actual clean mass of the material is normally contaminated to gain additional mass so as to fetch a better price. In addition, it is simply not cost effective to recycle the material since virgin raw materials are cheaper. As for plastic laminates, they have no recyclable potential for both the plastic and paper industries. The "contamination" is very difficult and costly to overcome.

#### 5.4.2 Recycling Technologies in Use

The plastics industry is one of the earliest to practice recycling and it has been recycling plastics for more than a decade. However, the bulk of recycling concerns only in-house factory waste. Actual activities recycling come from converters with excess post-production waste; they would recompound the recovered reworkable plastic and recycle them into the original product.

Unlike the other industries studied in this report, the plastic recycling technology is not an integral part of the production process. As pointed out by the MPMA and MPWMTF, there are no Malaysian specifications for "design for recycling" or "design for the environment" as yet. Some equipment manufacturers have altered their designs in alignment with international demands for recycled compounds or laminates.

There has been a general reluctance on the part of the plastics manufacturers to invest in modern production designs which incorporate recycling capability. Overall, the industry is generally reluctant to spend new capital to replace older equipment with

more modern designs that include recycling capabilities. Nonetheless, some plastics converters are undertaking research with the objective of reducing virgin material requirements.

Among the various options, mechanical recycling - that is, chopping, melting, pelletising - remains the cheapest way to recycle and is present in the industry. Chemical recycling is more expensive and hardly exists. There is some experimentation at present. Recompounding activity - that is, blending reworkable resin with virgin resin - is limited and tailored to meet client specifications (Figure. 5.4). Incineration remains an expensive exercise and non-existent in the country.

Efficient Growth, for example, uses plastic sheet wastes as its major raw materials. All its recyclable raw materials are cleaned before inspection. Screening is carried out manually with unwanted waste being sorted out further. The screened plastic waste is then crushed or shredded before being subject to a pelletising process (Figure 5.5). The pellets are then packed and sold to wholesalers. Pellets are eventually used to manufacture nursery bags, garbage bags, plastic containers, etc. Its output is about 80-120 tons per month. The pellets are sold to buyers outside Peninsular Malaysia, particularly to Singapore, Thailand, Sabah and Sarawak.

Its recycling technology came from Taiwan and is comparatively cheap; Taiwanese technology can be as low as 30% the cost of technology from the West. There are some modifications done to its production process by Efficient Growth and these are achieved from its own R&D activities.

#### 5.4.3 Price of Wastes

The plastic waste collected at the dump sites is not sorted out and is sold on a log, stock and barrel basis. The dump site collector at Kelana Jaya would pay about 20 sen per kg of plastic waste delivered by municipal collectors. The waste pickers and outside suppliers at Jinjang North, on the other hand, receive about 15-20 sen per kg of the plastic waste from the collector.

The waste is subsequently sold to a trader. In the case of the Kelana Jaya collector, she sells her collected waste to a trader for about 37 sen per kg while her Jinjang counterpart sells his for 20-25 sen per kg.

Recyclers like Efficient Growth pay about 30-50 sen per kg for plastic waste sourced from dump sites and 60 sen to RM1.20 per kg for factory waste. However, of late, the company has been sourcing more and more imported waste.



Figure 5.4 Mechanical Recycling & Plastic Waste in Malaysia

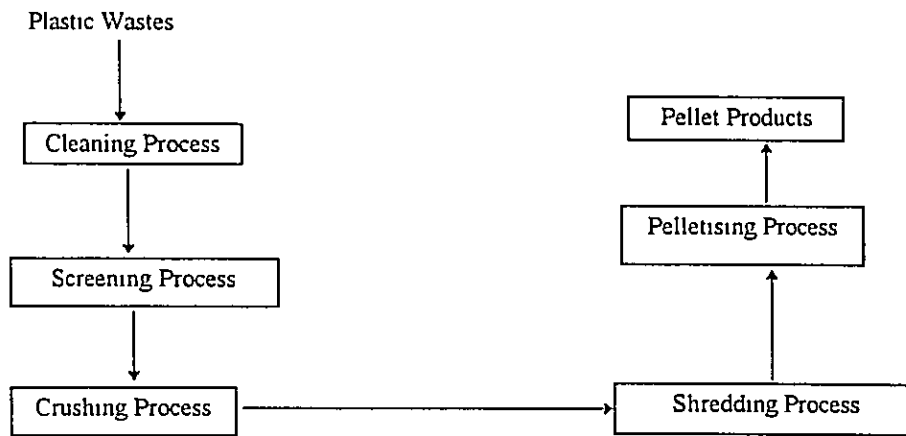
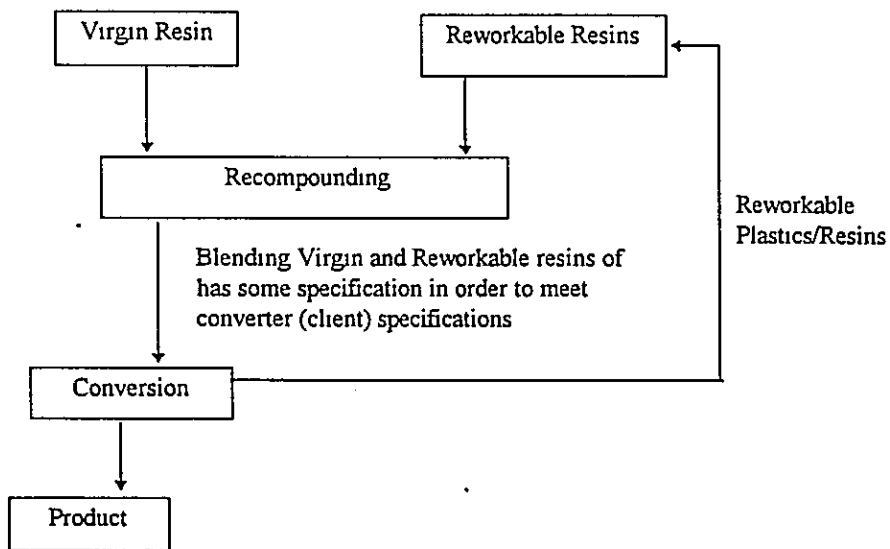


Figure 5.5. Typical Reworked Plastic Process in Malaysia



\*There is no resin compounders within Malaysia: compounding is defined as blending various virgin resin grades or virgin resins in order to produce a blended resin to converter specification.

#### 5.4.4 Supply and Demand

There is a growing usage of plastic waste in the production process. Imported plastic waste, for example, doubled between 1992 and 1993. They are utilised in the production of lower-end consumer items such as pails and chairs for domestic consumption and traded as a commodity in the region. The major buyers of such plastics products are from India and China.

Efficient Growth also supplements its plastic waste supply through imports. These are sourced mainly from Germany and France. The volume of imported waste utilised depends on availability and price. Sometimes, the production would utilise up to 100% waste import as raw material. At other times, no waste import is used. Occasionally, it may not be able to secure any quality waste at all. But, it does build up its buffer stock in an attempt to regularise its production. There is a growing preference by the company to use imported waste because of steady supply and comparatively "cleaner" and non-contaminated. One of the major reasons why the company has stopped using local waste from the dump site is the problem with smell.

Where possible, local factory waste will be sorted, but supplies may be uncertain. Occasionally, the factory will contact Efficient Growth to sell their waste. At other times, the factory waste is open to bids with the waste going to the highest bidder.

Notwithstanding this fact, the scope for demand as a whole for recyclable waste remains limited. According to the MPMA and the MPWMTF, there appears to be limited domestic market demands in Malaysia for products manufactured from recyclable materials.

#### 5.4.5 Main Actors

- Waste pickers and municipality collectors remain an indispensable component of the post-consumer plastics recycling system. Most of the plastic waste are then passed back to the collectors at the dump site who in turn resell it to plastics traders who then deliver and sell it to the recycling businesses or trade it off as a commodity. In the case of the collector at Jinjang North dump site, the company would shred the plastic waste and bale it before selling.

Traders end up selling the waste to numerous small businesses producing recycled resins. Their typical operations would involve segregation, washing, drying and extruding. Companies such as Efficient Growth, who use entirely waste as raw materials, would do its 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 who need blended resins. Ultimately, the plastics is processed into finished products for consumer and industrial use. Typical examples of final products using recycled materials include bags, chairs, pails, footwear and other household items.

#### 5.4.6 Extent of Waste Recycled

According to the MPMA and the MPWMTF, the recyclers operate at 1-5 tons per day using a combination of old restored equipment and in-house custom designed or fabricated recycling equipment. In the case of Efficient Growth, the company purchases about 100-150 tons of recyclable plastic waste per month. The major waste used include PP, LDPE and HDPE.

Overall, industrial waste is not the problem; rather, it is the post-consumer waste which is problematic. The low recovery rates of recyclable plastics have created uncertainty to processors and converters.

Between industrial waste and household waste, the plastics firms prefers the former. Household waste poses some problems. Efficient Growth, for example, has traditionally sourced its waste from collection agents from the dump site as well as undertake direct sourcing from factories manufacturing plastic products. However, as a result of contamination and unhealthy trade practices of agents supplying dumpsite materials, the Company has stopped using this supply channel altogether and relies heavily of factory waste at present. It supplements its waste requirements from imported waste.

#### 5.4.7 Key Problems and Issues with Recycling Post-Consumer Waste

In Malaysia, plastics consumption is rising rapidly. The plastics industry growth has been registering about 15%-25% annually. In mature economies, the consumption of plastics is estimated at 100 kg per capita while the current global consumption is way behind at 16 kg per capita. The gap roughly indicates the potential of plastics consumption to grow. The unhealthy balance between disposal and recycling certainly warrants much concern.

Rising consumption of plastics has major negative impacts - the problem of pollution arising from extensive goods and food packaging. At factory level, plastic waste is of little consequence as it is being recycled because it makes good economic sense. However, there is the general concern with post-consumer waste which gives rise to pollution. This is particularly true with throw-away plastic film packaging. Without doubt, plastics consumption will rise because its production requires relatively low energy consumption, the material is highly processable and chemically resistant, and its feedstock is plentiful. Thus, it is highly substitutable for other materials in most products. Most importantly of all, its virgin raw material is relatively cheap.

The current level of plastics recycling is small. Less than 15% of products manufactured contain recycled materials. The producers' main concern is the quality of their products. Essentially, there is no technical problem with the product; however, consumers are generally fuzzy about the end results. For example, if clear plastics are mixed with blended plastics, the product cannot achieve the sheen of virgin materials notwithstanding the fact that coloured plastics are functionally strong and does not show weakness.

The recycling of plastics has been highly selective, only homogenous materials are recycled. Manufacturers are not prepared to produce mixed recycled plastic because of uncertainty over demand. It appears that there is limited domestic market demand for products manufactured from recyclable materials in Malaysia. New markets and new applications for recycled plastics have to be formed.

Moreover, the recycling technology for plastic waste in Malaysia is still very limited. The ordinary PET bottles, for example, are difficult to recycle because it is made of three different types of plastics: namely, the cap is LDPE; the container is PET and the base is PVC. In this instance, while cost-effective technology is needed to separate the different types of plastic materials, it is conspicuously absent. What is problematic is the inability for the industry to separate the different types of plastics or resins in the various products. In other countries, new technologies exist to recycle PET bottles. The current trend in circumventing this problem is to produce PET bottles using only one material. It may only be a matter of time before recycling of PET bottles becomes feasible and viable.

Similarly, there is still almost no recycling of engineering plastics, except for thermoplastics such as LDPE and HDPE. Engineering plastics require disassembly and this is extremely costly, cumbersome and non-economical.

Mechanical recycling is the basic form employed and it is also the cheapest. In this instance, the materials are chopped up, melted and then made into pellets. Chemical recycling is only at a pilot stage and is most expensive. While plastics can be recovered chemically, the process is not economically viable. As for incineration, where energy is recovered, it may not be feasible in view of the high amount of wetness in the solid waste.

Overall, the low recovery rates of recyclable plastics have created uncertainty of supply to processors and converters. Inevitably, the local recycling business relies on imported waste as there is a lot of supply of inexpensive, low quality post consumer plastics from Europe.

Differentiating plastics is also a difficult exercise. In the absence of a proper coding system, it would be difficult to operate an efficient waste sorting system. The current endeavours of the plastic manufacturing fraternity to implement a coding system is a positive step towards greater recycling. Coding their products by identifying types of plastic would facilitate easier segregation and particularly to encourage segregation at source.

The current supply of recyclables leave a lot of room to be desired. Efficient Growth, for example, does not have any contractual agreement with factories but would buy their wastes if supplies are available. Some of these involve a tender process. Notwithstanding a rather uneven supply of plastic waste, the Company has managed to build up a buffer or reserve stock so that it can sustain fairly regular production activity. There may be instances where there is no adequate waste supply and the Company would not undertake any production activities.

For the recycling companies to sustain their activities and grow, the supply of plastic recyclables needs to be consistent in both volume and quality. While production output can thrive on recyclables, getting clean plastic waste is problematic. Massive cost incurred in cleaning the materials poses a major obstacle to its utilization as raw materials. The rejection of dump site waste by Efficient Growth is a reflection of the extent of contamination of plastic waste.

In addition, manipulative traders are fond of contaminating the waste with water and other materials to gain additional weight in the waste. It is not uncommon to find that the eventual real weight of the recyclable plastics amounts to only a third of the originally calibrated weight.

There is still insufficient personnel with the relevant technical know-how to help with the recycling technology. At this juncture, there is inadequate knowledge pertaining to solving recycling issues and production problems.

## 5.5 Paper

### 5.5.1 Key Recyclable Items

Recyclable paper waste is classified into 21 grades by the Malaysian paper milling industry. The premium grades include clear white paper, printed white office paper and computer paper. Newspapers and corrugated boxes are also sought after. Most suitable for recovery are printing and writing papers which have long fibres.

While almost all types of paper waste can be recycled, there is very little actual recycling of old newspapers locally. Only about 10%-20% are used in Malaysia, the rest of the newspapers are exported to Singapore and Thailand.

However, some types of paper cannot be fully recovered. For example, glossy art paper with high chemical content is mostly wasted. Papers with short fibres are not feasible to recover. Also, papers mixed with wet waste or contaminated with wax, oil or plastics are not suitable for recycling. According to Central Malaya Paper Sdn Bhd, there is no facility to recycle newspapers and the profit margin may be too thin to induce recycling locally.

### 5.5.2 Recycling Technologies in Use

For convertors like Fatt Paper Merchants Sdn Bhd, the shredding and baling technology can be costly. The company's shredder cum baler from Japan cost about half a million riggit. This machine would probably cost more now given the appreciation of the Japanese Yen.

The recycling technology for paper waste is relatively simple and does not pose a problem as far as recycling efforts are concerned (Figure 5.6). However, this has to be qualified in view of the low recycling level of newspapers. The newspapers in Malaysia are produced mainly from 100% imported materials and most of the newspaper waste is exported

Some of the paper products with 100% recycled material include industrial paper, toilet tissue, household paper (serviettes and towel), joss paper, moulded products (egg and fruit trays) and office papers.

Theen Seng Paper Manufacturing Sdn Bhd (or Theen Seng), for example, recycles waste paper into packaging materials, envelopes, printing papers, tissue papers, etc. Its monthly output of paper products is around 1,000 tons; about 80% of its output are consumed domestically while the balance are exported to Singapore.

### 5.5.3 Price of Wastes

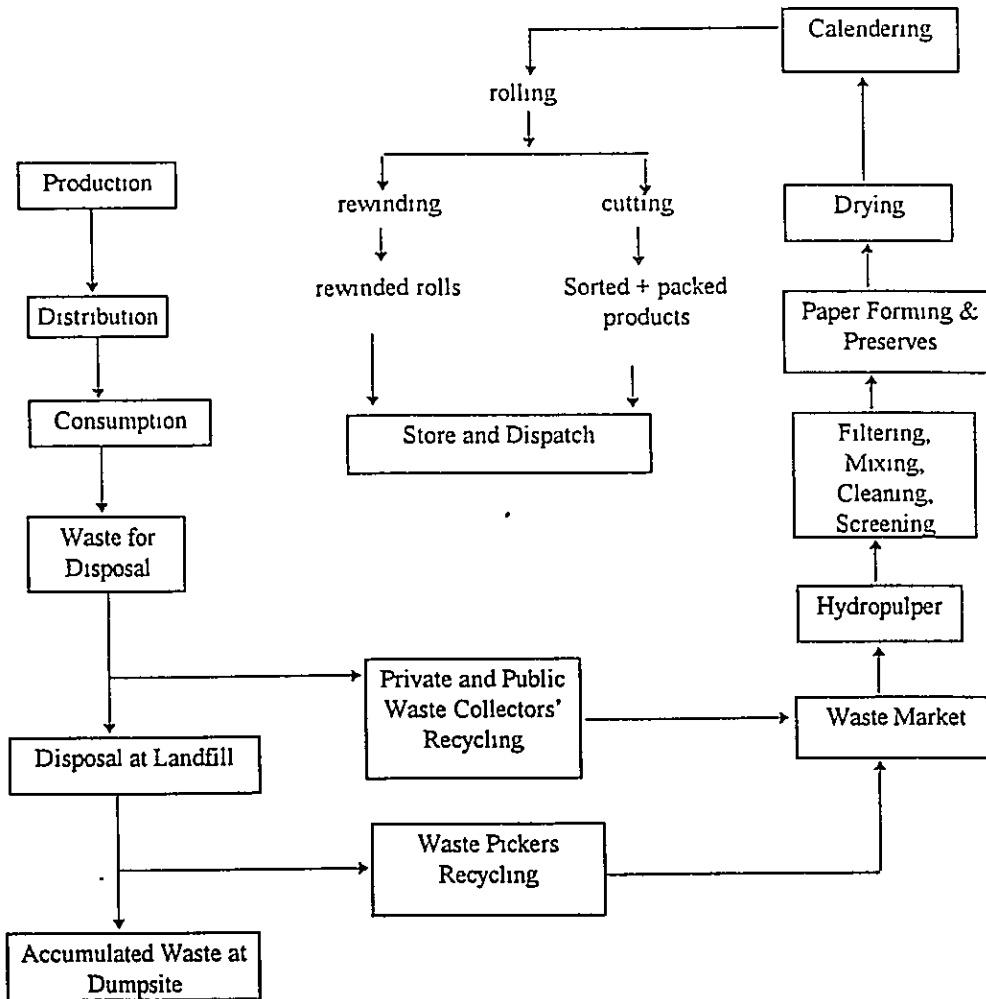
At the Jinjang North dump site, the rates paid by the collector to waste pickers and outside agents are as follows : white office paper waste at 14-30 sen per kg; newspapers at 10-25 sen per kg and corrugated boxes and cardboard at 8-23 sen per kg. At the Kelana Jaya dump site, the collectors paid 20 sen per kg for white papers and 12 sen per kg for other types of paper to municipal truck workers.

There are also many newspaper agents operating their own area network. However, because of their monopsonistic position, the rates they pay to households are extremely varied. A rough rule of the thumb guide is something like 70 sen for newspapers piled up to height equivalent to a fully stretched-out hand as measured from the end of the thumb to that of the last finger.

Traders buying from these various sources may have to pay around 36-40 sen per kg for white papers, 30 sen per kg for newspapers and 28 sen per kg for cardboard. Mixed paper would cost 24 sen per kg. According to Central Malaya Paper, the present trading price for black and white paper is about 40 sen per kg, old newspaper is 30 sen per kg and old corrugated cardboard 28-30 sen per kg.

As for the final consuming company like Theen Seng, the company pays between RM80 to RM800 per ton for the paper wastes delivered at their factory. The price varies depending on the grades. Newspapers, for example, currently fetching about RM250 per ton (about 25 sen per kg) in contrast to its earlier period when the price was as low as RM50 per ton (about 5 sen per kg). White papers, on the other hand, could cost as much as RM800 per ton (or 80 sen per kg) depending on the quality.

Figure 5.6. Paper Waste Recycling Process in Malaysia



#### 5.5.4 Supply and Demand

Paper waste is in high demand because of its cost effectiveness in production. The cost difference between recycled and virgin material is sizable, and could amount to as much as 45% difference. Obtaining pulp matter from recycled material requires 30% less energy.

Then Seng collects about 1,000 tons of paper waste per month. Its monthly output of paper products is also around 1,000 tons. The company produces paper products such as packaging materials, envelopes, printing papers, tissue papers, etc.

The company's waste comes from all over the country. They come mainly from paper suppliers, printers, government offices, etc. and such the waste paper are generally "clean". The company also has its own agents to source for waste.

On average, Fatt Paper buys about 1,500-2,000 tons of paper waste a month and sells an equivalent amount of products each month. Part of its waste are sold to Central

Malaya Paper, which collects an average of 15,000 to 16,000 tons of paper waste a month. Of these, about 2,000 tons are resold to smaller mills. The rest are sold to the sister companies within the Muda Holding Group. For example, North Malaya Paper Mill deals with mainly cultural or wood free papers and printing papers. Kajang Paper Mill handles industrial papers and corrugated medium papers while Century Packaging, which secures its stock from Kajang Mill, produces industrial wrapping papers and plastic coated papers. Federal Packaging, on the other hand, which gets its stock from North Malaya Paper, deals with corrugated carton boxes. The group is a vertically integrated business concern, commencing with waste sourcing to production of semi-finished products and ending up manufacturing finished paper products.

### 5.5.5 Main Actors

Paper manufacturers source paper wastes from agents and traders. Most agents source their waste from households and then resell them to traders or cater directly to the paper recycling companies. Some traders get their waste supplies from dump site collectors.

Fatt Paper, for instance, is a convertor dealing with paper waste for over 10 years. It has about 40 employees and 11 trucks in operation. Its principal operations include sourcing, warehousing, sorting and baling of paper waste. Its two major channels of paper waste include its own direct sourcing and agents. These agents are usually small or sole operators sourcing papers on a house to house basis or office to office basis. Some of its agents are based in other states.

On average, the company buys about 1,500-2,000 tons of paper waste a month and sells of an equivalent amount each month. So far, the market can absorb whatever amount the company can supply. Half of its waste comes from its own sourcing while the other half comes from the agents.

The company submits tenders for paper wastes from printing firms, corrugated paper manufacturers and other paper product manufacturers. Upon successful bidding, its trucks will go round to collect the waste and deposit them at the factory cum warehouse. There is no long-term trading contract between the factory waste suppliers and Fatt Paper. However, the company does have a few long term business relationships with some factories. This is generally formalised with Fatt Paper locating its baling equipment at the factory so that the baled waste can be immediately slipped out of the the company's warehouse. Such relationships are built on goodwill.

Goodwill also needs to be fostered with the agents. Again is no contractual agreement to supply to Fatt Paper on a regular or fixed basis. The agent would usually supply the waste paper to whoever gives the highest price although a few who value long term business relationship operate otherwise. These agents are more dependable and have become long-time suppliers to the company.

Fatt Paper receives all kinds and grades of paper waste. They are manually sorted into different grades at the warehouse and are then pressed, then baled and delivered to the final users. The Company is currently supplying paper waste to 6 paper mills within



and outside the Klang Valley. The reason why it is also catering to mills in other regions or states is because there is a demand for such paper waste and the supply is inadequate within the locality.

There is also no long-term contractual agreement between the mills and the company - though some business understanding have been struck - mainly because of price fluctuations. In general, all parties do not wish to make long-term selling or buying commitments. Moreover, the company cannot guarantee a consistent or constant supply of the specific types of paper required. Most mills maintain a 3-month buffer or reserve stock of paper waste, as protection against irregular supply.

One principal buyer of Fatt Paper's waste is Central Malaya Paper (CMP). Fatt Paper is one of the several middlemen traders the CMP deals with. Other suppliers to CMP include small-time agents. Overall, its middlemen and agents are based around the country in Kajang, Johore Bahru, Malacca, Batu Pahat, Ipoh and Butterworth to buy paper waste on bulk basis for its sister companies within the Muda Holding Group. The Group's vertically integrated operations enable its waste purchasing activity to operate on economies of scale.

For a stand alone recycling company like Theen Seng, it has contracted several agents to supply a specific volume of paper waste every month. The agents will collect sufficient quantity of paper waste from various sources and then sort them out into various grades before baling them. As no agent can source all the different grades, they limit themselves to grades which are readily accessible to them. The collected waste is then sent to the company for delivery.

#### 5.5.6 Extent of Waste Recycled

The potential for recycling is tremendous. The companies interviewed want to use 100% recyclables. Theen Seng, for example, has recently increased its usage of paper waste from as much as 95% of raw materials to 100%. And also, in the case of the Muda Holding Group, it is the Group's policy to use 100% recycled stock. No virgin pulp is used because it is expensive and in short supply.

Most of their waste requirements come from industry or factory sources. There is negligible amount coming from households. Household waste is predominantly old newspapers.

#### 5.5.7 Key Problems and Issues with Recycling Post-Consumer Waste

The paper recycling industry has an image problem. Social prejudice against recycled paper is prevalent. Recycled papers are generally regarded as inferior. There is still the prevailing preference for office papers, for example, to be made from virgin pulp. This is because the quality of recycled paper, being secondary form, is slightly lower than paper made from virgin pulp. Some degree of awareness of the importance of recycling paper and the acceptance of recycled paper is vital. Such trends are already consolidating in developed countries.

The price of paper waste cannot be too low; otherwise, the low return to the collector, agent or trader will discourage collection. If price of paper waste is low, it is not economically feasible for agents to operate the collection activity in view of high transportation cost. The current shortages of paper waste and the relatively high price make the collection an economically viable activity.

The recycling industry needs to grow on volume and not so much on price. The profit margin for the convertor is fixed and is usually small. As such, its financial viability and operational sustainability are based predominantly on the volumes transacted. To this extent, the industry is sensitive to the cyclical business environment.

For paper waste to be recyclable, it has to be relatively clean. Paper waste collected at the dump site are generally soiled and contaminated beyond cost-effective recovery. As such, there is a constant need to ensure that paper waste are relatively clean for them to be valuable. The greater the contamination the greater is the cost of sorting and cleaning them. Moreover, there would also be problems of workers' unwillingness to handle such contaminated waste at the recycling factory. Proper and effective separation needs to be enhanced at the source for the recycling industry to increase its recycling activities.

Manpower problem limits the operation of a trader or convertor to some extent. As sorting waste is generally perceived as a low status job, it does not attract much interest from the locals notwithstanding the fact that wages plus overtime allowances can average RM1,000 per month.

## 5.6 Summary of Major Findings

In Malaysia, waste is demanded for three main reasons; it is either recycled, exported or traded as a commodity. While the main demand is generated from local need to recycle, there is a fair bit of demand generated externally. Such demand structure is product specific: for example, a) plastic waste, in addition to being recycled locally, is being traded as a commodity internationally by some traders; b) nearly all the old newspapers are exported with very minimal local recycling; and c) aluminium can waste, on the other, is exported entirely without any local recycling.

As far as recycling is concerned, the recycling of industrial waste is not the problem but the recycling of consumer waste is. Retrieval of post-consumer waste remains relatively low. Contaminated post-consumer waste, coupled with a limited collection infrastructure, has generally resulted in fairly low level of recycling of post-consumer waste. In other words, the realisation of the full potential of recycling post-consumer waste is still very far off. And there is much room for incremental improvement in the rate of recycling post-consumer waste.

Low recycling activity is not so much because there is very little demand for recyclables within the recycling industry. On the contrary, the recycling industry is very active but their activities are, to a large extent, underpublicised. When asked if their

business entities can cope with handling more recyclable waste, the typical answer from the collectors, agents, traders and manufacturers interviewed is an unqualified "Yes". The recycling fraternity is in dire need for more recyclable waste

Recycling of industrial waste is prevalent because of in-house activity as well as a general preference for factory waste by recyclers. The homogeneity of the waste ensures consistent quality with the raw materials and hence, would automatically induce in-house recycling. It makes economic sense. As for the preference for factory waste as recycling materials, this is based on the fact that such waste is generally cleaner, non-contaminated and does not exude terrible smells.

Notwithstanding the above, recyclable waste will always be demanded because of its inherent advantage over raw materials; it is more cost effective to use than virgin materials. As pointed out by the recycling manufacturers interviewed, the waste is price competitive with virgin materials in the sense that when the energy usage is taken into account, recyclable waste proves to be extremely cost-effective. In other words, for the same amount of energy used, more output can be generated from recyclable materials as a result of greater production throughput than in the case of using solely virgin materials.

As such, from the recycling industry point of view, there is a need to enhance more recycling of post-consumer waste. 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.

Currently, there are several major channels where post-consumer waste is retrieved and diverted back into the recycling-cum-production system; these include the activities of the waste pickers at the dump sites, collectors at dump sites, municipality garbage collectors, middleman collectors (including the agents and traders) and finally the manufacturers who use recyclable waste as raw materials. The overall networking structure is rather dynamic and does not have a standard activity flow. The relative roles played by various actors may also differ from one situation to another or from one industry to another. Nonetheless, it suffices to say that the existing loop from waste generation to the final waste user is partly formal and partly informal and is inter-state in character.

Waste collected by waste pickers and municipal 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 collector collecting aluminium waste, another collecting ferrous metals and the third one collecting 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 at the site. The trading activities of the waste pickers are more prominent at Jinjang North while the activities of the municipal workers are more pronounced at Kelana Jaya.

The dump site collectors would then resell their waste to either the middleman collector or supply straight to the recycling manufacturers themselves. Waste separation may or may not occur along the way, but when it reached the middleman,

most of the waste would have to be separated by then into its appropriate categories for the final use of the manufacturing concerns. 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.

In the case of aluminium can waste recycling, the agents are normally operating as sundry shops buying the cans from drop-in customers. These cans are then resold to a major trader who in turn will export them overseas. Japan is the major importer. However, there are not many of these agents around and household awareness of their presence is limited. In fact, the previous attempt to set up its own network of agency centres by the trader interviewed in this study was discontinued after its "cash a can" campaign ended. It was not cost effective to do so, presumably the overheads are high - the trader incurred cost for the centre and has his staff performing the transaction and baling. After the dismantling of its centres, individual self-operating agents emerged and established itself as can collectors.

In addition to sourcing from agents, the trader may also do its own direct sourcing by undertaking community recycling projects such as those carried out with hotels, residential areas and schools. In these programmes, collection bins for cans are provided by the trader and collections of the waste are undertaken either twice a week or as and when the bins are filled up. These programmes can be initiated by the trading company itself or by the community itself. Overall, the trader relies heavily on factory waste for its constant supplies, in addition to importing waste.

In the case of glass recycling, dump site collectors may go directly to the ultimate buyer, who would also buy supplies from other agents or collectors. Some of these suppliers are located in other regions and states. Not all the glass waste are recycled locally; while some of the bottles are reused or crushed into cullets to be recycled, the rest may be sold to a trader in another state who in turn may export it to Thailand where the bottles are converted into lamps for lighting purpose. The recycling manufacturer interviewed also organized community-based recycling projects. It is similar to that of the aluminium can trader, whereby special collection bins for glasses are given to schools, residential areas and hotels and collections will be on regular basis or on call basis.

As in the case of the aluminium industry, the recycling manufacturer has to ensure that it get regular supply of waste. Besides building up some buffer stock, the manufacturer specially appointed a contractor to go round its direct network to pick up the glass waste. Factory waste is again an important source. The manufacturer will also entertain the occasional drop-in glass waste sellers.

As for the plastic waste recycling, waste pickers and municipality workers once again play their equally important role in recycling plastics. Most of the plastic waste is sold to the dump site collectors who may resell it to plastics traders who would then deliver and sell it to the recycling businesses or trade it off as a commodity. In the case of the collector at Jinjang North dump site, the company would shred the plastic waste and bale it before selling to another trader.

The traders will end up selling their waste to the numerous small businesses producing recycled resins. Their typical operations would involve segregation, washing, drying and extruding. Companies such as Efficient Growth, who use entirely waste as raw materials, would do its 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 needing blended resins.

In the case of paper waste recycling, a substantial amount of household waste and office waste would have been sieved out before the final disposal at the dump sites. This is because of the numerous agents - who are mainly sole operators - present in the system. They go house to house and office to office to collect papers. Whatever that is left behind will end up at the dump where waste pickers would isolate uncontaminated papers for sale to the collector. At the dump site, the municipal workers would also deliver and sell the paper waste gathered on their rounds of garbage collection. 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. Goodwill play an important part in the relationships between the agents and the traders and the manufacturers.

The recycling of paper is probably the most pervasive and systematically organised than the other industries discussed in this study. The good price for paper waste has been the single most important contributing factor to the relatively higher degree of waste retrieving activities among the agents and traders. And manufacturers generally would opt for paper waste in view of the growing shortage of virgin pulp and the associated higher price of the materials.

As can be observed from the actors operating within the recycling infrastructure, the waste retrieval and recycling system is rather "locked-in" and has a life of its own; the removal of any part of the recycling infrastructure could result in a lower rate of recycling activity and a concomitant increase in the waste accumulation at the dump site. Given the existing scenario, the weeding out of waste pickers from the scene will mean that a lot of potential recyclables will not come back into the recycling system. The prevention of the municipal workers from collecting recyclables when doing their rounds of garbage collection could lead to greater contamination of potential recyclables as no efforts would be made to separate the waste before being thrown into the truck for compressing. While it may be possible that the waste pickers may eventually be able to retrieve them, the contamination would certainly reduce the usefulness of the waste as recyclables.

As can also be observed, there is no shortage of efforts on the part of the recycling fraternity to source for waste. Besides importing waste to some extent, attempts have already been made to institute community-based recycling projects to complement existing sourcing. This is generally seen as a relatively viable channel to source waste directly from the public. In fact, the companies interviewed indicated their desire for more recyclables. What remains to be seen is the extent of cooperation the Malaysian community is prepared to give. The central question at hand is : how can recycling be activated and enhanced at the community level?

There are basically two major issues at hand as far as the community participation is concerned. First, the current efforts by the recycling fraternity to establish community-based recycling programme is too dispersed and fragmented. The efforts are too diffuse to have a significant impact on community recycling as a major source of recyclable waste. However, it should also be noted that activating such community-based programmes would also depend on the initiatives of committed community members themselves. It cannot be just a one-way traffic project implementation with the industry imposing on the community. This is not likely to be effective. Secondly, activating a community-based programme is one thing, ensuring that the recycling programme is successful and sustainable is another. And this is certainly problematic. The two major recurring problems encountered in such recycling efforts include (a) a high degree of waste contamination despite allocation of special bins for the collection of specific waste, and (b) a low volume of recyclable waste at designated collection sites.

Setting up a network of community-based projects is potentially costly for two main reasons. First, there is the time, money and efforts spent on initiating and realising the programme. The question is how can cost be reduced, who to bear the cost and how would cost be shared out? Second, if a networking of sources is a workable solution, there is also the problem of undertaking a potentially costly exercise in making sure the project is carried right through. Teething problems such as low participation and "learning curve" factor are likely to prevail at the start. This is where the collection problem arises. Low volume of recyclable waste and high contamination level will deter collections as the returns from such collections would not justify the cost of transportation, manpower and overheads incurred. Under such circumstances, the collection services would have to be withdrawn. This problem would be accentuated in situations where the collector is independent of the manufacturing company. All said, it is without doubt that the entire recycling exercise will be less costly if it can draw on the cooperation of a well-motivated public. Collection cost has to be low.

Among the various possible recyclables, enhancing glass waste retrieval would probably offer the most potential for marked improvement in recycling activity while plastic waste has lesser prospect. Their respective assessments are as follows :

*Glass Bottles* : the material does not contaminate easily; domestic demand for local glass waste is strong; recycling technology is an integral part of glass production; no problem with product quality using recyclables; as indicated by a glass manufacturer interviewed, increasing glass waste usage relative to virgin materials is expected and regional collection centres would probably have to be established; and the experience in community-based recycling project has some notable successes.

*Aluminum Cans* : both industrial and household wastes are well sought after; industrial waste like extrusions and others are recycled locally; no problem with product quality using recyclables; however, there is no recycling of cans locally, but the demand is strong; can waste is exported entirely; the export market is sizable - Japan is the major buyer and China is emerging to be another big purchaser in the waste market; and the experience in community-based recycling programmes registered qualified success.

*Papers* the material has a higher potential of contamination; strong domestic demand for industrial and office wastes for recycling; recycling technology is relatively simple and does not pose a problem; some social prejudice still exist against recycled papers, household supplies of recyclable waste for domestic recycling is limited; main household waste is old newspapers and they are mainly exported; collection system of old newspapers is already well established; current collection is thriving because of good price for paper waste; the concern is that the system may breakdown when the price is low; the demand for old newspapers would probably be even greater if there is local recycling of old newspapers.

*Plastics* : some recycling activities exist but are generally limited; virgin materials are still preferred because recycled plastics are not compatible; recycled product may not achieve the same quality (for example, sheen) that virgin materials can attain; currently, recyclable materials are used for low-end products; nonetheless, imported plastic waste is growing; however, plastics recycling technology is not an integral part of the production process; the different chemical composition of plastics makes recycling difficult; as reprocessing of plastics involves high capital cost and requires big throughputs to make it worthwhile, manufacturers are not prepared to produce mixed recycled plastic because of uncertainty over demand - that is, who to sell it to; moreover, certain plastic wastes are definitely recyclably unfriendly; manipulative contamination of plastic waste can also pose a problem to using local waste; while rising consumption of plastics would mean more waste generation, recycling - while being a waste reducing option - cannot be relied on as the principal avenue for reducing disposal waste because of its limitations due to the various problems peculiar to the plastics industry itself.

As a final comment, it should be noted that for waste to be readily and economically recycled, it not only need low collection cost but also a strong final demand. It is only when demand for the recycled product is strong enough to cover collection cost of the waste 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 the activated collections have already established end uses for the waste. In this respect, it is important that recycling efforts be market-led.

Having said that, it should be bore in mind that the market for recycled materials, like commodity markets, is volatile. Price do fluctuate widely and the direct demand is in constant competition with virgin materials while its derived demand is affected by its final product substitutes. Technology and rising cost of labour can easily make market-led recycling efforts uneconomical. As such, market forces while providing the impetus to recycling efforts may be in no position to sustain such activities over the long run. Other public policy issues will also need to be addressed; these would include the need to develop a recycling culture among the public and the need to explore ways to reduce waste generation at source. All these issues cannot be seen in isolation from one another; they form an integrated whole.

## **CHAPTER 6**

### **SUMMARY OF MAJOR FINDINGS**

#### **6.1 Introduction**

This chapter contains a summary of the major findings of this study. The focus group findings and its significance will be discussed, as will be the recycling experience of various communities, and the recycling industries and the waste collection system. These will then form the basis for policy recommendations which will be the subject of the next chapter.

#### **6.2 Focus Group Findings**

If the participants of this study are representative of how urban Malaysians feel about recycling, then to instill proper recycling habits means having to change social attitudes. Malaysians, it seems, are willing to do only a limited amount of extra work to recycle. Environmental awareness is low and they are not prepared to do extra work to ensure the success of a recycling campaign.

The level of their environmental awareness is generally superficial i.e. confined to their physical environment. One or two individuals are familiar with environmental issues because of their professions; one of them has an in-depth knowledge of the environment while the medical doctor could easily relate the environment to health-related issues. The rest of the participants have some awareness of environment problems because of direct experience and/or exposed through the media. They could identify such problems as air pollution (haze, open burning, nearby construction project exacerbating the dust problem), soil erosion (the collapse of Highland Towers, tree cutting) and cleanliness of their immediate living environment (garbage, littering, squatters throwing rubbish into the river nearby).

As for garbage or solid wastes, they relate mainly to that of their living environment. In that regard, so long as they do not encounter any problem with littering or garbage in their backyard, it is not a problem for them. For the low cost high density housing residents, their problem is the constant littering of their housing area; for the middle class condominium residents, they are irked by the indiscriminate rubbish strewn in the river flowing at the back of their residence.

The problem of the dump site is relatively remote to most of the respondents of this study, although those with a education (correlated with personal status and wealth) tend to be more aware of this problem. Hence, the majority of them have no inkling of what goes on at the dump site. They are unaware of overfilled dump sites. And environment problems associated to methane gas and leachate toxicity do not mean much to them.

Nonetheless, most of the participants acknowledge that they are partly to blame for contributing to the rapid waste accumulation. Other factors they see as contributory



factors include population growth, lack of recycling facilities, over-packaging of products and inability to bury their rubbish as in the rural areas

As for the waste issue within their community, the residents perceive their immediate environment to be relatively clean, except for those residing in public housing. The majority are generally satisfied with waste collection though some aspects of localised waste problems need addressing. Thus their rather complacent attitude.

Only a few residents are interested in recycling. While supporting the view that recycling may help to reduce wastes, very few are prepared to put in the extra effort. The main problem appears to be the residents' apathy and lifestyle. Some of the reasons for the low interest in recycling participation include:

- Apathy or human mentality
- Fast lifestyles
- Inconvenience of climbing up and down the stairs to deposit the recyclables
- "No time to do so" (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)
- "Space constraints" (the kitchen is too small to separate waste)
- Low waste volume of recycleables
- "No buyer for the waste"

However, several of them do reuse plastic bags for rubbish and keep their old newspapers for the "onp" buyers. And also, a few do sell or deposit certain recycleable items at a distant collection centre. However, these people are a tiny minority. Many say they would make the extra effort if monetary incentives are present.

The residents believe that the following measures are indispensable to ensure success in recycling programmes :

- Overcome negative Malaysian mentality
- Need to educate and create awareness among the general population
- Inculcate concern and caring for the environment
- Inform the public to make them understand the importance of separating and recycling
- Shock the public with deadly consequences of ineffective waste disposal system
- Hold talks and recycling programmes at schools
- Launch campaigns through the mass media
- Keep the community informed about recycling programmes
- Introduce competitions and incentives as a means to generate more support and enthusiasm for neighbourhood recycling

In terms of the specific features for a recycling programme in a neighbourhood, the residents feel that the programme should take into consideration the following factors :

- Sustained publicity campaign on the recycling project in the neighbourhood
- Education for the residents on the waste problem and the need for recycling

- Keeping residents informed and updated on the programme
- Fixed and regular collection schedules or have a buyer for the waste
- 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 distant to the collecting site or centre is only a short distance
- Low-cost waste separation efforts on the part of the residents

To sum up, the major policy considerations for recycling programme to work at community level are :

- Publicity and project education
- Convenient recycling programme
- Low-cost programme to the residents
- Regular and fixed collection schedule

The effectiveness of the residents' associations (RA) in helping to mobilise the community in carrying out recycling within their locality have not yielded any real results. As such, there is some misgivings by the residents of its role. But if the RA is not the best body to be an external agent, then which other body or organisation would fit the bill?

Our opinion is that most of the RAs are not well focussed, especially when it comes to an issue such as recycling. But the fact remains that they do have the capacity to organise at the community level. And they can act as a communication channel to the government. As such, it may be still be the second best choice, since there is no best choice. However, the key issue is really the level of cohesion of the community. The greater the cohesion, the better the chances of success for a recycling campaign.

Whichever the form of the external agent, the poorer residents have stated in no uncertain terms that they would only recycle if they keep the money; sharing with the RA or any other body out of the question.

Finally, nearly everyone saw law enforcement as unlikely to work. Enforcement would be a real problem, and may be too costly for the government. At best, it can act as a deterrent which instills fear more than it will bite. What is required is a long term attitudinal change in people's values about the environment, and motivation to do something about its degradation.

### 6.3 Participation Of Communities In Recycling

At the level of the community, recycling programmes show mixed results. The most successful - based on participation and continuation of project - are those undertaken at S.K. Taman Petaling, ISKL and Hillside Apartments.

Some of the common traits of these recycling programmes include:

- Baseline awareness and education cultivated within community
- Presence of an agent to monitor the recycling programme
- Continued education and follow-up maintenance throughout the project by the agent and other organisers
- Support from management (principals, recycling companies, developers)
- Free collection
- Payment for recyclables
- Incentives such as competition and prizes also played important roles in the schools

However, even for these successful programmes, the common problem faced in all these recycling efforts is the inconvenience of the programme. Inconveniences include:

- Making residents buy special bags to recycle and separate into many different groups
- Making residents walk or travel the extra distance to get to the recycling bins
- Burdening students by getting them to carry recyclables to school

Some common problems encountered in recycling campaigns that failed or did poorly over the long term include the following :

- Lack of groundwork and overall support by organisers to inform neighbourhood or school about the recycling program being launched in that area
- Participants in recycling program were not properly briefed on the rationale and mechanics of the programme
- Importance of recycling and separation not instilled on participants
- Lack of follow-up to keep participants motivated
- Lack of incentives to inspire participation

A common recommendation for a successful recycling campaigns in the future is to get the 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 launching a recycling campaign cannot be over-stressed. The MPMA's two day workshop for its plastic recycling campaign at schools was a good example. The MPMA invited one teacher from all participating schools to the workshop which thoroughly explained the importance of recycling. During the first month of plastic collection, most schools were responsive.

Continued monitoring, education and follow-up throughout the recycling program is crucial for the campaign's long term success. Plastics collection decreased in S.K. Kelana Jaya because teachers and other organisers stopped reminding students to participate after the initial competition. Whereas in S.M. Taman Petaling the teachers and principal made extra effort to ensure its long term success. This continued monitoring and publicity/ education also contributed to the success of ISKL and Hillside Apartments recycling .

Most of the groups interviewed cited the importance of monetary and other incentives to ensure success in recycling. 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 include financial and material support from developers, government and recycling companies to the community by giving free bins and containers, distribution of information to community, sponsoring community gatherings, etc. Such incentives have helped the Hillside Apartments recycling programme reach its participants

Interviewees also stress the importance of convenience. Getting Malaysians involved with the least interference to their every day life is important, especially at the Malaysians current level of awareness and concern. Schools have complained that the burden of community recycling are being pushed onto them. Although they feel that recycling is an important habit to cultivate at school, community recycling should be done on a larger and higher level. Malaysians won't pay to recycle. Making Malaysians pay would be suicidal to any recycling programme.

On the commercial front, hotels are making a head-start in recycling. However, the overall results are not so encouraging. The most prevalent problems being :

- Contamination of waste
- Infrequent waste collection

These two problems are related. As they reinforce each other, it is extremely important that they are resolved soonest possible as it could threaten the current recycling efforts.

As for offices, recycling is currently practised on a limited scale, eg. the re-use of "clean wastes" like paper and envelopes. Recycling of other solid wastes is much further away. Corrugated boxes are also collected by the sports club of one complex 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.

#### 6.4 The Recycling Industries and Recycling Collectors

In Malaysia, solid waste is either recycled, exported, traded as a commodity or disposed off at dumpsites. While the main demand is generated from local need to recycle, there is a fair bit of demand generated externally. Such demands are product specific: for example, a) plastic waste, in addition to being recycled locally, is also traded as a commodity internationally; b) nearly all the old newspapers are exported with very minimal local recycling; and c) aluminium can waste, on the other, is exported entirely without any local recycling.

The recycling of industrial waste is good economics and therefore it is not a problem, the recycling of consumer waste is. Retrieval of post-consumer waste remains relatively low. Contaminated post-consumer waste, coupled with a limited collection infrastructure, has generally resulted in fairly low level of post-consumer waste recycling. There is much room for incremental improvement in the rate of post-consumer waste recycling.

The low recycling activity is not because of low demand for recyclables. On the contrary, The recycling fraternity is in dire need for more recyclable waste. The activities of recycling infrastructure are, to a large extent, underpublicised. The crux of the recycling issue is that waste has a value.

As for the issue of sufficiency, the current demand for waste certainly far surpasses the supply. And recyclers resort to imports to meet part of these needs. Without doubt, this demand-supply gap can be met by greater systematic efforts aimed at waste separation at the community level. Unlike factory waste recycling, the community-based recycling efforts are too few and far between.

Recycling of industrial waste is prevalent because its homogeneity ensures consistent quality and hence, this automatically induces in-house recycling :

- Homogeneity of in-house waste ensures consistent quality with the raw materials
- Ex-factory waste is generally cleaner, non-contaminated and does not exude smells

Notwithstanding the above, recyclable waste will always be in demand because of its inherent advantage over raw materials; it is more cost effective than virgin materials. As pointed out by recyclers, the price of waste is competitive with virgin materials. And when the energy savings is further taken into account, recyclable waste will prove to be even more cost-effective. For the same amount of energy used, more output can be generated from recyclable materials than from using solely virgin materials.

As such, from the recycling industry point of view, there is a need to focus on the recycling of post-consumer waste. What remains to be done is enticing the public at large to recycle.

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

- Activities of the waste pickers at the dump sites
- Collectors at dump sites
- Municipal garbage collectors
- Middleman collectors (including the agents and traders)
- Distributors and manufacturers who reuse throwaways
- Manufacturers who use recyclable waste as raw materials

Figure 6.1 illustrates a schematic of the various levels of recycling. The relative roles played by various actors may also differ from one situation to another and from one industry to another. Nonetheless, the existing loop from waste generation to the final waste user is partly formal and partly informal and is inter-state in character.

Waste collected by waste pickers and municipal collectors is mainly sold to the collectors at dump sites. In the case of the Kelana Jaya dump site (see Figure 6.2), three collectors are stationed there (one collecting aluminium waste, another ferrous metals, and the third one, 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 waste buyer.

The dump site collectors would then resell their waste to either the 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 to be separated. Separation and baling may start as early as at the dump site. 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.

In the case of aluminium can waste recycling, the agents are normally operating as sundry shops buying cans from drop-in customers. These cans are then resold to a major trader who in turn exports them overseas, with Japan being the major importer. However, there are not many of these agents around and household awareness of their presence is limited.

Figure 6.1: Levels of Recycling in Malaysia

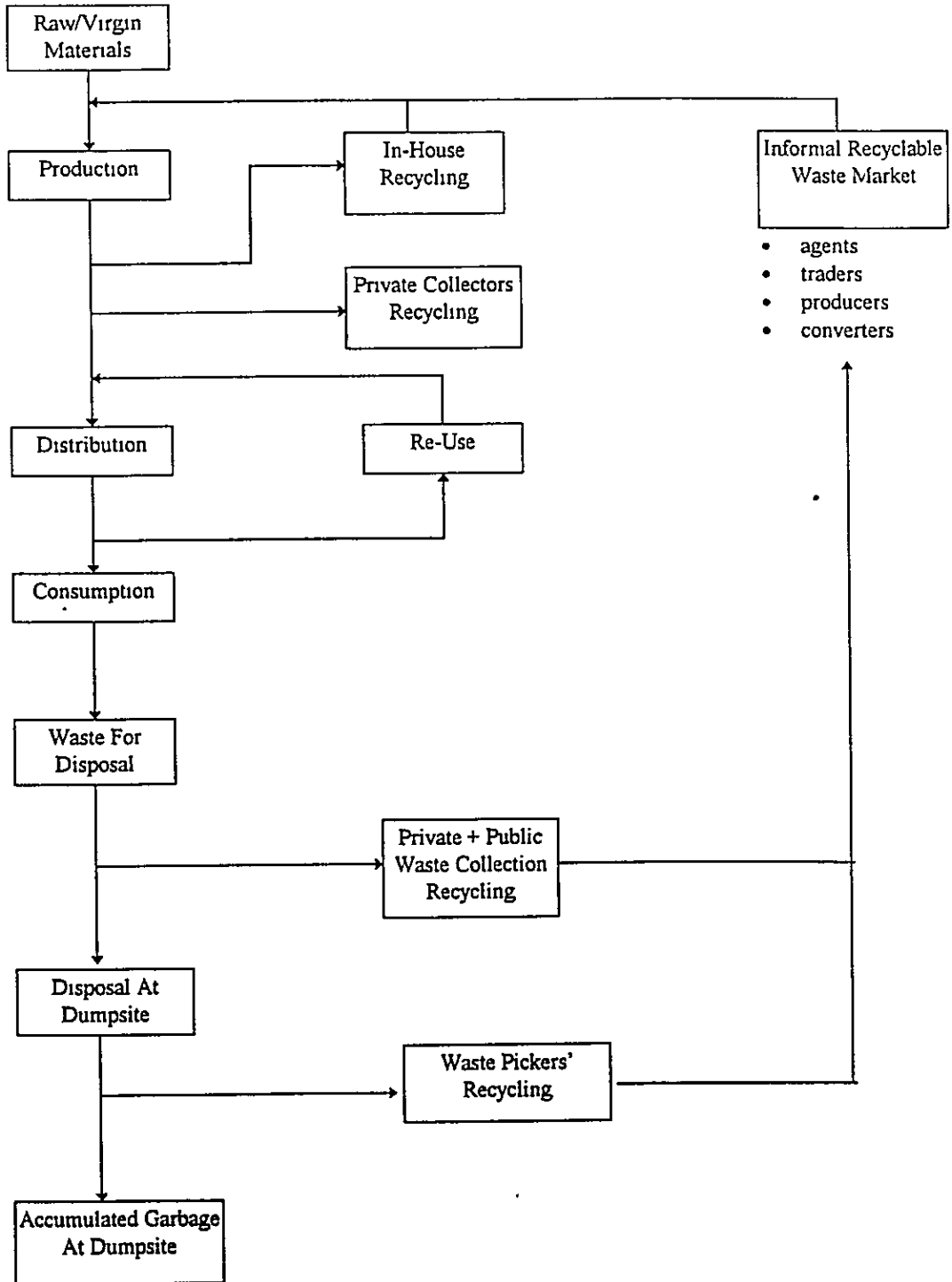
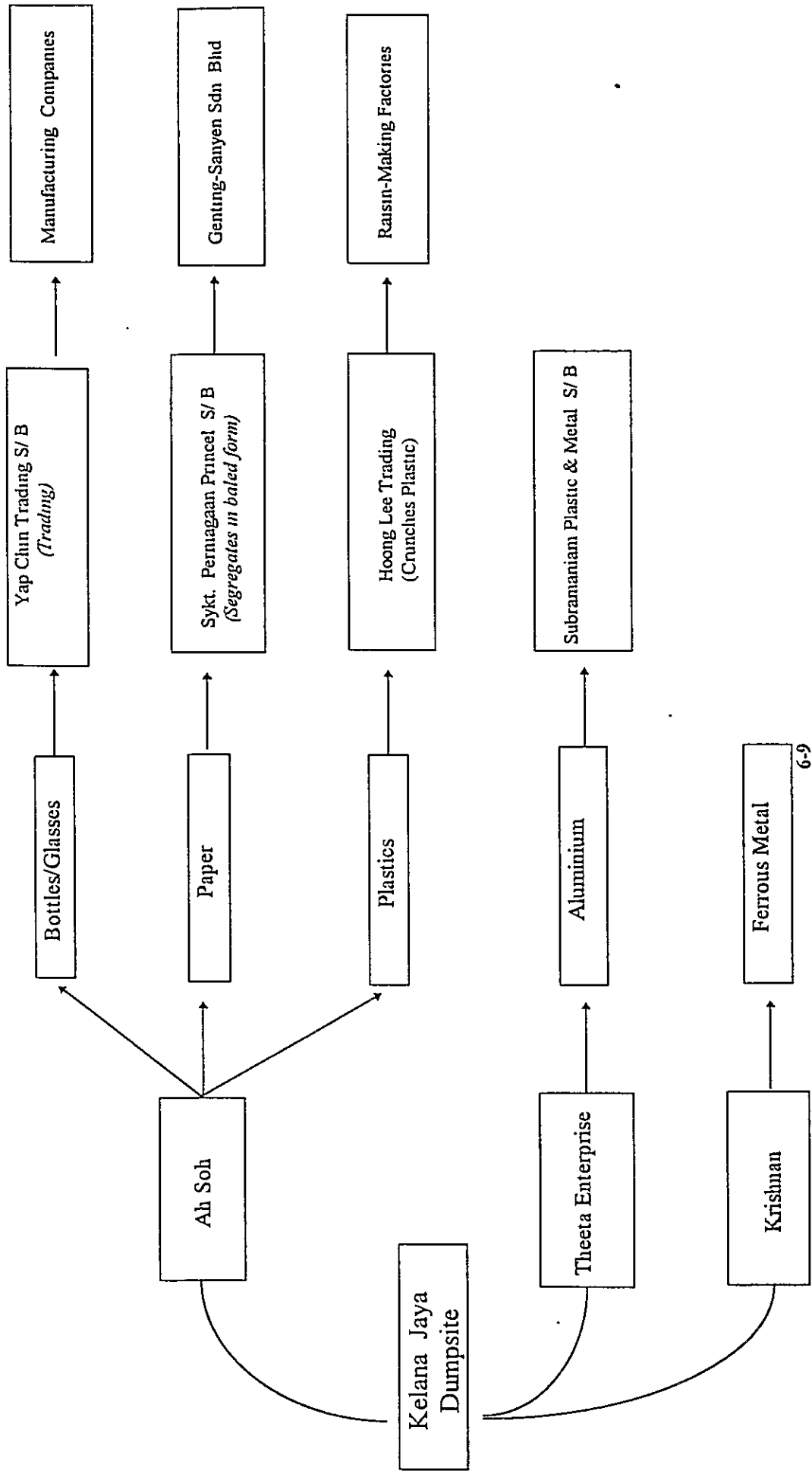


Figure 6.2: Separation and Waste Collection at Kelana Jaya Dump Site





In addition to sourcing from agents, the trader may also source from community recycling projects in hotels, residential areas and schools. In such programmes, collection bins for cans are provided and collections of the waste are undertaken weekly or as and when the bins are filled up. These programmes could be initiated either by the trading company or by the community. Overall, these collection from the community is small in volume. The trader relies primarily on factory waste for its constant supplies, in addition to importing waste for re-exporting.

In the case of glass recycling, there is hardly any door-to-door agent or a "bring" type collecting centre specialising in glass. The ultimate buyer would normally seek the supplies from a few multi-product collection centres. Some of these suppliers are located in other regions and states. Not all the glass waste are recycled locally. Some may be sold to a trader in another state who in turn may export it to Thailand where the bottles are converted into lamps for lighting purpose. The glass manufacturers also organise community-based recycling projects similar to that of the aluminium can trader.

Buyers of recyclable wastes has to ensure that they get a regular supply of waste. Besides building up some buffer stock, some manufacturers appoint contractors to go round to pick up the waste from their network. The beverage factories are an important source of waste supply. The manufacturer will also entertain the occasional drop-in glass waste sellers.

As for the plastic wastes, waste pickers and municipal workers play an important role in recycling. Most of the plastic waste is sold to the dump site collectors who may resell it to plastics traders. Traders then deliver and sell the plastic to small recycling businesses or resell to other traders. At Jinjang North dump site, the collector shred the plastic waste and bales it before selling to a trader.

The traders would eventually sell their waste to numerous small businesses producing recycled resins. Their typical operations would involve segregation, washing, drying and extruding. Some companies use entirely waste as raw materials and would do their own crushing or shredding as well. 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 needing blended resins.

As for paper waste, a substantial amount of household and office wastes have been sieved out before appearing at the dump sites. This is because of the numerous agents - who are mainly sole operators - present in the system. They go from house to house and office to office to collect papers.

At the dump site, the municipal workers would deliver and sell paper waste gathered from their rounds of garbage collection. 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.

Paper recycling is probably the most pervasive and more organised than the other industries discussed in this study. The high price for paper waste has been the single most important factor to a relatively higher degree of waste retrieval. And manufacturers generally would opt for paper waste in view of the growing shortage of virgin pulp and the concomitant higher prices of virgin materials.

As can be observed, the recycling infrastructure is rather well-established; the removal of any part of the recycling infrastructure could result in a lower rate of recycling activity and a concomitant increase in the waste accumulation at the dump site. There is no shortage of efforts on the part of the recycling fraternity to source for waste.

There is no shortage of efforts to source for wastes. In addition to importing waste, attempts are made to institute community-based recycling projects. This is a relatively viable channel to source waste directly from the public. The central question at hand is: how can recycling be initiated, sustained and enhanced at the community level?

From the industry point of view, the two basic issues in community recycling are: first, the current efforts are too dispersed, fragmented and diffused to have any significant impact on community recycling to be a major source of recyclable waste. Expanding these programmes, however, is not a matter of imposing on the community to recycle. Getting the residents cooperation is vital.

Second, activating a community-based programme is one thing, ensuring that the recycling programme is successful and sustainable is another. And this is certainly problematic. The major recurring problems encountered with recycling efforts include:

- High degree of waste contamination of recycleables
- Low volume of recyclable waste returned
- High cost of waste collection

All these three problems are inter-related. Setting up a network of community-based projects is potentially costly for several reasons

- Time, money and efforts need to be spent on initiating and sustaining the programme
- Coordinating and helping communities solve problems of recycling, difficult though it may be, needs local initiative and drive; external efforts alone is not sufficient
- Given the high labour and transport costs, the cost of collection is exacerbated by low volume of collected recyclables and high contamination of the recycled materials

Collection cost has to be low to enable the recycling industry to cast its recycling activities across a broad spectrum of society. Some of these would involve government incentives or subsidies for recycling, local authorities' initiatives at community-based recycling and widespread public support and cooperation in waste separation.

Among the various possible recyclables, enhancing glass waste retrieval would probably offers the most potential within the immediate term while plastic waste has restricted scope. Their respective assessments are as follows :

#### Glass Bottles

- Glass material does not contaminate easily
- Domestic demand for local glass waste is strong
- Recycling technology is an integral part of glass production
- No problem with product quality using recyclables
- Increasing glass waste usage relative to virgin materials is planned by the industry
- Regional collection centres may to be established by industry leader
- Community-based recycling experience has some notable successes
- Collection system is relatively underdeveloped compared to that of old newspapers

#### Aluminium Cans

- Industrial and household wastes are well sought after
- No problem with product quality using recyclables
- Industrial waste like extrusions and others are recycled locally
- No recycling of cans locally but strong overseas demand meant that can waste is exported entirely - mainly to Japan
- Experience in community-base recycling programmes registered qualified success
- Collection system is relatively underdeveloped compared to that of old newspapers

#### Papers

- Paper material has a higher potential of contamination
- Strong domestic demand for industrial and office wastes for recycling
- Recycling technology is relatively simple and does not pose a problem
- Some social prejudice exist against recycled papers
- Household supplies of recyclable waste for domestic recycling is limited
- Main household waste is old newspapers and they are mainly exported
- Demand for old newspapers would probably be even greater if local recycling of old newspapers is developed
- Collection system of old newspapers is already well established helped by good price for paper waste
- Major concern is that the collection system may breakdown when the price is low

#### Plastics :

- Some recycling activities exist but are generally limited
- Recyclable materials are used for low-end products
- Virgin materials are still preferred because recycled plastics are not compatible
- Recycled product may not achieve the same quality (for example, sheen) that virgin materials can attain
- Plastics recycling technology is not an integral part of the production process and is a critical limiting factor to recycling
- Different chemical composition of plastics makes recycling difficult while reprocessing of plastics involves high capital cost and requires big throughputs to make it worthwhile

- Manufacturers are not prepared to produce mixed recycled plastic because of uncertainty over demand - that is, who to sell it to
- Certain plastic wastes are definitely recyclably unfriendly
- Contamination of plastic waste is also a problem
- Current initiatives by the Malaysian Plastics Manufacturers Association offers a better prospect towards effective management of plastic waste and should be strongly supported

It should be noted that for waste to be readily and economically recycled, the cost of collection must be low, and the collary that recycled materials should also be in demand. It is only when demand for the recycled product is strong enough to cover collection cost of the waste that recycling will take place. In this respect, it is important that recycling efforts be market-led with judicious support by the government at all levels of the production, consumption and distribution nexus.

Having said that, it should be borne in mind that the market for recycled materials, like commodity markets, is volatile. Prices do fluctuate wildly and direct demand is in constant competition with virgin materials while its derived demand is affected by its final product substitutes. Technology and rising cost of labour can easily make market-led recycling efforts uneconomical. As such, market forces while providing the impetus to recycling efforts may be in no position to sustain such activities over the long run. An intervening policy measure may be required. Other public policy issues will also need to be addressed; these would include the need to develop a recycling culture (that does not require monetary incentives for motivation) among the public and the need to explore ways to reduce waste generation at source. All these issues cannot be seen in isolation of one another; they form an integrated whole. Table 6.1 summarises the major levels of barriers to recycling.

The next chapter focusses on developing suitable recommendations for recycling to take a more ingrained role in Malaysian society.

Table 6.1 Barriers to Recycling Efforts

<p>Social</p>	<ul style="list-style-type: none"> <li>• Public awareness of general and environment problems associated with waste disposal is very lacking</li> <li>• Societal recognition of the importance of waste recycling to the economy is non-existence</li> <li>• Community is not prepared to put in too much efforts to ensure success with recycling</li> <li>• Contamination of recyclable waste is a frequent occurrence</li> </ul>
<p>Institutional</p>	<ul style="list-style-type: none"> <li>• Absence of concrete waste reduction policy and quantifiable goals and objectives</li> <li>• Waste collection infrastructure is underdeveloped and inadequate</li> <li>• Absence of recycled product marketing</li> </ul>
<p>Economics</p>	<ul style="list-style-type: none"> <li>• Waste collection by the private sector is prohibitively expensive to undertake where recyclable waste to be collected has uneconomic collection volume or is heavily contaminated</li> <li>• Waste industry is highly cyclical in nature</li> <li>• Demand for recyclables is under constant threat from virgin materials; left to itself, the market will generally prefer virgin to recycled materials, if only for their greater consistency of quality</li> <li>• Lack of a market for the recycled-material end-product will also be a major obstacle to recycling efforts, this is particularly the case of plastics</li> </ul>
<p>Technology</p>	<ul style="list-style-type: none"> <li>• Except for plastics, the technology for recycling does not pose an obstacle</li> <li>• Glass recycling technology is an integral part of its production technology</li> <li>• Paper recycling technology involves a minor addition to the production process</li> <li>• Aluminium can recycling technology is non-existence; the demand for recycleable cans comes from oversea</li> <li>• Plastics recycling technology is basically mechanical</li> </ul>

## **CHAPTER 7**

### **MAJOR RECOMMENDATIONS**

#### **7.1 Establishing a Comprehensive Plan for Waste Management and Recycling**

##### **7.1.1 Goals and Objectives**

The goals and objectives of a comprehensive plan for waste management and recycling in Malaysia should be two-fold:

- 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 comprehensively tackle all levels of waste generation problem and management using the “cradle-to-grave” approach. In essence, this entails an integrated approach towards waste management and recycling. The generalised but comprehensive approach is the “4Rs” strategy - namely reduce, reuse, recycle and recover. However, to be fully integrated, these strategic considerations would also need to be supplemented by composting of garden and organic wastes.

Last but not least, it is equally important that quality standards are adhered to for waste dump, i.e. a sanitary landfill.

##### **7.1.2 Integrative Strategy for Waste Management and Recycling**

###### **a) *Ranking of the 4Rs***

From a perspective of minimising environmental impact, the most desirable action is to reduce the amount of waste, followed by the reuse of 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 landfilling or other environmentally friendly method. The diagram below illustrates the 4Rs strategy more graphically.

Reduce	<ul style="list-style-type: none"> <li>• Reduction means preventing waste production at source rather than having to clear up afterwards</li> <li>• Waste reduction may address issues such as product redesign, packaging and other initiatives that can cut present waste volumes</li> <li>• Reduction is also particularly effective in reducing the amount of raw materials used</li> <li>• In the final analysis, confronting the problems of waste management may mean confronting the issue of overconsumption</li> </ul>
Reuse	<ul style="list-style-type: none"> <li>• Reuse is an appropriate option for rigid containers that hold liquid or powdered products. The best example is refillable beverage bottles</li> <li>• Reuse is economical only where the rate at which the reusable containers returned by consumers is high and where the cost of returning and cleaning the container is no higher than an alternative form of packaging</li> <li>• A deposit programme for containers is necessary which requires retailers, distributors and manufacturers to collect used packaging from consumers</li> </ul>
Recycle	<ul style="list-style-type: none"> <li>• Consistently available markets for secondary materials are essential to the success of recycling programmes.</li> <li>• Left entirely to the market, recycling will take place only where demand for the recycled product is higher than its collection cost.</li> <li>• Collection is usually organised in one of the three ways: (a) "collect" type requires the public to sort waste, for curb pickup, (b) "bring" type involves trash sorting and bringing it to a collection centre or site, and (c) "later-stage separation" where waste is collected together and sorted separately at the sorting centre or dumpsite</li> </ul>
Recover	<ul style="list-style-type: none"> <li>• Energy is recovered from wastes through burning in specially designed combustors, furnaces or incinerators</li> <li>• Burning garbage is not a clean process. It produces air and water pollutants and toxic ash. Incineration frees toxic metals to be leached from the landfill incinerator ash into ground water and pumped into air nitrogen and sulphur oxides (both precursors of acid rain), carbon monoxide, acid gases, dioxins and furans (extremely toxic substances suspected of causing cancer and genetic defects), and heavy metals like lead, cadmium, and mercury</li> <li>• Because of these potential negative spillovers, it is prudent to proceed slowly and cautiously in the adoption of waste-to-energy plants. While energy recovery can play an important role, it is paramount to support clean, safe incineration with energy recovery</li> </ul>

**b) Composting**

Organic waste can also be recycled. As this is a major source of household garbage, retrieving such waste from the waste stream would also be a very effective option in a waste abatement strategy.

Composting is an effective option for yard clippings and leftover foods, but not for all waste. Organic wastes destined for the compost pile are easiest to handle if they are free of inorganics and toxic substances.

### 7.1.3 Measures for Waste Management and Recycling

Within the integrative waste abatement strategy outlined above, policy measures can be framed according to these broad policy thrusts (Figure 7.1):

- To increase usage of waste as raw materials for production
- To reduce waste generation and increase reuse at the production-distribution-consumption phase
- To enhance waste recycling activities within the community
- To promote waste retrieval and recovery at dumpsite
- To establish quality standards for dumpsites

#### a) *Increasing usage of waste as raw materials for production*

The strategic considerations to increase usage of waste as raw materials for production should be focused on increasing the substitution of recycled materials for virgin materials in the economic production system.

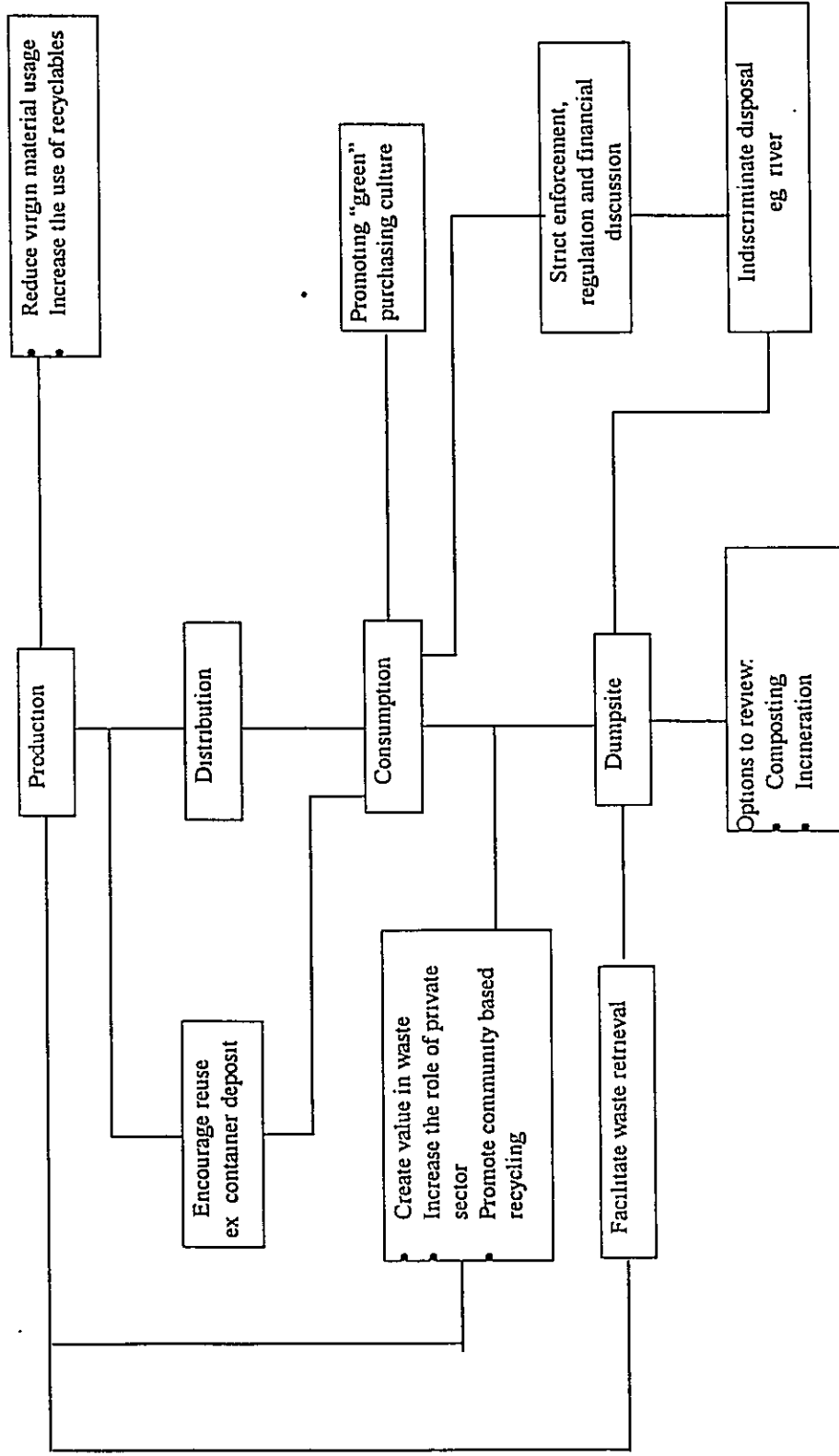
Growth in the usage of recycled materials comes from an expansion in production and the rate of substitution for virgin materials. While the production may gyrate in tandem with economic conditions - and requiring stimulation from broad-based fiscal and monetary policy measures - the promotion of recycled material usage in the production process needs specific policy stimulant.

There are two major reasons why virgin materials is generally preferred as production input.

First, there may be price distortion in favour of virgin material usage. There are two possible reasons why companies may pay artificially low prices for virgin materials: the environmental costs of making them has not been incorporated into their price and/or the virgin material inputs may be subsidised. The objective of any proposed remedial action, therefore, is meant to bring the price of virgin materials closer to real cost. In this respect, it seems relevant at the outset to undertake a comprehensive review of current industrial policies and incentives which distort market pricing in



Figure 7.1 Strategic Policy Measures for Waste Abatement



favour of virgin materials Remedial policy measures could take several forms - the removal of subsidies for virgin material production, imposition of taxes on virgin materials, and introduction of industrial incentives such as allowances and tax exemptions in relation to usage of recycled materials as production input. Ultimately, these measures must go hand in hand with the overall thrust of the broad national policy for economic growth and industrial development. As this is a national matter, it would fall outside the purview of the local government.

Secondly, while virgin materials are generally preferred for its quality, consistency, greater use of recycled materials can nonetheless be induced by ensuring that recycled materials is uncontaminated The lower the contamination, the lower is the cost of cleaning waste and hence, the more attractive is the recycled materials as production inputs. Any policy measure in this respect may be focused on setting up an organised waste recovery (sorting and cleaning) facility while ensuring that waste separation at the community level is properly executed The former policy measure would probably entail much deliberations at the national level, involving the State and Federal Governments, as to how this would fit into the national solid waste privatisation plan, and hence, would not be a measure that can be implemented within the short term. However, the latter measure can be expedited if community-based recycling can be organised with a effective dosage of waste management education and awareness.

b) *Reducing waste generation and increasing reuse in production, distribution and consumption*

At the production, distribution and consumption levels, there are several strategic considerations. First, there is the need to reduce waste generation at the production-distribution stage. Secondly, there is the need to encourage greater reuse of the materials or products. And finally, policies must be promulgated to encourage consumption of recycled-material end products A combination of enforcement measures and market-based instruments is needed.

Specific policy measures related to waste reduction should focus on packaging; that is, enforcement of a packaging reduction programme and the encouragement to use recycled packaging materials. This is because packaging is mostly thrown away after a single use. A reduction programme would also include eliminating unnecessary wrappings. These may take the form of obliging every company in the distribution chain to accept back all waste packaging resulting from its products or setting up a collection system and recycling waste packaging.

As for reuse, it may be fairly easy to revive the once-common reuse practice - the return of refillable bottles. Measures such as a container deposit programme can stimulate reuse within the industry. The programme will require retailers, distributors and manufacturers to collect used packaging from consumers, who in turn could redeem used packaging for deposits. Such deposit schemes would ensure the return of containers while ensuring that manufacturers and distributors retain some responsibility

for products and packaging. It is also cost effective with minimal financial imposition on the Government.

Other possible measures include a tax on throwaway containers to discourage their use. Before any of these policy measures are promulgated, they have to be properly studied in terms of the possible undesired economic ramifications resulting from its imposition.

To stimulate the consumption of products made from recycled materials, specific policy measures may include introducing market-based incentives such as "green" purchasing policy or exploring new uses for secondary materials. Government purchasing policy, for example, can be a valuable tool in channelling consumption of such products. Directives to various government departments on "green" purchases could be complemented by financial incentives for the private sector to consume recycled products.

Over the long run, the uncertainty of market demand for recycled products is also a impediment to the use of recycled materials. To this extent, greater cooperation between the public and private sectors - in terms of facilitating market identification for products made from recycled materials (especially in the case of the plastics industry) and R&D activities on recycling technologies and products - is indispensable. The exact structure of this cooperation can only be effectively moulded from more discussions between the Government and industry.

c) *Enhancing waste recycling activities within the community*

From consumption to waste disposal, enhancing waste recycling within the community is paramount if general waste abatement activities are to have a major impact on the waste stream. The three major strategic policy considerations include inducing greater consumer responsibility to manage their waste, facilitating private sector waste collection activities and sustaining the market for collected recycleables.

Involving the community in recycling would require a several pronged approach; there is a need to put a value to waste and to create awareness across a broad front. Putting a value on waste can come as a punitive form or as an incentive. In theory, imposing landfill charges on a regular basis for the collection of waste destined for the dumpsites would encourage more effective waste management on the part of the consumers and encourage recycling. It confronts small generators with the cost of managing their own waste flows. However, the problem with this approach within the Malaysian context is that it could result in a greater degree of indiscriminate waste disposal, eg into rivers. As such, imposing the cost of waste management would only make sense if it is complemented by strict and effective regulation, enforcement and penalties

A more acceptable approach would be to introduce itemised waste collection and landfill charges cost in the annual property assessments. This has the effect of ensuring

that consumers are made accountable for the waste they generate while at the time lightening the financial burden on the local authority in waste management

A generally preferred approach is to adopt community-based recycling programme in residential areas. For this to be effective, several conditions must prevail to overcome the pervasive public inertia to recycling, these include the provision of leadership from the Government, publicity and public education, integrated waste collection and recycling service, a convenient and low-cost recycling programme, monetary incentives, etc.

Notwithstanding the growing awareness of environment and waste problems, a recycling programme will not work by merely making the necessary announcements and supplying additional recycling bins. The level of environmental awareness and public inertia to recycling is too low that without a systematic approach to address the problem, it will almost be doomed to fail.

A paramount factor to jump start community recycling efforts is the commitment and leadership by the Government. A lot of effort in project planning and execution across the various tiers of the Government is necessary to ensure a cohesive approach, efficient use of resources and maximum impact from community-based recycling programmes. And these Government's efforts cannot be short-term endeavours; it must be sustained over a long period. There is a need to ensure adequate financial and human resources to oversee, implement, manage and monitor the recycling projects as well as to attending to and rectifying problems encountered when the projects is in full swing.

The local authority, on its own, is in no position to execute a full-fledged recycling programme because of resource constraints. And this is particularly true where financial matters and nationwide publicity-cum-awareness raising are concerned. The Ministry of Housing and Local Government, Department of Environment or Ministry of Science, Technology and Environment, MIGHT and other government sub-committees responsible for recycling should also be involved with recycling efforts to be undertaken by local authorities.

Educating the public about waste, its associated negative environmental impact, its productive usefulness to the economy, etc. is a very important starting point before the launching of recycling projects. If the public is not mentally prepared, the individual programmes are likely to fail. However, the efforts made to raise awareness have to be pitched at the national level - involving the Federal Government, private sector, NGOs - if it were to reap maximum results and optimum use of resources. Such efforts, if solely run by the local authority, would be limited by human and financial constraints.

In implementing community-based recycling programmes, it is important to ensure that the effectiveness and efficiency of solid waste collection is maintained. An integrated garbage-recyclable collection service must be adopted giving equal importance to waste and recyclables collection. There are two main reasons why this would influence

the outcome of a recycling programme. First, there is a need to ensure that existing waste collection is maintained and made more efficient, e.g. regular and fixed schedules for it. It is important that the local authority ensure that this is not a recurring problem that households faced. If solid waste is not properly collected at the outset - that is, in the absence of reliable, frequent, consistent and hassle-free service for the households - recycling is not going to work for the simple reason that residents will be too preoccupied with the bigger problem of getting rid of waste to be concerned about its separation. As such, it seems prudent for the local authority to operate an effective and efficient general waste collection services before progressing into recycling programmes.

Secondly, operating the recycling programme may be at the expense of general waste collection service. Given that the municipal workers are already retrieving recyclables on their waste collection rounds, it seems appropriate to formalise this activity and make collection of recyclables as part of the routine. Having said this, it should be noted that this may possibly affect the waste collection rate in terms of coverage for any given time period. Recycling efforts by households may collapse if general waste collection by municipal workers suffered as a result of the workers' priority interest in retrieving recyclables. This problem is typified by a situation where workers pick up only one or two bags of waste - probably containing recyclables - and leaving the unwanted garbage behind by the roadside. Such attitude would certainly be an important demotivational factor for the household to separate waste as their efforts are perceived to be a futile exercise.

In view of this potential problem, initiatives aimed at formalising the recycling activity of the workers would necessarily mean that the local authority would need to institute compensatory measures to ensure that there is no loss in efficiency in household coverage with respect to general waste collection. This would probably mean a greater supervisory and monitoring role for the local authority in overseeing activities of their workers.

Another factor which enhances the chances of success with recycling at community level is the implementation of convenient recycling system for immediate waste disposal for household waste for collection. A "collect" system is generally preferred over a "bring" system and a fixed-scheduled but regular collection for recyclables is essential. While the former makes it convenient for the households to dispose their waste, the latter enables them to plan an effective management system for their household waste. Most households would only be prepared to store away their waste for a short time only for various reasons - including the lack of storage space, unsightly, unhygienic, etc. In addition, a low-cost system, involving minimal expenses on the part of the households, is preferred. The major cost item to the residents would be the container for the recyclables. Such containers may take the form of normal plastic bags or private-sector sponsored containers.

Monetary incentives in the form of payments for recyclables can also increase the participation rate. While this is critical for lower income households, it is of lesser importance to the relatively higher income households.

Besides making the public more responsible for waste management, there is also the need to boosting waste collection activities among the private sector so as to complement the services provided by the local authority. The expanded role of the private sector can be expanded in several ways. Given the high cost of labour and transport, waste collection by the private sector is prohibitively expensive to undertake where recyclables to be collected has uneconomic volume or are heavily contaminated. To this extent, it is essential to ensure that any designated area of coverage for collection must reap economies of scale in the sense that the volume collected justifies the cost of collection at least. It probably makes more economic sense to have a single collector for specific recyclables for a selected area or region.

The other measures which need to address is the contamination of recycled materials. Some additional efforts in educating the residents is needed to encourage sorting out waste properly and possibly cleaning and bundling them up. The lower the cost of collection and cleaning, the more attractive the recyclables would be for sourcing by the traders and recyclers. Alternatively, market-based incentives can also be structured to specifically encourage waste collection.

Finally, there is also the need to examine policy options to sustain a market for recycled materials. One possible option is to examine the usefulness of a buffer stock approach to sustain recycling activities. A feasibility study would have to be undertaken to ascertain its viability. Buffer stocks for papers in developed countries, for example, enable collectors of waste paper to sell to an government-established fund when prices drop below a predetermined level. The stock is sold when prices rise. Such assurance would make recycling more appealing to local governments, while providing scrap purchasers with stable supplies of secondary materials.

Economically sustainable recycling requires high consumer participation rates, yet households cannot be asked to change their behaviour from week to week in order to accommodate market swings. Low and volatile prices are the bane of secondary materials markets. Without a dependable floor price, or ample storage space to maintain price-stabilising buffer stocks, programme planning is impaired.

d) *Promoting further waste retrieval and recovery at dumpsites*

There are several ways where waste deposit at the dump site could be minimised further. These include rechanneling indiscriminate waste disposal back into the formal waste stream for further retrieval, establishing waste sorting facility and reducing waste volume through incineration and composting.

Waste extraction from the waste stream can be further enhanced by redirecting indiscriminate waste disposal effectively back into the formal waste stream. Given the

present frequent occurrences of indiscriminate waste disposal, the force of the law is important to redirect the waste back to the dumpsite for possible final retrieval of recyclables. As such, the policing and enforcement functions of the local authority have to be tighter.

Also, establishing an organised waste sorting system or facility will also be an important component to waste retrieval. This is essential especially where a two-stream (wet and dry) waste collective system is adopted as further sorting is required. This can take the form of a simple shed for proper manual waste sorting into their different categories. This could be part financed by the collectors at the dumpsite and part financed by the local authority. This would also entail formalising the role of the municipal waste collectors and expanding their activities into waste sorting.

Waste destined for final disposal can be further minimised if measures such as incineration and composting can be incorporated into the grand plan of waste abatement. While incineration would require a more cautious approach because of its potentially negative environmental spillovers, the adoption of composting would be more environmentally friendly. Backyard composting can be promoted. Households can easily compost food and garden wastes. For those who lack the will to do the job themselves, communities can collect materials for composting at central plants. Alternatively, dumpsite composting can be undertaken.

Backyard composting can be promoted through a network of local authority staff and volunteer "master composters" as households can easily compost food and garden wastes. The only possible problem - other than the willingness to sort out waste properly - is that if the organic waste is heavily contaminated with inorganics and substances toxic to plants, the waste is useless for composting. In this respect, much education of the community is required. The resulting compost can then be sold as fertiliser for use in gardens and parks or provide a constant source of fertiliser for the use of the composter.

e) *Establishing quality standards for dumpsites*

As for the waste that is finally deposited at the dump site, there is a need to ensure that some quality standard is employed for waste dumps. Comprehensive measures must be outlined to tackle the polluting effect of dump sites. While priority may be given to sanitary landfill, there is a need for the local authority to be more vigilant about the methane gas emission and leachate at waste dumps and be pro-active in implementing remedial measures to control and manage the problem more effectively.

#### 7.1.4 Other Policy Issues and Measures

Among the broader policy measures, two major issues warrant the consideration of policy makers. These are legislation and waste stewardship. Because of the widespread

ramifications, their potential contribution to waste management and recycling is tremendous.

a) *Legislation*

Legislation can certainly play a critical role in an integrated approach towards solid waste management in Malaysia. This is particularly important to jump start recycling on a wide scale. It is interesting to note that such an approach is not a radical measure; even in developed countries - where the level of environmental consciousness is high - the enactment of legislation is an integral part of the country's efforts aimed at abating waste volume and boosting recycling activity. Mandatory waste separation, bottle deposit bill, imposition of producer's waste management responsibility are some such examples.

However, it should be noted that enactment of legislation is only one side of the coin. It is equally important to ensure that the enforcement of the law is effective. Otherwise, this would generally be perceived as a lack of conviction on the part of the government towards waste abatement.

While legislative efforts help, it is not a sufficient condition to ensure high participation in recycling over the long run. Raising awareness is equally important, if not more.

b) *Waste Stewardship*

Corporate responsibility for preventing waste should be a central feature of future government policy. The stewardship approach shifts at least some of the burden of waste management to manufacturers. It can take several forms :

- At its simplest, it involves the provision of information to product users or waste handlers.
- Another approach is for the government to assess products' health and environmental safety before commercialisation.
- The increasingly popular approach is to encourage industry to manage their own wastes; i.e. each industry to "take-back" their own wastes. This is now a feature of a number of national environmental regulations in the developed countries and has also featured in voluntary agreements between governments and industry.

The underlying assumption is that high levels of waste occur as a result of the traditional separation between creating trash and disposing it, e.g.:

- Private firms and individuals make decisions about producing, distributing, and consuming products with little regard for its waste-creating consequences.
- Governments, on the other hand, have traditionally assumed responsibility for dealing with whatever waste that resulted from such private decisions.



Waste stewardship endeavours to redress this problem by getting firms to accept responsibility for the environmental impact of their products over the entire product life-cycle.

In the packaging field, concrete measures may include .

- reduced packaging of household products, a standard packaging from more to less desirable - that is, no packaging, minimal packaging, reusable packaging and recyclable material
- re-introduce refillable glass bottles
- voluntary buy-back programmes for drink containers
- financial support for recycling efforts

In the case of non-packaging industry, corporate responsibility may take the following forms:

- introduction of longer life general-purpose batteries
- collection of spent batteries at retail locations
- collection of spent motor oil at service stations

In terms of its implementation, the Government needs to set specific waste reduction targets for particular product groups, in consultation with stakeholders at the outset. By setting waste reduction targets rather than forcing implementation of specific waste reduction activities, a waste stewardship strategy permits a manufacturer or distributor, for example, to choose among the 4Rs to find the most cost-effective way to meet the targets and encourages stewardship over the product life-cycle as they try to reduce waste at each stage. A monitoring structure is required and is to be complemented by "reward" and "penalty" system.

If the action plan targets are met on or ahead of schedule, the distributor would receive permission to use a distinctive promotional format - e.g. EcoLogo - to highlight achievement. If targets schedules are not met, regulations would provide for an environmental tax or surcharge to be levied on each unit of the distributor's products sold. Money raised in this way could flow to municipalities to finance waste management programmes.

Alternatively, tradable reduction credits may be introduced among competing firms within an industry. It will lead to the same overall reduction in waste while rewarding those most able to reduce waste and avoiding undue hardship to those least able to do so. Provisions may be made for companies for whom waste reduction would be prohibitively expensive to purchase a portion of the waste reduction credit gained by a company whose waste reduction programme was relatively efficient and inexpensive.

The municipality may also participate in this programme by managing on behalf of a product distributor; that is, managing and operating any recycling programmes that the private company wishes to include in its waste stewardship action plan. In return, the

municipality would receive an agreed-upon service fee. Although the municipality might become contractually responsible for delivering certain components of the programme, the company would not be relieved of its responsibility to meet the reduction targets

## 7.2 A Proposed National Framework for Recycling

After having sketched out the elements of a comprehensive waste management and recycling plan, it is important to outline the elements of a national framework for recycling.

It goes without saying that without a national or regional framework, local initiatives at recycling will be very costly to any initiator. The principal reason for this is that the issue of recycling cuts across all levels of government. For instance, the federal government's tax structure determines consumption and production patterns, while the local government is the one having to deal with the consequence of "higher level" policies, i.e. dispose of solid wastes. Even though recycling would on the surface to be a local level issue, consumption patterns are very much market driven, and hence, setting national or regional priorities may point to new directions.

In that regard, it may be important to examine the contributions of all levels of government which could contribute towards establishing a sustainable recycling effort.

Presently, the government is already in the midst of evaluating bids for the National Solid Waste Privatization Programme, and therefore is tight-lipped about the bids that have been received. From a discussion with the Ministry of Housing and Local Government, the government is also engaged in rounds of discussion with various parties on a national effort at recycling and solid waste management.

Based on the scenarios above, this section will discuss the relevance of the three tiers of government with respect to a recycling campaign.

Constitutionally, the federal government is responsible for taxes, such as corporate tax, sales and excise duties, indirect taxes, etc. Indeed, the tax on virgin materials or a subsidy to consumption of goods made from recycled materials would fall under the purview of the federal government. To a lesser extent, state governments also could influence the price of goods, in its pricing of land for manufacturing operations. And both the federal and state governments have some form of control over the local authority, which receives grants and aid for both development and operations. Therefore if one were to devise an integrated approach to solid waste and recycling, it goes without saying that all three levels of government must be involved.

Devising a national policy for recycling would require assessing all aspects of financial and other capabilities of the local government. By themselves, they would not be able

to finance, operate and sustain a recycling programme. Even the largest local government, i.e. the DBKL have serious budgetary difficulties if they were to pay for and sustain the full costs of a recycling campaign. As such, from a financial standpoint, the federal and perhaps even state governments would have to chip in to shoulder the burden. The corporate sector could be invited to contribute financially. And environmental NGOs could be invited to be the link with the people.

Efforts should therefore be coordinated at the federal government level, if there is to be a national effort at starting a recycling campaign. The federal government should be sensitive to the burden solid waste management has on the local governments, since they are unable to resolve such problems in a satisfactory manner.

Following this discussion are some short term, medium term and long term initiatives that the federal government could take on a national level type recycling campaign. It may be important to bear in mind that the concerns of the federal government are more in the long term interests, rather than in the short.

### 7.2.1 Federal Government

In summary, the immediate, medium and long term policy measures are:

#### a) *Immediate-Term Policy Measures*

- Review existing policy measures which inhibit 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
- 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
- Promote community-based recycling programme
- Promote environmental and recycling education at school
- Make provisions for schools to set up environment and recycling clubs as part of the educational process

#### b) *Medium-Term Policy Issues*

- Formalise a cooperative working relationship with the private sector and national NGOs in nationwide recycling
- Outlining the national strategy and policy framework for waste abatement
- Expand community-based recycling programmes to more local authorities

c) *Long-Term Policy Issues*

- Institute community-based recycling nationwide
- Compile national data and statistics on waste generation, recovery and disposal
- Set reasonable targets for recycling and waste reduction
- Increase national recycling rates and targets over time
- Monitor national waste abatement performance
- Institute the principle of corporate responsibility for preventing waste
- Institute a “green” purchasing policy for government departments and “green” purchasing incentives for consumers
- Evaluate the feasibility of establishing a buffer stock on recyclables to stabilise the waste market

### 7.2.2 State Government

As a state government, the issue of solid waste disposal is also critical in that land has to be provided for landfill or for dumping. Given the NIMBY<sup>1</sup> attitudes of most communities, state governments may have to bear part of the brunt of dump site criticisms.

Bearing that responsibility implies that the state government may wish to take a longer view of the situation. The longer view may involve a closer participation of the state government in recycling efforts, e.g. in monitoring the levels of solid waste generation, its trends, and the capacity of its dump or landfill sites, and even providing financial and other kinds of support to the local government.

Considering these issues at hand, the following are some initiatives which the state governments may wish to consider adopting within the context of a national recycling effort.

a) *Immediate-Term Policy Measures*

- Initiate pioneering local authorities to embark on community-based recycling programme
- Provide financial support to local authority for community-based recycling
- Encourage schools to set up environment and recycling clubs

b) *Medium-Term Policy Issues*

- Induce pioneering local authorities to expand their area coverage and other local authorities to undertake community-based recycling programme

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<sup>1</sup> NIMBY means “Not In My Back Yard”, an acronym meaning that people want to enjoy the fruits of service, but do not want to suffer as a consequence of that enjoyment. As such, it is alright to have landfill sites, but just do not build it in my backyard.

- Establish a data bank on waste generation, recovery and disposal at state level
- Establish reasonable waste reduction targets at the state level

c) *Long-Term Policy Issues*

- Institute “green” purchasing policy for state government departments
- Implement of statewide community-based recycling
- Monitor solid waste abatement performance at state level
- Increase recycling rates and targets over time

### 7.2.3 Local Government

Aspects of initiatives which the local government could consider over the immediate, medium and long term are as follows:-

a) *Immediate-Term Policy Measures*

- Enhance community-based recycling activities by initiating pilot projects; until the national solid waste planning is mapped out, creative thinking in urban waste management seems likely to emerge from experiments with community-based recycling programmes
- Involve NGOs in community-based recycling programmes, publicity and public education
- Secure Federal and State Government funding for sustained publicity, information dissemination activities and public awareness raising
- Assist schools in setting up environment and recycling clubs
- Expand the role of private sector in recycling efforts
- Coordinate of formal and informal municipal solid waste management practices; need to resolve and outline the roles of the municipal and private garbage collectors with respect to recycling
- Identify areas for private sector involvement and selection of private sector participant/candidate
- Formalise the recycling role of municipal garbage collectors
- 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
- Monitor pilot recycling projects
- Understand more deeply the economics of solid waste disposal services within the context of the local authority
- Explore the adoption of composting at dump site, residential area and backyard for future implementation
- Conduct classes and education on composting with residents’ associations and NGOs

b) *Medium-Term Policy Issues*

- Establishing a waste data bank at the municipal level
- Establishing reasonable waste reduction targets
- Extend of 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

c) *Long-Term Policy Issues*

- Ensure recycling efforts and activities operates within the national solid waste management framework
- Continued expansion of community-based recycling into all residential areas
- Increase recycling rates of all waste generators

### 7.3 Action Plan for Pilot Recycling Project in Bangsar, Kuala Lumpur

The USD of DBKL asked for an action plan to be put together for recycling in Bangsar, a residential area with mainly middle to upper-middle communities, but with a spattering of poor (high rise) density housing, coupled with high income condominiums. This section of the report outlines a plan of action to commence recycling efforts for this area of Kuala Lumpur.

There are many shortcomings to such a plan, especially if it were to be solely the effort of the DBKL. This is because there are many policy decisions which are being taken by various levels of government which would affect the workings of such a plan. For instance, would the Ministry endorse such a plan, and help to co-finance the costs of a recycling campaign, or is it more likely that the DBKL will have to wait till the Ministry have taken the lead in this matter. Since the initial effort will involve the DBKL taking a lead (e.g. calling stakeholders to a meeting), the USD will probably have to convince the DBKL to allow resources to be put into recycling as opposed to other proposals before them, eg the incinerator study which is before the Mayor (Star May 30, 1995 "KL to go ahead with incinerator study", Metro p.5). Additionally, the DBKL will also need to take a sustained approach towards recycling because of the high inertia of the public; is it prepared to do this in a very creative and sustained manner?

Nonetheless, it is imperative that there be answers, however tentative they may be, to such questions. Notwithstanding such policy issues which can only be resolved within DBKL, the following plan which the DBKL may wish to take into consideration in a

serious recycling effort, starting with a pilot project in Bangsar and then extending it to the rest of Kuala Lumpur over a period of time.

### 7.3.1 Action Plan for Pilot Recycling Project

At the outset, it is important for the local authority to create a recycling portfolio and allocate ample human and financial resources to it. As a start, the appointment of an officer in charge of recycling is needed to get things moving.

Next, an organising committee needs to be set up to implement community-based recycling programmes. Possible candidates should be listed out for selection. In view of resource constraints of the local authority, it may be expedient to incorporate representatives from the Ministry of Housing and Local Government, Ministry of Science, Technology and Environment, Department of Environment, MIGHT, other government-initiated sub-committees responsible for recycling, NGOs (such as Environment Protection Society, Malaysia, Malaysian Nature Society, etc.) and industry recyclers into the committee.

Higher-tier government involvement at the community project level is needed (see Section 7.2). Their involvement would also ensure that recycling efforts at the municipal level fits into the national recycling plans. In addition, the Federal or State governments will have to contribute financially to a national recycling campaign, and to review macro issues such as market-based incentives for boosting recycling which would assist and supplement recycling efforts of the municipality. Relevant issues include budget allocation for recycling activity, the proposed landfill assessment fee, financial incentives and tax.

NGOs can provide effective and efficient information dissemination on the environment and recycling. They can help tremendously in the educational process. Some of the possible avenues for information dissemination include holding talks and exhibitions at schools, community halls, in public places or having media reviews and reports. NGOs can also assist in setting up environment and recycling clubs at schools.

Private industry representation is important in a sense that they can immediately identify their needed recycled materials and hence, define the relevant recyclables for incorporation into the recycling projects. Useful items for emphasis include glass, aluminium cans and papers which can easily find an immediate market. As for plastics, they would involve more deliberation with the industry - say, the Malaysian Plastics Manufacturers' Association - to identify effective recycling stream. Overall, the private industry would also provide useful input for the streamlining of recycling activities and define their relevant issues and scope of participation.

The local government may also wish to learn from those who have successfully implemented programmes. There are two means to explore. First, it would be for one expert to be invited to come, research, discuss the probabilities of implementing a

recycling programme in the pilot project area. Second, local government personnel who are going to be involved in recycling could undertake a learning trip to countries that have been successful. In that regard, the DBKL or MPPJ could apply to JICA (through the EPU) for such assistance.

As far as finances are concerned, it is difficult to ascertain the cost of launching a pilot recycling project at this juncture. This is dependent on the scale with which the government is prepared to be embarked on. Nonetheless, as funds can be a critical constraint, this problem can be circumvented by getting sponsors and pooling the financial resources together. For example,

- industrial sponsors for publicity and information dissemination (for example, "free" media focus on environment, waste and recycling efforts)
- sponsors for containers (such as developer, property manager or recycler providing big drum containers for high rise housing), or
- sponsors for plastic bags or crates or boxes for recyclables for curbside collection (the ad hoc and short-term recycling initiatives by independent private industry such as petrol companies can be harnessed by requesting them to part finance recycling programmes of the local authority), or
- private sector to collect recyclables

The thrust of initial pilot project may be based on voluntary participation. However, this approach is likely to fail if general environment and recycling awareness is absent or needs to be raised. Residents should be thoroughly briefed on the pilot recycling programmes. Prior to implementation, the Government and public interest groups can conduct meetings with residents, provide informational flyers or booklets on solid waste problems and give them recycling and waste reduction information.

It is important that publicity campaign be done on a big-bang format, involving residents' participation. Creatively designed public advertising campaigns will help to get the message to people more effectively. Media attention on the pilot project can certainly boost awareness and motivate. Carnivals, fun fairs, family recycling day, etc. are some such examples and getting private sponsors for the event would certainly reduce the financial burden on the local authority.

However, such publicity cannot be a one-off event and has to be sustained over a longer period so as to sustain the motivation of the residents. Reminders from a designated neighbourhood leader about the timing of the next pickup and the value of recycling also help. The educational efforts could range from seasonal newsletters and public meetings to fridge magnets and stickers. Constant communications with residents should be supplemented by house visits.

Making the programme convenient to the residents is essential. Offering frequent collections, which mean consumers need to dedicate less household storage space, would certainly enhance participation. In addition, people are also prepared to store



waste provided that there is imminent monetary rewards for doing so (particularly, in the case of lower income group).

Overall, recycling will be less expensive if it draws on the cooperation of a well-motivated public. That is an attraction of involving environmental groups in such proposals. Recycling schemes would probably work better if authorities or voluntary bodies make it as easy as possible for households to participate in them, and then allow a warm glow of self-righteousness to be their chief reward.

More details of the action follows.

Community recycling programmes can be generally categorised into two broad groupings:

<p>Partial Recycling</p>	<p>This is usually aimed at a limited number of materials and participation is generally voluntary. Such programmes are usually designed as an adjunct to waste management systems that rely primarily on landfills or incinerators. Experiences in developed countries indicated that they rarely achieve overall recycling rates higher than 10%-15%.</p>
<p>Intensive Recycling</p>	<p>This includes comprehensive separation of materials, recovery of all reusable or recyclable items, and composting of organic waste. This is generally viewed as a substitute rather than a complement to incineration. If properly designed and operated, this can bring the tonnage of waste requiring disposal down to levels comparable to incinerators.</p>

Experiments in partial recycling is deemed prudent before any launching of intensive community-based recycling programmes.

### 7.3.2 Proposed Residential Area for Coverage

For a start, Bangsar provides an ideal residential location to launch a pilot recycling project. The surrounding neighbourhoods representing a broad cross-section of the city population. On the whole, Bangsar has a relatively active and well-educated citizenry which is probably inclined to support and participate in recycling programme. The Bangsar Residents' Association has also expressed interest in its newsletter regarding recycling.

Proposed Area for Pilot Project Launching	Bangsar, Kuala Lumpur
Residential Coverage	Three main neighbourhoods are proposed : a) Landed property housing in Bangsar Baru b) Condominium Blocks c) Sn Pahang Flats

### 7.3.3 Key Features of Recycling Project

Programme Features	<p>These are characterised by :</p> <ul style="list-style-type: none"> <li>a) Source separation by households <ul style="list-style-type: none"> <li>• “wet” and “dry” waste separation in Bangsar Baru</li> <li>• “non-sought-after” Waste and “sought-after” waste separation for high-rise buildings</li> </ul> </li> <li>b) Depositing separated waste <ul style="list-style-type: none"> <li>• in the case of landed properties, two options are available  1st Priority : separated waste can be stored in a different coloured plastic bag for collection, or  2nd Priority stored in a different container, box or bin</li> <li>• in the case of high-rise building, a big central bin or drum could be sited at the base of each block</li> </ul> </li> <li>c) Convenience <ul style="list-style-type: none"> <li>• fixed-scheduled and regular collection</li> <li>• door-to-door collection for landed properties and block-by-block collection for high-rise</li> <li>• for “dry” waste, collection may coincide with general household waste collection</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>• for "sought-after" waste, the collection frequency may be weekly or as and when the containers are full</li> </ul> <p>d) Economies of collection</p> <ul style="list-style-type: none"> <li>• for landed properties, collection can be undertaken by local authority</li> <li>• for high-rise, private collectors undertake collection</li> </ul> <p>e) Monetary incentives for households</p> <ul style="list-style-type: none"> <li>• monetary incentives is important for low-income households in Sri Pahang flats (this can be left to the private collectors to shoulder)</li> <li>• monetary incentives can be overlooked for the higher income groups (education and awareness are more important), nonetheless, it may enhance more participation but not critical to determine success or failure of the recycling programme</li> </ul> <p>f) Voluntary community participation</p> <ul style="list-style-type: none"> <li>• in the absence of mandatory requirement, imparting awareness and education is the extremely important</li> <li>• project monitoring is an integral part of the project management</li> <li>• collaboration with RAs, community leaders, private recyclers and NGOs is indispensable</li> </ul> <p>g) Awareness, education, public interaction and feedback</p> <ul style="list-style-type: none"> <li>• need to let people know about waste problems and its environmental consequences, recycling, etc</li> <li>• need to obtain residents' concerns and incorporate these, where appropriate, into the policy planning</li> <li>• need to describe and explain clearly the programme about to be thrust upon the residents</li> <li>• giving them lines of communication to City Hall</li> </ul> <p>h) Utilising a multi-fold communications approach to recycling throughout the process</p> <ul style="list-style-type: none"> <li>• this would include articles in residents' newsletters, newspapers, radio broadcasts, television programmes as well as enforcing more direct resident contact, important information include recycling programme features, updates, progress, motivating information, etc.</li> <li>• for initial project implementation, two brochures may be designed for initial direct mass contact and project explanation</li> <li>• public relations efforts are very important and these demand preparation and execution by City Hall staff or organising committee</li> </ul>
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7.3.4 Specific Features of Neighbourhood Programmes

a) *Recycling Programme by Residential Type*

<u>General Programme Features Across the Board</u>		
<ol style="list-style-type: none"> <li>1. High Profile Media and Sustained Publicity</li> <li>2. Education of 4Rs/Environmental Awareness/Programme Awareness</li> <li>3. Integration of Recycling Programme with Solid Waste Management</li> <li>4. Agents of Change/Organiser/RAs/NGOs/Leadership (Government/Industry)</li> <li>5. Finance/Taxation/Market-Based Recycling Programme</li> <li>6. Legislation/Enforcement/Volunteer System</li> </ol>		
<u>Condominium</u>	<u>Landed Residence</u>	<u>Low-Cost Public Housing</u>
<i>Programme Feature</i>	<i>Programme Feature</i>	<i>Programme Feature</i>
<ul style="list-style-type: none"> <li>• Bring system</li> <li>• Either mobile collection unit or on-site bins</li> <li>• Regular collection</li> <li>• High-level and sustained publicity</li> <li>• Organiser could be the RA or property manager</li> <li>• Monitoring is essential for on-site bin collection</li> </ul>	<ul style="list-style-type: none"> <li>• Curbside collection</li> <li>• Collection by local authority</li> <li>• Fixed and regular collection schedule</li> <li>• High-level and sustained publicity</li> <li>• RA to provide leadership and cohesion</li> </ul>	<ul style="list-style-type: none"> <li>• Bring system</li> <li>• Private collection with monetary incentives</li> <li>• More regular schedule collection</li> <li>• External agent is needed, though RA is utilised</li> <li>• High-level and sustained publicity</li> </ul>
<i>Community Issue</i>	<i>Community Issue</i>	<i>Community Issue</i>
<ul style="list-style-type: none"> <li>• Convenience of waste separation</li> <li>• Hectic lifestyle</li> <li>• Medium level environmental consciousness</li> <li>• Low participation</li> <li>• Need strong community cohesion</li> </ul>	<ul style="list-style-type: none"> <li>• Convenience of waste separation</li> <li>• Hectic lifestyle</li> <li>• Medium to high level environmental consciousness</li> <li>• Low participation rate</li> </ul>	<ul style="list-style-type: none"> <li>• Severe space limitation</li> <li>• Low to medium environmental consciousness</li> <li>• Low participation</li> <li>• High turnover of residents</li> </ul>

7.3.5 Implementation Schedule

<p>Implementation Schedule</p>	<p><u>Stage 1 : Listing of Possible Invitees to Participate in Recycling Project</u></p> <p>On its own, it would be extremely difficult for City Hall to organise the pilot recycling project because of resource constraints. Incorporating relevant organisations into the project management would not only help to overcome the limited resources available to City Hall, it can also enhance the chances of project success. The relevant organisations are :</p> <ul style="list-style-type: none"> <li>• Residents' Association (RA)</li> <li>• Environment-Related Non-Government Organisations (NGOs)</li> <li>• Private Recyclers</li> </ul> <p><u>Stage 2 : Exploration of Recycling Project</u></p> <p>Organising round table meetings with senior representatives from City Hall, RA, NGOs and private recyclers :</p> <ul style="list-style-type: none"> <li>• to establish interest and commitment to implement recycling project</li> <li>• to identify basis for collaboration</li> <li>• to deliberate on City Hall's project proposal</li> <li>• to structure a viable plan for project implementation</li> <li>• to define roles and functions of the respective organisations</li> </ul> <p>Perhaps at this stage, experts from other countries could be invited to participate. One possible area to explore the JICA network of consultants and advisers.</p> <p><u>Stage 3 : Pre-Project Contact with Residents</u></p> <p>There should be some initial resident contacts prior to project implementation. Some information dissemination is essential. This may be undertaken via brochures.</p> <ul style="list-style-type: none"> <li>• The first brochure may be mailed a month prior to the project launching initial collections</li> <li>• The brochure should inform residents that a recycling programme was coming and that they would be a very special part of an important experiment to determine if recycling would work in Bangsar</li> <li>• The brochure shall also inform the residents of an imminent face-to-face meeting with the organising committee</li> </ul>
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Stage 4 : Pre-Project Meeting with Residents

There is a need for the organising committee - especially, the City Hall staff - to hold a meeting in each pilot project neighbourhood :

- to explain the recycling programme
- to get feedback from the residents
- to answer questions
- to identify specific City Hall staff available to address residents' needs

Constructive feedback could be taken into consideration in the programme implementation if necessary. This meeting will also serve to reflect City Hall's commitment to the programme.

Stage 5 : Project Launching

High-level publicity is essential for project launch. It should involve the organising committee as well as the residents. Possible options at the disposal of the organising committees include special day event or carnival, rallying song and slogan, etc. The handing over of central drums for high-rise waste separation may also be "officially" handed over the residents in that neighbourhood. It should be noted that the primary objective of this exercise is to reach out to make as many residents as possible and to make them aware of the programme.

Stage 6 : Commencement of Recycling Collection

A second brochure would serve as useful reminder of the recycling programme. Essential information includes specific instructions on how and when to recycle, as well as persons to contact in the event of problems.

Stage 7 : Project Review and Problem Rectification

It is proposed that a monthly review of the recycling progress be made by the organising committee. These reviews are important platform for the organisers address and rectify teething problems and residents' inertia by mobilising the necessary resource to get the project moving. Persistent efforts in reminding residents to recycle, encouragement by peers, house visits and constant interactions are indispensable.

	<p><u>Stage 8 : Information Update on Recycling Progress</u></p> <p>An update brochure may be mailed to residents in the pilot areas, congratulating them for participating in the programme; data on amounts they have recycled can be highlighted to provide further encouragement; a questionnaire may also be included with this brochure asking residents for information on their recycling habits - information that would otherwise be difficult to obtain :</p> <ul style="list-style-type: none"> <li>• they may be asked of their willingness or unwillingness to participate and why</li> <li>• the problems they faced and suggestions for improvements to the recycling programme</li> </ul> <p>Where necessary, modifications to programmes may be undertaken to ensure greater effectiveness.</p> <p><u>Stage 9 : Expanding the Recycling Coverage into Other Areas</u></p> <p>Once the programme has stabilised, it would be appropriate to consider expanding the programme to other residential neighbourhoods, schools, complexes and offices. Experiences gained from the pilot projects would be useful input for formulating better and more effective recycling programmes.</p>
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Resident Association Chairman

SS3 Residents' Association in Petaling Jaya  
Contact Person : Dr. Ganesan  
Chairman of SS3 Residents' Association

International School of Kuala Lumpur  
Contact Person : Ms. Pam Stewart, Teacher  
Ms Elas Leong, Teacher

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