2.5 Intermediate Treatment and Recycling

2.5.1 General Condition in Malaysia

(1) General

The following four items on intermediate treatment and recycling are discussed in this section.

- Materials recovery and recycling
- incineration
- mechanical size reduction such as pulverization, shredding, compaction, etc.
- composting

Although Malaysia has the above system activities, the facilities and equipment utilized in the activities are small in scale compared to those utilized in some other developing and advanced countries. The scope of intermediate treatment are more confined to private businesses expect in the case of incineration. However, a proposal for an incineration plant to be managed by the private sector was already submitted to be examined by DBKL.

(2) Materials recovery and recycling

To date, there has been no reliable and comprehensive study or report on materials recovery and recycling in solid waste management practice in Malaysia. However, it has been reported that recycling has been active at the municipal disposal sites through scavenging activities. The ABC report (1988) stated that there are about 230 official disposal sites throughout Peninsula Malaysia. Eighty three had been identified where scavenging exists with at least 2,000 persons in total involved in the scavenging activities. The number of scavengers have increased over the recent years corresponding to decline in employment opportunities due to recession.

The items mostly recovered and recycled are plastic, scrap metal, paper, cloth and glass. Their typical sale values are shown below.

Recoverd waste	Typical Sale Price
Plastic	$60/ton
Scrap metal	$50/ton
Paper	$30/ton
Cloth	$30/ton
Glass items	$20/ton

Source; Klang Valley Environmental Improvement Project

(3) Incineration

The only urban waste incineration plant with a capacity of 100 tons/day began its operations in September 1987. The plant is owned and managed by Majlis Perbandaran Kuala Terengganu and it was built with an initial cost of 6.5 million ringgit. A detail and comprehensive report on this plant could be found in Section 4.5.

(4) Mechanical Size Reduction

There is no large mechaniccal size reduction plant available for solid waste except for those small sized facilities owned and operated by private sectors for recycling purposes. The size of the mechanical reduction facilities is normally small and confined to compaction and shredding facilities which suits the private company's purposes.

(5) Composting

To date, there has been no compost derived from urban solid waste being produced. Compost currently are derived mostly from animal manure and straw. These compost are not produced on commercial basis but supplied from animal farms to be used as a supplement to

the chemical fertilizers in farmed lands throughout the local surrounding areas.

2.5.2 Recycling in Penang State

Materials recovery and incineration are the two main types of intermediate treatment activities that are active in Penang State.

(1). Introduction

At present in both MPPP and MPSP, materials recovery are limited to the recycling of reuseable materials without treatment facilities for domestic or export purposes.

The most effective way to recover reusable materials is to separate them at their generation sources. In Penang state, however, such activity has been carried out mainly by private recyclers without any commitment of the council.

Materials recovery in the study area is carried out by two main groups; i.e. the scavengers at municipal disposal sites and the private recyclers who collect from source or from the scavengers.

The quantity of recyclable materials in the study area totalled an average of 80 tons/day (estimated by the Study Team). It is mainly generated by residents, commercial and industries that produce recyclable waste.

The types of recyclable waste range from the common paper, plastic, glass and metals.

(2). Scavenging

a. Scavenging at municipal disposal site

Scavengers in the study area is the largest group of recycler in terms of individuals or persons. However, they in total accumulate less amount of reusable waste when compared to those collecting at source. There is no clear cut characteristic which can define the scavengers in the study area. The scavengers range from children to elderly persons and their presence at their work site fluctuates daily. A two week observation and scavengers count carried out in two separate periods in March and June 1988 showed the presence of an average of 130 scavengers daily (80 at the BSDS and 50 at the PPDS, excluding PBDS because of negligible figures).

The people alienating the municipal disposal site resort to collecting reusable materials and selling them as their main source of income. The survey carried out in March and July 1988 showed that the categories for scavenging varies from individuals. Below is a summary of the the categories.

Categories of Scavengers	* Percentage from Total Scavengers Daily	
	Children	Adult
Full time work for permanent income	< 3%	> 60%
Part time work for supplementary income	< 15%	< 40%

* Percentage fluctuates daily, weekly and seasonally.

Thus, it can be seen that a majority of the scavengers are earning their living at these municipal disposal sites. Although the number of part-time children scavenging is quite astonishing, this part time occupation for them fluctuates and is only significant during school holidays. Otherwise, the number of children scavenging on part-time basis is still small (less than 15% daily of the total

scavengers on site).

Most of the people interviewed, scavenge because they have no other better jobs and the income from the disposal site is good to sustain their livelihood. It is anticipated that as the economic situation gets better, less will become full-time scavengers and resort to other better jobs for their major sources of income. The survey has supported this fact that very few (less than 15%) has been scavengers for more than 5 years.

b. Mode of operation and activities of scavengers

The activities of the scavengers at the disposal sites are basically confined to two types of works; i.e.(i) collection of recyclable on salvagable waste and (ii) sorting out the goods manually before selling to the buyers at site.

An interesting feature is that 26% of the scavengers have certain types of tools such as hammer, chisel, hatchets and container bags used in their work. On top of this, 84% of the scavengers have their own means of transportation to get to the disposal site and to transport their goods to local dealers in town (which would offer better prices than those sold at disposal site). A survey conduct has the following breakdown of vehicles owned by the scavengers.

Table 2.5-1 Vehicles Owned by Scavengers

Type:	% of Scavengers
Bicycle	53.0 %
Tricycle	10.0 %
Motorcycle	15.8 %
Pick-up Truck	5.2 %
No Vehicles	16.0 %
Total	100.0 %

The types of goods normally callected and sold by the scavengers and others are as shown in table 2.5-2.

Table 2.5-2 Types and Prices of Reuseable Materials

Items	Selling Price of Scavengers	From Primary Dealers		From Secondary Dealers		From Final Dealers		Buying Price of End User	Remarks
		Buy	Sell	Buy	Sell	Buy	Sell		
Paper									
- Newspaper & Books	$ 0.04-0.05/kg	$ 0.04/kg	$ 0.05/kg	NA	NA	$ 0.05-0.10/kg	$ 0.10-0.14/kg	$ 0.20-0.70/kg according to the 12 grades	Prices highly depend on their grades
- Cardboard	$ 0.05-0.08/kg	NA	NA	NA	NA	$ 0.05/kg	$ 0.13/kg		
- Other	NA	NA	NA	NA	NA	$ 0.10-0.45/kg	$ 0.15-0.51/kg		
Glass									
- Bottles	$ 0.025-0.065/bottle	$0.02-0.10/bottle	NA	NA	NA	$0.10/bottle	NA	NA	
- Glass (Broken bottles)	No market	No market	No market	No market	No market	No market	No market	No market	
Textile	No market & supply	NA	NA	NA	NA	No market	No market	NA	
Plastic									Plastic bin is dealt with both per weight and pieces
- Plastic bin	$ 0.05-0.15/pc	$ 0.10-0.35/kg	$ 0.20-0.45/kg	$ 0.30-0.50/kg	$ 0.45-/kg	$ 0.10/pc	$ 0.12/pc	NA	
- Plastic sheet	$ 0.15-0.20/kg	ditto	ditto	ditto	ditto	$ 0.30/kg	$ 0.50/kg	NA	
Metals									
- Ferrous	$ 0.05/kg	$ 0.04-0.08/kg	$ 0.07-0.10/kg	$ 0.10/kg	$ 0.11-0.12/kg	$ 0.06-0.20/kg	NA	NA	Prices of ferrous metals highly depend on their grade
- Copper	$ 1.10/kg	$ 2.50/kg	$ 3.00/kg	NA	NA	$ 4.00-5.20/kg	NA	NA	
- Aluminum	$ 0.20/kg	$1.60/kg	$ 2.20/kg	NA	NA	$ 3.00-3.50/kg	NA	NA	
- Others	NA	NA	NA	NA	NA	$ 3.50/kg (Brass)	NA	NA	
Others	NA	NA	NA	NA	NA	NA	NA	NA	Nothing is answered

Abbreviation ; NA : Not Available
PC : Piece

c. Distribution channel for scavenged goods

The market network of scavenged goods is as shown in Figure 2.5-1.

Upon retrieval of usable goods, the goods are normally sold to the primary dealer stationed on the site. The primary dealers would sell their merchandize to other dealers. The dealers would finally sell of these goods to the end users, both foreign and local.

The various types of recycled goods that are sold to foreign buyers are plastic, paper and metal scrap as copper, iron, lead, aluminum, etc. These are exported to Thailand, Burma and to countries as far as Japan and Korea. However, the exports largely depends on the quality, quantity and price. The amount of export again fluctuates according to both internal domestic market forces and the external foreign damand.

d. Social and public health hazard aspects of scavenging

i) Social aspect

The work environment and occupational hazards of the scavengers are well seen at the disposal sites. Firstly, the work environment i.e. the condition of both the PPDS and the BSDS where open dumping and controlled tipping respectively are parcticed, poses many occupational hazards such as high possibilities of infections, diseases and accidents. Uncontrolled and undefined movements of the scavengers and vehicles on site subjects the Councils to possible prosecution due to negligence should there be an accident to the scavengers. The slack in inspection on incoming waste disposed of at the site by private collecters may invite prohibited or dangerous waste at the municipal sites, which would finally be posed to the scavengers. Although the scavenging is prohibited in the municipal dump site areas, they have been allowed on the premises of humanitarian grounds. Because most of the scavengers earn their livelihood income from sale of waste goods, they are allowed on the sites. It is estimated that the scavengers recover

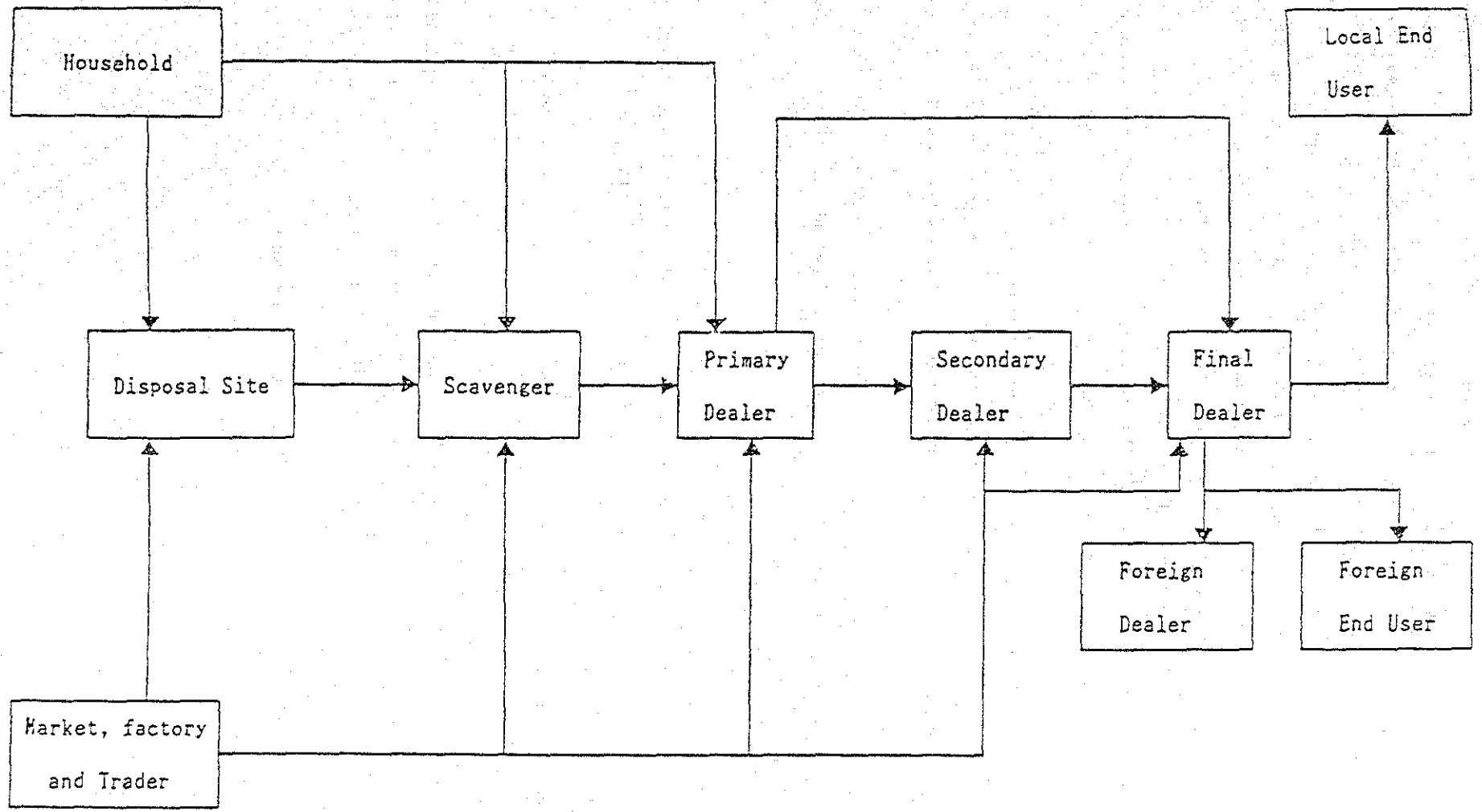


Fig. 2.5-1 Distribution Channel of Reusable Material

approximatly about 15% (JICA Study Survey Estimates) by weight of the total recycle waste in the study area.
The average income of scavengers varies and it depends largely on what types of goods they have for sale. Goods derived from scrap metal fetch good prices however, it is often difficult to obtain valuable metals such as copper and lead at the disposal site. Otherwise, plastic and tin products are more commonly sold because the products are plentiful and easy to find. On the average from the sales, each scavenger may obtain between $5 to $15 (estimates by the Study Team) per day. The average income of scavengers gathered by the study are shown in Table 2.5-3.

Compared to other developing countries, scavengers here have better standard of living. This is based on the following observations obtained by the interview survey conducted by the JICA study Team:-

- They live in houses, away from the disposal site. In other developing countries, most scavengers live on or around the disposal site.

- Their houses are supplied with the basic utilities such as electricity and piped water. In some other developing countries, the scavengers do not have these utilities.

- Most of the scavengers surveyed have their own means of transportation.

- They are quite well organized. These scavengers have special attires and some tools for work. The items collected are well stacked and sorted out at their specified areas.

- They can afford private medical attention when required.

Table 2.5-3 Average Income of Scavengers and Average Quantity of Waste Collected by Them

	Number of samples	Range of income per scavenger	Amount of waste collected daily
MPPP	9	$ 13 to $ 25	80 kg to 172 kg
Sub Average		$ 18.61	133.77 kg
MPSP	10	$ 5 to $ 15	28 kg to 95 kg
Sub Average		$ 8.40	58.80 kg
Average (total per 26 days/month/person)		$ 13.50 ($351.13)	96.29 kg (2,503.41 kg)

This reflects that financially, they are better than other scavengers in some developing countries.

The average income is estimated as $350 per month per scavenger. This amount is almost as much as what a blue-collar worker earns. There may be possibilities that if further studies are carried out, the average income per scavenger may prove to be higher.

Based on the survey in the study, the amount of recyclable waste collected and recoverd by the scavengers per month is estimated to be 375 tons per month in Penang state.

The calculation is based on the following :-

Average 130 scavengers per day	x	30 days/month	x	96.3kg of waste/day/ scavenger

ii). Health aspect

The scavengers work between 3 to 11 hours daily at the disposal site. The average is 6.8 working hours per scavenger per day (estimates by the Study Team).

From these two figures, the averange total number of hours each scavenger spend on the disposal site per year is :-

26 day-month x 6.8 hrs-dayx12 months = 2126.6 hrs/yr

Summary on the percentage of scavengers interviewed, with regards to their work duration, and medical aspect are as shown below :-

	No. of Scavengers	Percentage from total
Scavengers working more than 6 hours at disposal site daily	12	63.2%
Scavengers that have medical check-ups	4	21.0%
Scavengers with illness or diseases due to condition at disposal site	6	31.6%
Scaventagers with 2 or more scavenging years	12	63.2%

From the health view point, it would be surprising to know that despite of the unfavourable condition of the dump site, the scavengers working on the dump site were mostly healthy. Others have been reported to have only minor diseases and bodily pains. A medical examination carried out on 6 scavengers picked at random from the site verified that all of them were fit and healty. Thus, there seems to be little relationship between scavengers health and condition of the dump site.

The scavengers are also aware of their health and often seek medical treatment from private clinics and hospitals. They also disapprove burning at the dump site as it is a hinderance to them to carry out good scavenging activities. Some of scavengers have attires specially meant for their work and these are changed after they finish working, thus minimizing the chances of communicating diseases to others or themselves.

(3). Private Recyclers in Penang State

a. Present situation

The private recyclers in Penang state consist of private company organizations that accumulate and sell recyclable waste from commercial and industrial areas. In the study area there are more than 60 companises that exist to undertake the recycling activities. From these figures, more than 20 are based in MPPP and 40 in MPSP (Source: MPPP and JICA Study Survey).

Most of these private recyclers are dealers to the scavengers. They also obtain their merchandize from industrial and commercial sources. In many cases and more often, the recyclable waste is processed such as those dealing with scrap metal where smelting and ingotting are involved.

b. Mode of operation and activities

The private recyclers are mostly well organized companies and are registered with the Councils. In MPSP, a list of the companies could be compiled and they are mostly listed under buying and selling of reusable good.

These companies vary in size depending on scale of operation. The smallest size company observed had at least 3 workers who are directed to manually sort and itemize goods. The largest company that the Study Team had visited have more than 20 employees.

Although many of these to recycling companies are static, some have ventured out to the generation sources to buy their merchandize. At least 60% of these companies find source of their good directly and from other local agents. They have a number of buyers (averaged about 7 buyers each) to obtain various kinds of goods. Normally, one buyer would specialize or favour only one or two types of items.

For recyclers who need source of their goods, vehicles to transport back these goods to their place is a necessary. For these large companise, they would have trucks or lorries. Their common generation source would be the industrial zone (such as FTZ, Mak Mandin and Prai Industrial Complex), commercial complexes and tenders from large factories that produce recylable waste. Goods that are normally preferred include carton boxes, paper, plastic (sheets, PVC, plastic containers), scrap metals (copper wires, aluminium scrap, lead scrap, etc.). From the survey carried out by the Study Team, it is estimated that 81% and 71% of the total factories in MPPP and MPSP respectively, produce recyclable waste. The total amount of recyclable waste generated in the study area is estimated to be 53.9t/d. Table 2.5-4 and Table 2.5-5 explains the above.

The survey has also revealed that there is an organization or association of recyclers. However, this association has been dormant for the past few years.

The recyclable goods gathered are normally stored up to a quantity large enough to cater for orders and export. It has been that for plastic items, these are compressed, compacted and packed before exporting to foreign buyers. While metal scrap are melted down to produce ingots which are then exported out to countries such as Japan and Korea. Due to the unfavorable export duties, paper has been largely collected and recycled for domestic use.

The exact amount of recyclable waste collected by these entrepreneurs are not know. This may be attributed to major factors i.e. :-

- insufficient list and date on the actual number of companies undertaking these activities.

- the policy of may companise that regards the amount of goods transacted as their trade secret and their unwilingness to disclose the quantities.

Table 2.5-4 Recyclable Industrial Waste

Quantity (t/d)	Recyclable Waste	
	Total no.of factories surveyed. (no. of factories that produce recy. waste)	Average amount/factory (t/d/factory) *
MPPP 5.24	58 (47)	0.090 t/d/factory
MPSP 28.03	110 (78)	0.254 t/d/factory

Note: In MPPP: 81% of the total factories surveyed produce recyclable waste.

In MPSP: 71% of the total factories surveyed produce recyclable waste.

* : This figure is for all factories regardless whether they produce recyclable waste or not.

Table 2.5-5 Total Amount of Recycleable Waste From Factories

Recyclable Waste		
Average amount Per factory (t/d/factory)	No. of factories in the area	Q'ty of Recyclable Waste/day (t/d)
MPPP 0.090	60	5.4t/d
MPSP 0.254	191	48.5t/d
Total amount of recyclable waste/day		53.9ton/day

c. Distribution Channel

A distribution network of the reusable material is as shown in Fig.2.5-1.

The dominant difference between scavengers and those listed as dealers or private recyclers is that they deal in large or bulk volumes of recyclable waste. Visits made to these recyclers have shown that the market and distribution infrastructure are well organized. They have proper employees, equipment and vehicles to execute collection, storage and sale of their merchandize efficiently and effectivily. Many of these large companies deal with original dealers and export their goods, but these large companies constitute about 25% of the total recyclers having the capability of resourcing goods direct from its source and exporting it. These may be due to the active competitive purchase price that they have to quote and which requires volumetric sale to obtain profits. Another reason is because of the large financial investments that has to be borne initially to undertake the recycling business, especially to the rental of space, equipment and transport vehicles. As most of these companies have small operating capital, they are relying heavily towards the bigger dealers to purchase their goods and for the smaller dealler to trade with them.

The price of goods sold are shown in Table 2.5-2. Many of the ordinary recyclers have an average turnover of less than $6,000/month, while on the other end, it may reach more than $100,000/month.

(4). Estimation on the Quantity of Recyclable Waste

a. Average total amount of recyclable waste generated

The Study Team has undertaken various interview survey that included resident and factory interview survey as described in the S/R Volume V. Data were then compiled and analysed to obtain average amount of recyclable waste discharged by each of the residents, commercial and factories sectors. The average amount of recyclable waste discharged are computed as follows.

Sector	Average discharge by weight (tons/day)		Total tons/day
	MPPP	MPSP	
Residential & Commercial Sector	10.79	15.29	26.08
Factories	5.40	48.50	53.90
Total	16.19	63.79	79.98

Based on the answers of residents and factories, it is estimated that about 80 tons of recyclable materials are produced in Penang state of which about 26 tons of them are from residential and commercial sector and about 54 tons are from factories. However, due to a little number of the answers, the figure of residential and commercial sector would not be reliable.

b. Average amount of recyclable waste collected by scavengers at municipal disposal sites;

The above can be computed as follows.

(average number of scavengers on sites daily) x (average amount collected per day i.e. /scavenger)

130 nos./day x 0.096 t/dscavenger = 12.51 tons/day

$$\text{percentage collected by scavengers} = \frac{12.48}{79.98} \times 100\%$$

$$= 15.6\%$$

2.5.3 Incineration in MPPP

At present, both in MPPP and MPSP, there is no real facility for urban solid waste incineration expect for very small scale carcass incinerators in MPPP described below.

The old batch-type incinerator uses waste wood and tire, etc. as auxiliary burning materials.

The old incinerator has no dust collector and is not designed for continuous operation at high temperature. Smoke, soot and smell disturb surrounding residents, thus resulting to their complaints.

To improve these conditions, the construction plan of rotary kiln type incinerator (Capacity 500kg/h x 2) was completed in 1988. And, a small carcass incinerator in southern part of island started its operation.

(1). Incinerators at Kampong Jawa Depot.

The Engineering Department of MPPP has two separated incinerators localed at Kampong Jawa Dept. One of the incinerators is about 62 years old and have been used until recently, to incinerate

abattoir, hospital wastes, carcasses, court exhibits, etc.. This old batch combustion type incinerator cannot support continuous high temperature combustion, resulting to unfavourable stack emission and environmental discomforts. Thus, a new set of incinerator was planned and construction was complate in 1988. The new incinerator has the following specifications.

Specifications of new incinerator at Kg. Jawa Depot

- Incineration Capacity : 2-furnaces, capable for 500kg/hr per each.(8 hours/day operation)
- Types of waste incinerated : carcasses, hospital waste etc.
- Density of Waste : 700 ~ 900kg/m^3
- Water Content : less than 85%
- Incombustible : less than 5%
- Heat Value : 600 kcal/kg (as fired)
- Residue :
  - Remained Organic Matter : less than 1% (in ash)
  - Remained Carbonaceous Matter: less than 10% (in ash)
- Condition of Flue Gas :
  - Particulate Emission in Full Gas ... under 0.25g/Nm^3(12% Co_2 in dry gas)
  - Density of Smoke ... not exceed ringlement No.1 shade
  - Stack ... top diameter 0.6m, height 18m
- Furnace Temperature : more than 800 °C(with auxiliary oil firing)
- Gas cooling System : cold air injection at the exit of furnace

According to the drawing, this incinerator has a secondary combusion chamber. Axiliary oil firing is made in the primary and secondary combustion to continue high-temperrature combusion. As the result, pollution by smoke, soot or ordr will be reduced greatly, compared with the exiting batch-type old incinerator. The quality of ash depends on retention time in the furnance and auxiliary burning oil amount. There is some doubt however whether it is sufficient to burn animal carcasses continuously (water

content* 85%, specific gravity: 0.7-0.9 t/m^3) in a rotary kiln type incinerator.

(2). Batu Maung Pig Incinerator

A pig incinerator was built in Batu Maung area recently, the outline of specification is as follow:

- Type and Capacity of Furance : manual feed batch type furnance with fixed grate capacity 150kg/hr
- Main Object to Incinerate : carcass only
- Residue : under 10%
- Operating Temperature : 550-650°C
- Combustion Chamber Volume : primary combustion chamber less than 1.5m^3
  secondary combustion chamber more than 0.5m^3
- Axiliary Burner : primary burner 500x10^3KJ/hr
  secondary burner 500x10^3KJ/hr
  (furnace temperature is controlled automatically)
- Stack : diameter and height is to be decided by the direction from DOE
- Gas Cooling System : to be kept under 400°C by means of cold air injection at the exit of furnance

In the primary and secondary combustion chambers, burners are provided to keep the furnance temperature at the same level automatically. If the operating temperature is kept some higher level, there will be no problem of smoke, soot or odor.

This incinerator looks like batch furnance with fixed grate designed for quite ordinary refuse easy to burn. For incineration of animal carcasses rich in water content, the incinerator usually provides the caution to introduce high temperature gases into the lower part of grate.

2.5-4. Improvements to Scavenging Methods of Materials Recovery

(1) Improvements to scavenging

There are two major ways by which materials are recovered as explained previously; i.e. through manual picking and sorting by the scavengers, and recovery of materials from its sources by the large and more established recyclers.

In relation to the former, scavenging and materials sorting at the municipal dumpsite has posed many problems from viewpoints of health, safety, nuisance and efficient operation. However, to eliminate scavenging at the dumpsite would also eliminate a source of income for the scavengers. The experiences from the other municipal councils have found it difficult to eliminate scavenging on disposal sites because of this reasen.

However, it would be possible to eliminate scavenging if the economics standard would improve significantly and sanitary landfilling is practiced in Malaysia. But until such times, it would be beneficial to look at various ways improving the situation and regard scavenging as a way of reducing waste disposed of.

There is little that can be done now about scavenging itself. However, scavenging could be improved so as to minimize the health, safety,nuisance and slack in operation it has caused. To improve and control scavenging activities, the following considerations may be useful.

- Restrict the number and types of persons allowed to scavenge on municipal disposal sites.

- Restrict the areas where scavenging activities can be carried out within the municipal disposal site.

- Allocating special storage areas for the scavengers to gather their goods before sale to dealers to minimise traffic hinderance

on disposal site.

- Establishment of organizations to employ the present scavengers to recover valuables on an organized basis.

As far as possible, only adults should be allowed to undertake scavenging activities. No children should be allowed into the municipal disposal site, even more to carry out scavenging in activities. Reducing or controlling the number of scavengers on site would minimise the risk of accidents and enable the authorities to control their movement and activities. To enhance control in scavenger movement, the authorities may want to define the work faces and separate areas where scavenging are allowed. This would further reduce the risk of accidents and allow the other vehicles work more efficiently.

The present situation has that scavengers are mostly independent. Establishment of organizations to employ the present scavengers would encourage systematic and more hygenic way of recycling.

(2) Improvements for recycling development.

While the uncontrolled scavenging posed many negative implications in the solid waste management, materials recovery from source conducted by the more established recyclers are quite impressive. These recyclers have been targetting at the large sources and generation areas such as factories, mills and industrial zones. Due to sorting complications and quantity constrants in recovery from residential areas, these are left to smaller door-to-door collectors to trade.

The residential and commercial sector is another good source of recycleable waste if acollective source-separation is encouraged. This would further reduce down the quantity of waste disposed of at the municipal dumpsite Indirectly, this would discourage scavevging at the municipal dump site as there are less and less recyclable

materials to be found there. Therefore, educating the public and having their community cooperation in sorting out recyclable materials would be advantagous to the solid waste management.

To encourage recycling development, authorities may consider incentives or relaxing trade policies to the recyclers. Currently, sound development of recycling industries are greatly hindered by trade policy such as duties export of waste paper. Tax incentives for the recycling industries would help to develop it further.

The possibility of introducing a subsidy system to increase the public's willingness to assist recycling activities and to stabilize the market prices of recovered items should also be considered.

Basides these incentives, the authorities may also have the option of fielding their own mechanical sorting plant. Such a plant would further improve quanytity of materials recovered. This option however, would require significant emphasis on economic evaluation and finantial investment because the quantities of recyclable waste involved are relatively small in portion (normally between 5% to 10% of total solid waste according to Klang Valley Environmental Improvement Project (April 1987)) and may not substantiate the investment made for the plant.

Enlightenment of the public regarding the importance of resources recycling through the provision of education for school children and housewives, etc. and the furter promotion of recycling activities with the cooperation of the general public would help to intensify the development of future recycling activities.

2.6 Final Disposal

2.6.1 General Condition in Malaysia

At present all municipal solid wastes are disposed on land where open dumping and burning is a common phenomenon.

There are approximately 230 official municipal dumping sites in Peninsular Malaysia. In most of them, crude open dumping is practiced, creating a lot of environmental as well as social problems such as air pollution and scavengers.

In the practice of open dumping to those of controlled tipping, there is no engineering input in the design as well as management of these landfills. In open dumping, the waste are just dumped and then it is sprayed with chemicals so as to prevent breeding of vectors and rodents. In controlled tipping, material is used to cover the waste as much as possible. Most of the landfills are not fenced and hence creates hazards to the surrounding public and are very messy, fast becoming an eye-sore. In the case of open dumps the wind and stray animals litter the waste all over the dumpsite as well as outside the area.

This situation however, is being rectified by the Local Authorities. They have started planning for better landfills which will be designed and managed properly. Although sanitary landfilling is hardly practiced in the strictest manner, however, many Local Authorities are now attempting to at least cover the solid waste with suitable cover material and then spray it with chemicals to prevent breeding of vectors and rodents.

The remedical and improvement for better disposal sites have been advocated by the recent development in SWM policies prepared by Department of Environment.

The following recommended code of practice and a guideline have been prepared by Department of Environment, Ministry of Science,

Technology and Environment and by Technical Unit of Local Government Division, Ministry of Housing and Local Government.

- Recommended Code of Practice for the Disposal of Solid Waste on Land, by Department of Environment, Ministry of Science, Technology and Environment.

- A Guideline on the Storage, Collection, Transport and Disposal of Solid Waste in Malaysia, January 1984 by Technical Unit of Local Government Division, Ministry of Housing and Local Government.

Environmental Quality (Prescribed Activities of Environmental Impact Assesment) Order 1987 came into force on the 1st April 1988, and after that date, it is mandatory for all Local Authorities, to carry out an EIA of the municiapal solid waste landfill facility construction project.

2.6.2 Present Situation in Peneng State

(1) Final Disposal in MPPP

a. Present condition

Solid waste in MPPP is disposed of at a landfill near the Bakau Street where the sea reclamation is carried out.

Control tipping, in which cover material is used to cover the waste as much as possible, is adopted at the dump site. Dumping takes place right to the edge of the sea whereby the shoreline continuously progresses outward. Ther is no offshore barrier built to protect the dump site from the action of the sea. Landfilling at the tip site needs to be controlled. Studies by USM has shown the occurrence of leachate of trace metals from the dump site into the sea water around it.

Bakau Street disposal site is also situated adjacent to a densely

populated area and, infact, it is part of the city itself. It is extremely crucial that landfilling be properly carried out.

Landfilling has been the traditional method of disposing refuse. Formery the sites were located at Pantai Acheh for the waste generated in the west side of the island and at Jelutong Mole for the waste generated in the east side. The present and previous dump sites are shown in Fig.2.6-1. All of the areas are sited at the shorefront or low-lying areas along rivers.

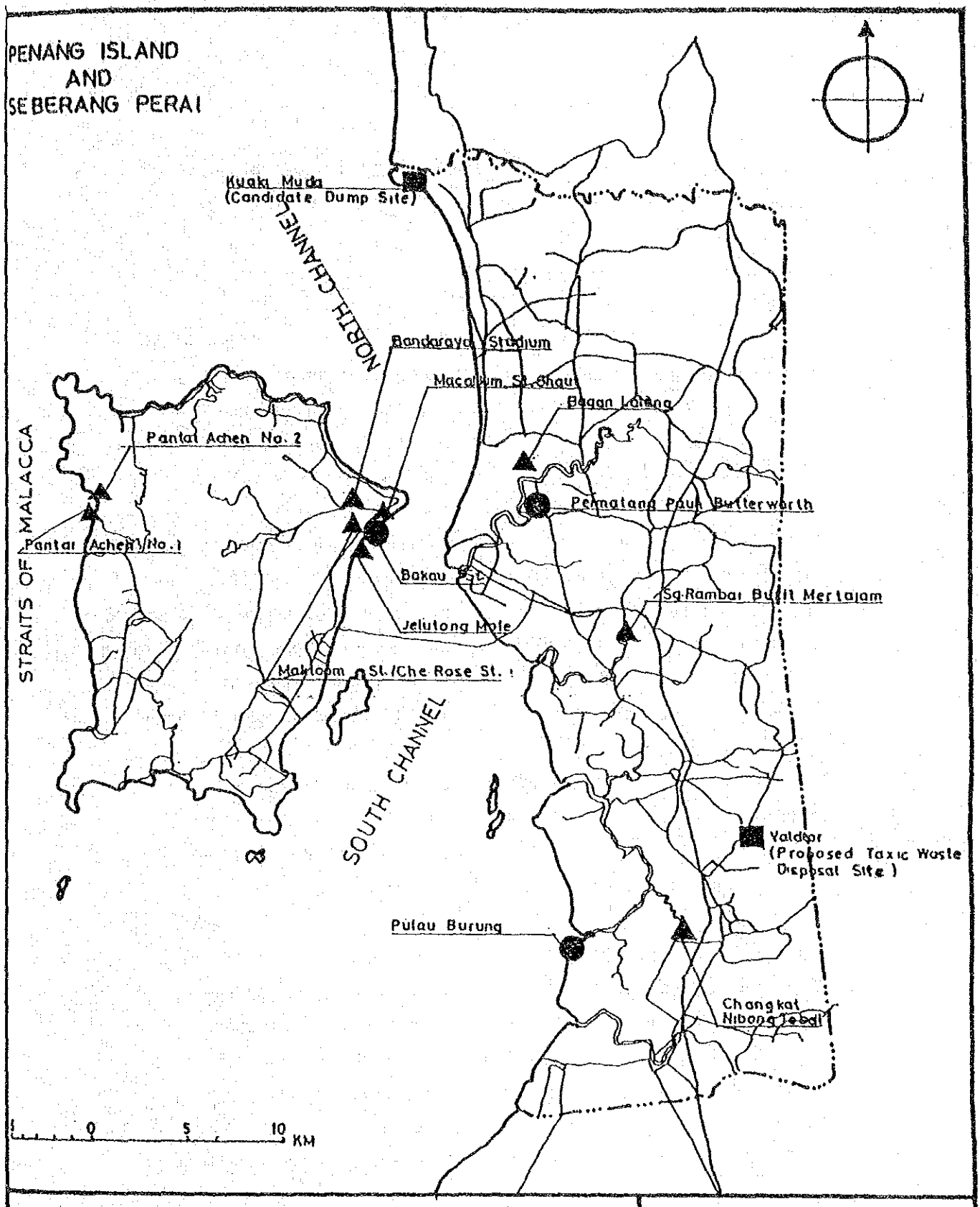
Land for final disposal of solid waste is increasingly difficult to find, not only around the urbanized areas but also in other areas throughout the island. When existing disposal site is filled up,development has caught up, making such sites no more suitable due to nearby habitation. As a result of this, landfills have to be sited further away or have to be operated in a strict sanitary manner.

b. Outline of disposal site

The present Bakau Street disposal site (BSDS) in March 1988 is outlined as follows;

i.	Name of site:	Bakau street disposal site
ii.	Year of operation:	April 1987
iii.	Location:	Approximately 3 km from Komtar (city centre)
iv.	Area available:	Approximately 10.4ha
v.	Remaining life:	Approximately one year (as from April 1988)
vi.	Amount of waste disposed:	414 ton/day (1987)
vii.	Disposal method:	Controlled tipping
viii.	Previous Land use:	Beach
ix.	Surrounding Land use:	Undecided
x.	Ultimate Land use:	Undecided
xi.	Available public utilities:	Telephone, electricity and water
xii.	Condition of approach road:	Good (all weather and

	sufficient width road)
xiii. Access road:	Good (paved with quarry waste)
xiv. Environmental issues:	Existence of animals and scavengers, sea contamination by leachate, etc.



LEGEND

- Present Dump Site
- Previous Dump Site
- Candidate (Proposed) Disposal Site

Disposal Sites In Penang State

Source: JICA Study Team

Location Of Disposal Sites

Fig. 2.6-1

c. Operations of disposal site

The operations of Bakau street disposal site in March 1988 can be summerized as follows.

i. Responsible organization:

	Task
Engineering Department:	- Site development planning, - Operational planning, - Operation, repair and maintenance of landfill equipment - Landfill operation - Environmental protection planning - Tipping
Health Department:	- Land acquisition for disposal site - Environmental protection planning - Weighbridge operation
Secretariat Department:	- Land acquisition for disposal site

A tipping fee of, M$60/month was charged to each individual dump site user.

ii. Organization and operation of disposal site.

- Engineering Department:	5 persons
Junior technician:	1 Persons
Landfill equipment operator (first shift):	2 persons
Landfill equipment operator (second shift):	2 persons
- Health Department:	3 persons
Overseer	1 person
Weigbridge operater	2 persons

iii. Operating hour

- first shift:	6:30 am - 2:30 pm
- second shift:	11:30 am - 7:30 pm

iv. Facilities

- Weighbridge:	1 unit (capacity, 25 ton)
- Control station:	1 unit of personnel computer

v. Equipment

- Bulldozer:	1 unit
- Bucket loader:	2 units
- Compactor:	1 unit (unserviceable)

vi. Cover materials (records of 1988)

- Red earth:	40,000m^3/year, 110m^3/day (for daily cover)
- Quarry waste:	6,500m^3year, 18m^3/day (for pavement of access road)

vii. Operation cost excluding administrative cost

	$/year
- Hiring of transport, fuel and lubricant, operators wages transportation of machinery, maintenance and repair of machinery	110,000
- Red earth	148,000
- Quarry waste	91,000
	349,000(1986)

- Insecticide

Insecticide is sprayed twice a week to control files and insects.

d. Future disposal site for MPPP

There was no future or proposed disposed site in MPPP in March 1988. The availability of suitable sites for solid waste disposal is limited. NIMBY (Not In My Back-Yard) syndrome against disposal site is spreading among citizens, which makes it more difficult for MPPP to acquire future disposal sites.

the life span of the existing landfill was expected to last till March 1989. It was therefore strongly suggested to plan ahead to select and to designate disposal sites (15 to 20 years ahead). Acquiring new landfill sites is an urgent matter in the solid waste management of MPPP.

(2) Final Disposal in MPSP

a. Present condition

In MPSP, all solid waste collected are to be disposed of at the Council's disposal sites. There are two disposal sites in MPSP, as following, (see Fig.2.6-1);

- Permatang Pauh Disposal Site for Northern & Central District
- Pulau Burung Disposal Site for Southern District

Both of these sites are not properly planned, designed, implemented or managed as sanitary landfills. Crude dumping is adopted at both disposal sites, which is not encouraged by the federal government and MPSP itself.

Although it is prohibited by the Environmental Requlations 1987, (clean Air), but the solid waste disposed of at both dump sites is burning spontaneously mainly because waste are not covered to prevent it. This creates a lot of problems to the surrounding environment and neighbouring inhabitants have been complaining to MPSP. It is necessary to ensure proper control of tipping, though it

requires large amounts of covering materials and financial burden in purchasing them.

Prior to the utilisation of the above-mentioned sites, the following disposal sites were used till 1981 (see Fig.2.6-1);

- Bagan Lallang Disposal Site for Northern District
- Sungai Rambai Disposal Site for Central District
- Changkat Nibong Tebal Disposal Site for Southern District

The upper two disposal sites were private owned lands. The Bagan Lallang disposal site has been covered with red earth and has been developed into a housing estate. Most of the disposal sites in MPSP are in low lying swampy areas and have created drainage problems.

Compared with MPPP, MPSP has much larger area. However, it is difficult to get suitable sites near urban areas due to limitations and high cost of land.

b. Outline of disposal sites

The present disposal sites in MPSP are outlined and summerized as follows. (Date was collected in March 1988)

Name of Site	Permatang Pauh disposal site (PPDS)	Pulau Burung disposal site (PBDS)
i. Service Areas	Northern & Central District	Southern District
ii. Year of operation	Since 1981	Since 1981
iii. Location	4 km from Butterworth	34km from Bukit Mertajam

	PPDS	PBDS
iv. Area available	7.1 ha	4.0 ha
v. Remaining life span	Not available (supposed to be less than one year)	Not available
vi. Amount of waste disposed	200 ton/day (using the study results, done from Feb.12 to 29 1988 by JICA Study Team)	not available
ii. Disposal method	Crude dumping	Crude dumping
viii. Previous land use	Low lying swamp area	Low lying swamp area
ix. Surrounding land use	River and agricultual land	Swamp
x. Ultimate Use	Sports complex	Undecided
xi. Available public utilities	Telephone, electricity	Nothing
xii. Condition of approach road	Good (all weather and sufficient width road)	Not good (part of access road is not paved for more than 1km)
xiii. Access road	Bad, during wet season	Bad, during wet season
xiv. Environmental issues	Smoke due to spontaneous burning, existance of animals and scavengers, river contamination by leachate, etc.	Same issues as Permatang Pauh disposal site

c. Operation of disposal sites

The operations of Permatang Pauh and Pulau Burung disposal sites in March 1988 are summarized as follows;

i. Responsibilities of organizations are as the following:

- Site development planning:	Health Department
- Land acquisition:	Health Department and Secretary Department
- Operation planning:	Health Department
- Environmental protection planning:	Health Department
- Operation, repair and Maintenance of landfill equipment:	Engineering Department
- Weighbridge operation:	Health Department
- Tipping charges:	Nil

ii. Organization and operation of disposal site

	Permatang Pauh disposal site	Pulau Burung disposal site
- Health Department: 11 persons		
Operator of landfill equipment:	1	1(irregular)
Overseer:	1	1
Operator of weighbride:	2	
Labouers	5	

	PPDS	PBDS
iii. Operating hours	7:00am to 6:00pm for both sites	
iv. Facilities		
- Weighbridge:	1 unit (capacity is 25 ton)	Nil
- Control station:	1 unit with a personnel computer	1 unit
v. Equipment		
- Bulldozer:	1 unit	Nil
- Bucket loader:	Nil	1 unit (Occasional use)
- Compactor	Nil	Nil
vi. Cover materials (1986 Records)		
- Red earth:	Nil	Nil
- Quarry waste:	Occasionally used for access road	Nil

vii. Operation cost, excluding administration cost.

Budget of final disposal site in 1987 was $200,000, but expenditure was $35,940 shown as follows;

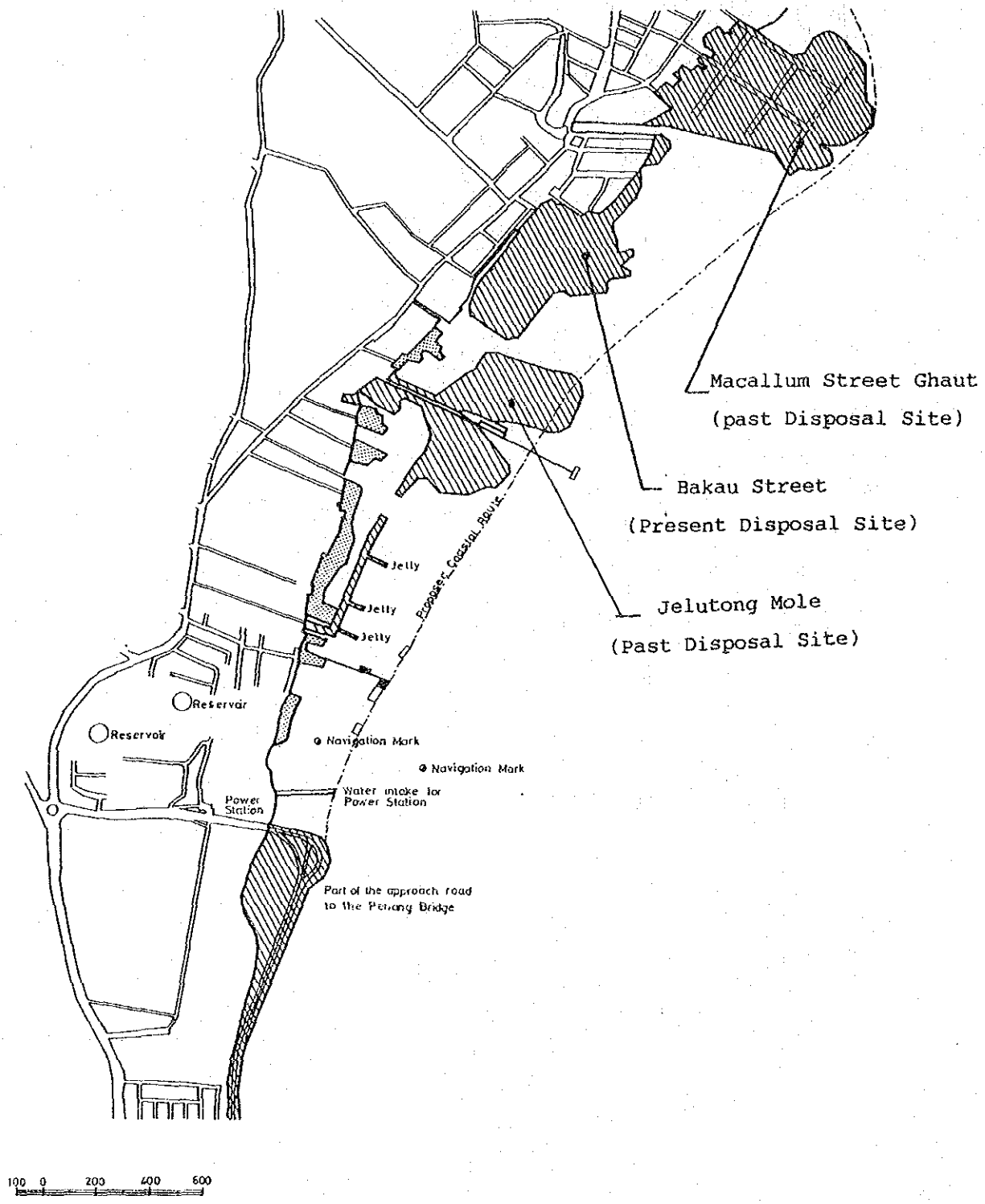
	$/year
Maintenance and repair of machinery	28,906.00
Fuel	1,814.00
Lubricant	220.00
Quarry Waste	5,000.00
Total	35,940.00 (1987)

d. Future disposal site

There was one proposed municipal waste disposal site and one proposed toxic waste disposal site in MPSP in March 1988. The availability of suitable sites for solid waste disposal is limited. NIMBY (NOT IN MY BACK-YARD) syndrome against disposal site is spreading among citizens, which makes it more difficult for MPSP to acquire future disposal sites.

The life span of the existing landfill sites was estimated to last for less than a year. It was strongly suggested to plan ahead, to select and to designate disposal sites (15 to 20 years ahead). Acquiring new landfill sites is an urgent matter in the solid waste management in MPSP.

A proposed site at Kuala Muda, 25km from Butterworth has been indentified and is located at the northern extreme of the municipality. It is located in a coastal marshland. About 40 acres (16 ha) of marshland could be utilished as disposal site. The site is planned to serve for the northern and central districts.



LEGEND

- Existing Squatter Areas (on sea)
- Reclaimed Land
- Caged Fish Farm

Final Disposal Sites in Jelutong Area

Source : JICA Study Team

Fig. 2.6-2

The Solid Waste Management Study For Pulau Pinang And Seberang Perai

2.6.3 Problem in Final Disposal

The present problems in March 1988 of the final disposal system in MPPP and MPSP are summarized as below:

(1) MPPP

a. Insufficiency in Final Disposal Site Plan

Since its foundation in 1974, MPPP has carried out the final disposal through reclaiming the coast in Jelutong. As shown in Fig. 2.6-2, the reclamation has been makeshift without any proper reclamation plan. In the future, the reclamation for final disposal should be designed in close coordination with Penang River improvement plan and coastal road construction plan.

The use of the present disposal site for reclamation after March 1989 is not authorized by the State Government. After that, no disposal site has been fixed. Any long-term plan has not been drawn up for final disposal site.

b. Insufficient Environmental Protection Measures

In the present disposal site, solid waste is coverd with earth every day. The on-site road is paved with gravel (quarry waste) for easy access. Except for this, there are not any particular measures for environmental protection. Adequate environmental protection measures are urgently required to prevent floating items and leachate from being washed away into the sea, and to avoid complaints from residents about offensive odor and to ward off crow gathering.

Recently however, MPPP has commenced construction of an earth bund to contain floating waste.

c. Organization

The actual final disposal operations in managed by Health Department and Engineering Department. In acquistion of sites, Secretariat Department coordinate with other authorities concerned. At present, there is no hinderence in collaboration between departments and sections concerned. In coming years however, it will be more difficult to manage the final disposal system smoothly because of the difficulty in acquisition of sites and neighborhood consensus. It may be therefore necessary to unify organizations concerned. At least, it is necessary to define the responsibilities of each organization.

d. Disposal Fee

The actual disposal fee was a uniform rate of $60 per month for each applicant for the use of the dumpsite. (The fee was not imposed on the disposal of solid waste collected by MPPP's own operation.) This rate applies to both individual persons and companies for an unlimited amount of waste for disposal. Thus, when a company obtains the permission, it can dispose of an unrestricted amount of refuse using registered vehicle. This uniform rate is advantageous to companies disposing of a large quantity, while it is a disadvantage to those disposing of in small quantity. Since $60 per month is not a small burden for the latter group, it seems that some of them are doing illegal dumping to save money.

(2) MPSP

a. Lack of a Section Responsible for Final Disposal

Although Health Department, in principle, is responsible for planning, management and operation of disposal sites, there is no section or personnel responsible for such work as well as site acquisition. In fact, there is no record of incoming vehicle at Pulau Buron disposal site since its opening in 1981.

b. Lack of Environmental Protection measures

In the existing disposal sites, no environmental protection measures are provided. There is dispersion of solid waste, river contamination by leachate and fire due to spontaneous ignition at many places in the disposal sites. The environmental pollution in and around Permatang Pauh disposal site is sometimes pointed out in the newspapers.

c. Acquistion of Disposal Site

There is no vacant place in Permatang Pauh disposal site where 95% or more solid waste produced in MPSP is disposed of. At present, solid waste is piled up at the site. And, waste is being reduced by open burning. To find new disposal sites is a very urgent matter to be solved.

d. Strict Enforcement for Prohibition of Illegal Dumping

MPSP has vast municipal area, in which urban areas, the main generation sources of solid waste are scattered. No disposal fee is collected for disposal of solid waste. This is to encourage people to bring waste to the disposal site. Illegal dumping is seen in many places. In order to reduce illegal dumping, it is necessary to enforce anti-litter laws strictly. In addition, the education of local residents and improved waste collection service are required.

2.6.4 Illegal Dumping

Waste being dumped illegally often causes much problems to both MPPP and MPSP. It creates not only an unsanitary environment, but also subjects to unaccounted costs in collection, haulage and disposal in both councils.

The section below looks into the common places and types of illegally dumped waste in Penang state, as well as its causes and possible solution.

(1) Locality of Illegally Dumped Waste

Illegal dumping occurs practically anywhere. However, large discharge of waste at places where it is not accounted for is an on-going concern to everybody. Amongst the many places, most common sites of illegal dumping is at or near the following places.

- Squatter settlements
- New villages, coastal villages
- River banks, secluded open space, unattended vacant land, etc.
- Near industrial and factory areas.

(2) Types of Waste Illegally Dumped

The types of waste illegally dumped vary according to the area where it is found and are generalized below.

Type of area	Type of waste illegally dumped
Squatter, New and Coastal Villages.	- Domestic Waste, Fishery Waste.
Factory, Industrial and other areas	- Multiple types but most frequently found are construction debris, bulky waste and garden waste.

The types of illegally dumped solid waste are listed below in the order of their respective volumes. In terms of weight, the positions of the first and second items are reversed.

i) garden waste

ii) construction debris

iii) domestic waste

iv) bulky items

v) industrial waste

vi) others

(3) Cause of Illegal Dumping

Illegal dumping are caused by several known reasons as listed below.

- Irresponsible attitude, selfishness and habits of some individuals of the public in dumping of waste.

- Inadequate enforcement against illegal dumping.

- Municipal disposal site prohibits disposal of such waste on its site.

- The disposal site is located too far away and there are no reliable collection services and inadequate disposal facilities.

Little public sense of consciousness towards sanitation is an important factor that causes much domestic waste being illegally dumped. Selfishness and personal conveniences result in waste being dumped everywhere such as on roads, into drains, irrigation canals, rivers, beaches, etc.

Although the Councils may have their by-laws and enforcement division, it still needs to consider enforcement more seriously. The existing number of enforcement officers are over-lapped with duties and out-numbered to effectively eliminate illegal dumping. Besides this, offenders compounded or fined for littering and dumping illegally should not be excused or pardoned. As it is,

offenders may be excused or their fines reduced by interested parties. This act may only sustain illegal dumping and it may be long before it being eliminated.

The municipal disposal site restricts the types of waste into its permises. Cartain types of waste such as toxic and hazardous waste are not allowed to the site. Thus, it may be disposed of illegally elsewhere away from the watchful eyes of the authorities and public.

The last cause is attributable to the large distance travelling that one has to undergo to dispose of its waste. For occassional user, the disposal fee at the BSDS in MPPP imposed on the user is a burden apart from the incurred cost of collection and haulage. This could have been the main factor why construction debris are mostly illegally dumped.

Illegal dumping has caused the Councils unaccounted manpower and money. The survey conducted by the Study Team on illegal dumping showed that between 10% to 30% of the manhours are lost to collect, haul and dispose of waste that are dumped illegally.

(4) Possible Solution

Illegal dumping, depending on the case, is more of a cureable negative social habits (being an act of selfishness and care-less attitude) and it exists in unique problem areas where limitations pravail or beyond the jurisdicted area of the Council.

Thus, the suggestions below would be more effective if it had great public participation and cooperation.

- Increasing public awareness and importance towards having clean and beautiful environment. Together with this, the ABC plan should immediately be recognized and implemented as it contains the necessary ingredients for a better and sound SWM.

- The Councils should seriously consider solving their present shortage in the enforcement unit. Although direct expansion in personnel is often difficult due to governing polices and financial constraints, the option of liberating the compounding authority to PHI and PHA should clearly be endorsed and supported by the Council. A proper and practical enforcement programe would enhance the contribution towards a clean, efficient and dedicated public cleansing service department.

  This would also require various inter-action and cooperation from other related departments to ensure extermination of illegal dumping.

- Extending reliable collection and haulage services to the special and underserviced areas such as squatter settlements, new and coastal villages within and beyond local boundaries. It would suffice to provide station collection or provide communal bins in these areas for starters. There should also be provisions for ample collection stations and communal bins, strategically located to cater for domestic waste generated. However, further research has to be done to smoothly implement and diffuse a commendable system that is financially suitable.

2.6.5 Privatization of Final Disposal

(1) General Condition in Malaysia

The "Guideline on the Privatization of Solid Waste Collection Service in Malaysia" was introduced in March 1987 by MHLG. This has been a marked recognition in the need of improvement towards a better privatization policy in the solid waste management. In the past, objectives of privatization laid down by EPU SWM projects have not been successfully achieved due to poor designs and was hastily carried out by the Local Authorities. And although the services are privatized, the overall responsibility as specified under the existing legislation still lies with the Local Authorities.

Disposal is the final functional element in the solid waste management system and is the ultimate fate of all solid waste. In almost all of the Local Authorities is Malaysia, crude open dumping is practiced, except in a few where the controlled tipping is practiced.

Privatization of final disposal is commonly carried out based on "contracting-out" parts of the operations or development of the disposal site. The Local Authorities are still the overall manager and operator of the disposal sites in Malaysia. The exact cost and benefits in privatization of final disposal is still not known because of the reason above. But the study by ENSEARCH has shown that on a "like for like" basis, private sector offers a cheaper cost in collection services compared to those conducted by the Local Authorities.

(2) Present Situation in MPPP

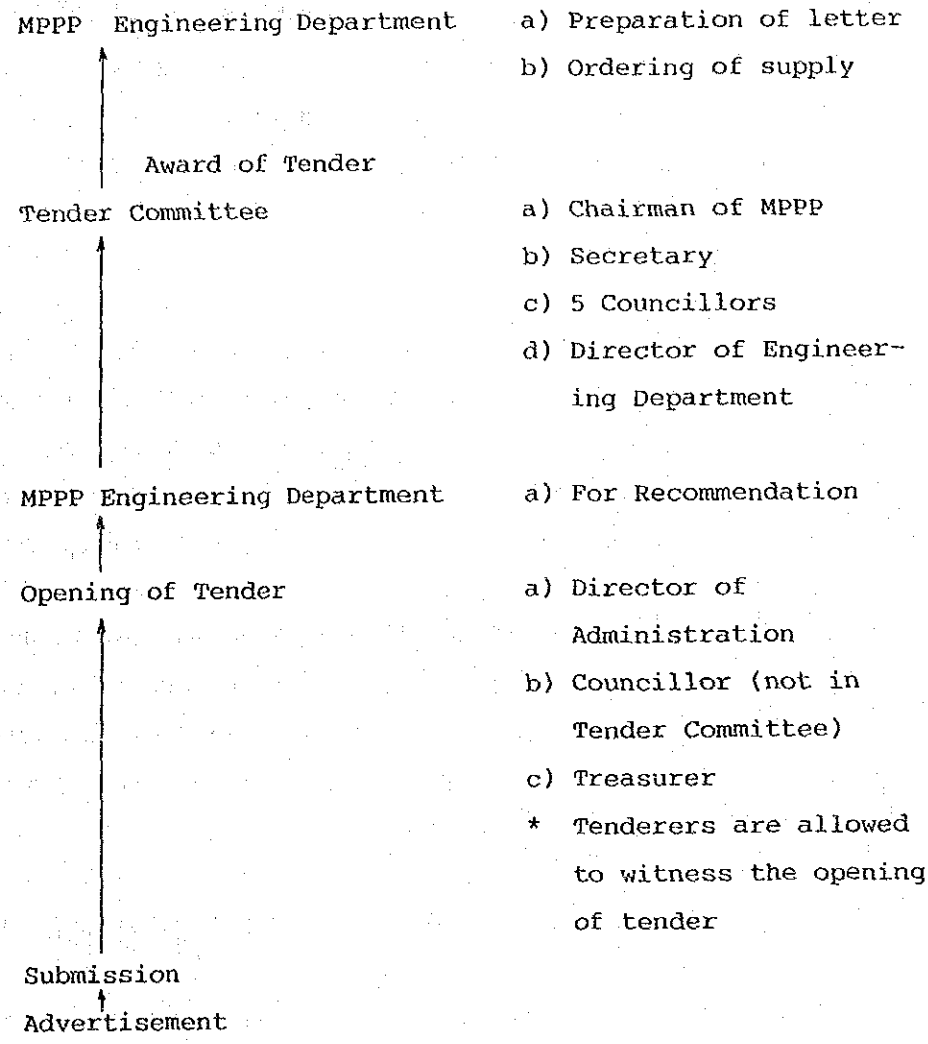
a. Extend of privatization

The Bakau Street disposal site is one of many disposal sites where controlled tipping is practiced. At present, the MPPP is managing and operating all of the disposal operations except for in the supply of covering material (red earth) and gravel (quarry waste), which are privatized by the Council. The Engineering Department possesses the necessary equipment for landfill use at the BSDS and any repairs and maintenance of the equipment can be done at the Engineering Workshop. However, should and when the need arises for extra usage of equipment at the BSDS, the Engineering Workshop is empowered to hire the equipment required.

b. Contracting out procedure

The contracting out procedure involved in selecting the contractor is shown below.

Contracting-out procedure



Note : MPPP Engineering Department has its own powers to invite quotation which are less than $10,000.00. Tenders which are beyond $10,000 shall have to be approved by the Secretatiat.

The availability of contract bids are to those contractors satisfying the conditions below.

Condition : 1) Suppliers who are officially registered with the Treasury of Malaysia.

3) Suppliers who are still eligible to bid for tenders.
4) Suppliers who are registered as a Bumiputra Company shall have to furnish the business status certificate during submission of tender.

c. Result of contracting-out

Owing to the small scope of privatization given out by MPPP; i.e. only for supply of covering soil and gravel for the BSDS, it is quite difficult to clearly judge to what extend has it affected the overall management of the site. One benefit howerver, is that the Council has manage to activate favourable competition among the bidders and obtain the best values for each volume of covering soil; i.e. the rates obtained are 10% to 20% lower than the JKR's rate. The contract had not sacrified sanitation nor had it caused "cut-throat" competition. This is so because the covering soil is obtained from a development project nearby and the contractor has been in a good position to supply the earth at a cheap price.

(3) Possible components of privatization in Phase I

Privatization of the Phase I project may be done in the construction of the third level sanitary landfill development and during the operation of the site.

Privatization in the development and construction of the PADS is recommended since it involves large manpower and machinaries. If MPPP were to develop it themselves, it would only be uneconomical. It is also conventional that such large projects be contracted out to allow the private sector participation in the nation building, particularly in the solid waste industry.

Operation of the new sanitary landfill offers a new solid waste management scope to the Local Authorities. Based on this understanding that it is recommended that the operations be understood

and managed by the authorities themselves first. Furthermore, operations of the new disposal system would be able to utilize the existing equipments and machinaries that the Engineering Department have. Otherwise, the equipment may be left idle if the operations are privatized. In addition to this, it would be almost difficult to find a contractor that would fully understand and also are capable of operating this site without sacrificing sanitary specifications.

However, the Local Authorities may wish to consider privatizing the similar supply of covering material if acquisition of Bukit Kecil is not possible and uneconomical. The extension of back-up equipment by hiring is another possible option of privatization.

Upon completion of the Phase I operation and maintenance, and after having the required experience, the Local Authority may then wish to consider privatizing more scope of works in a similar nature project. This will ensure that the private sector is also given the chance to learn the trade with constant attention and consultation of the Local Authority. With this transfer of know-how, it is hoped that one day in future, with enough assistance from the authorities, solid waste sanitary landfill operation and maintenance could be successfully be executed by the private sector.

(4) Present Situation in MPSP

a. Extend of privatization

The open crude dumping in Pulau Burong disposal site (PBDS) and preliminary controlled tipping in Permatang Pauh disposal sites offer no form of privatization except when the bulldozer or excavator break down. Whenever this occurs, the equipment would be hired to continue the operations at the sites the unofficial quotes on hiring of these equipments are $44/hr for the bulldozer and $48/hr for the excavator. The quotations are inclusive of operator, fuel, maintenance, repair and others in respect to operation of equipment. The frequent breakdwon of the 10 years old dozer equipment has caused MPSP an extra $30,000 in hiring another bulldozer and $25,000 for hiring the excavator. At present, MPSP's workshop hasn't the ability to repair their own bulldozer. Beginning from 1989, MPSP shall be privatizing the operation of the bulldozers and excavator fully.

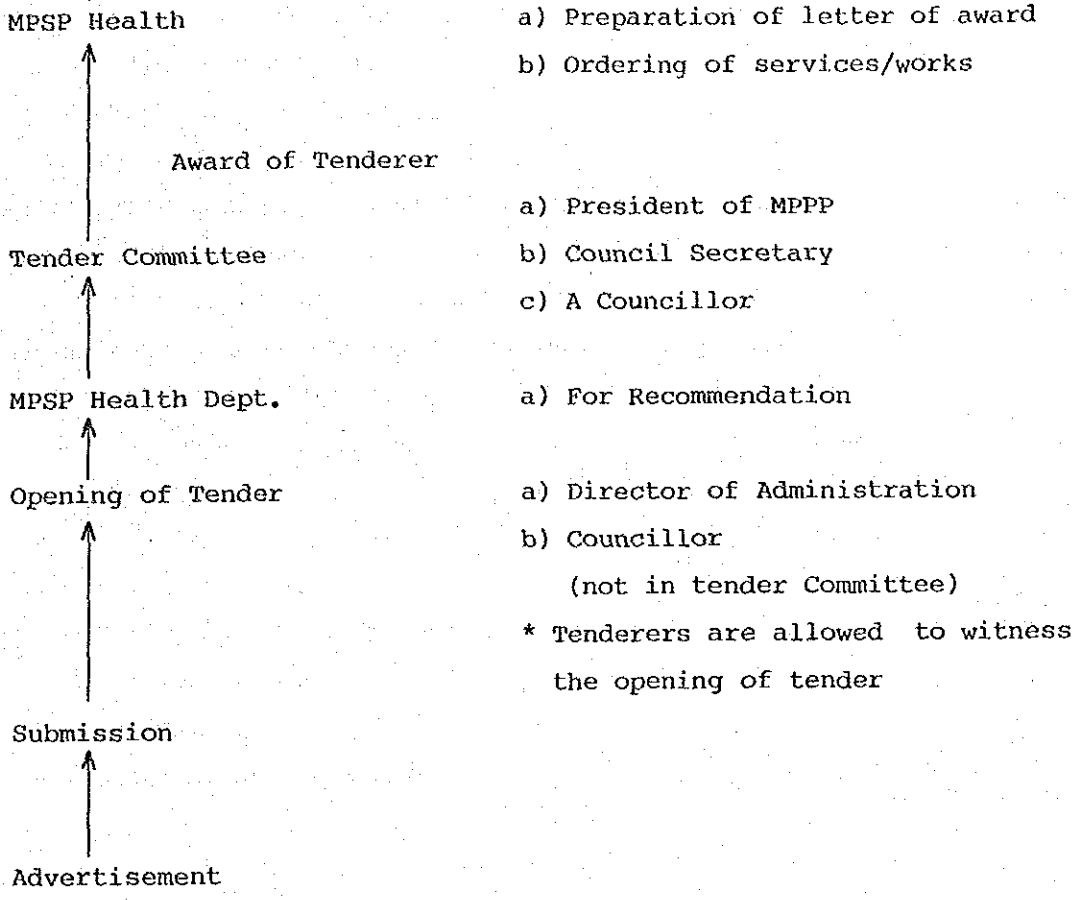
In addition to the above, quarry waste is also purchased from JKR's quarry at the price of $13-20/ton. It had cost MPSP $20,000 in 1988.

The other aspects which are possibly privatized by the Council in future are site improvement and development projects such as approach road construction and the supply of the covering materials.

b. Contracting out Procedure

Upon the upcoming necessity of particular works or services that the Health Department consider relevant to their needs and objectives, proposals are prepared and submitted to the councillors for approval. After approval is given, Health Department would publicize the works. The contracting out procedure is as shown below.

Contracting-out procedure



c. Result of Privatization

In the case of MPSP, the hired bulldozer and excavator has also often got to go for repairs due to its frequent breakdown. The hiring of equipments from this particular company has not helped very much in ensuring smooth and continuous operation of the disposal site. But since the hiring of this equipment is a temporary measure to overcome the immediate problems of MPSP's equipment failure, no justification can be made on it.

There are however some important experiences gained from the above practice. MPSP in its future privatization programme for its landfill

equipment should also consider clausing in the agreement for an immediate replacement of the equipment if it couldn't be repaired within a stipulated period of time. This move will ensure that smooth and continuous opearation is accounted for and that sanitary condition is always maintained at the disposal site.

There have not been much problems with the coordination in works and cooperation between the council's vehicles and the private equipment operations. This is an important outcome because it determines and reflects on the abilities of the Health Department in managing the disposal operations between the two parties. Coordination in works are derived from well planned operations.

(5) Possible Components of Privatization in Phase I

There are several ways which privatization could be introduced into Phase I project.

i. Privatizing the construction and development of facilities in Phase I.

ii. Partical privatization in operations of new disposal site.

a. Privatization of construction and development of disposal site facilities.

The Phase I project would involve construction of the major site development such as;

- Site clearing
- Construction of enclosing structure, drainage system and access.
- Construction of environmental protection facilitie such as buffer zone, leachate collection and gas removal facilities.
- Construction of buildings and its accessories.

Thus, it can be seen that the nature of building and construction works involved is quit large. Owing to the present status of MPSP

which has not the capacity in terms of machinaries, equipment and manpower to undertake such jobs economically, the construction and development of Phase I is best privatized.

In addition, privatization of the Phase I project would encourage more private sector involvement and participation in the building of better SWM and concurrently fulfill the objectives of privatization as outlined by EPU.

b. Partial privatization in operation of new disposal site.

Overall privatization in operation of the new disposal site (Phase I project) is not possible mainly due to the reasons below.

- Complications and difficulties in management between the contractor and local authorities because of the constraints in the existing legislation.
- There is no single private company who is specialized or has the experience in managing and operating a sanitary landfill. This reason would also apply to the aythorities which currently operate their disposal sites.

Thus,upbringing of the private sector towards better understanding and participation should be extended further to this new form of disposal and should be encouraged. However, it is crucial that the authorities know and have the first hand experience in matters pertaining to this disposal form prior to any form of privatization it may programme in future.

Therefore, contracting out in the Phase I landfill activities may be restricted to the following;-

- supply of cover and paving materials (when and if the authorities cannot acquire their own source of these materials).
- hiring or contracting out the operation of landfill equipment during long periods of mechanical failure of the authority's

landfill equipments. This is to insure against any interuptions in the smooth going of sanitary landfilling activities.

Upon gaining the necessary exposure and experience from operations, the authorities may consider privatizing other forms of works that may be suitable and proper for the private sector.

With the experiences gained from Phase i operations, the local authorities may now become the advisors or consultants to any similar works carried out by the private sector in Phase II and III.

The assumptions used in the suggestions above are as follows:-

i. By 1991, the Local Authorities would have acquired the necessary landfill equipment, personnel and contingency budget allocations approved.

   The landfill equipment required are bulldozers and excavators. Personnel required includes management and maintenance personnel as described in the S/R Volume III. The contingency budget allocations are necessary in order to overcome any short comings of the authorities in experiencing in this new from of disposal system.

2.7 Organization and Management

2.7.1 Aspects to be Examined and Problems Identified

The purpose of the study of the organization and institution is to improve the organizational efficiency. In the case of non-profit service oriented organizations, overall organizational efficiency may be evaluated in terms of the service output level relative to its quality, cost and number of personnel involved in the service. An efficient organization is the one which provides greater output of higher quality with smaller cost and personnel number.

The improvement of the organization efficiency requires changes in various organizational and institutional aspects. The following table shows organizational and institutional aspects to be examined and some problems identified.

Table 2.7-1 Organizational and Institutional Aspects to be Examined and Some Problems Identified in MPPP & MPSP

	ORGANIZATIONAL & INSTITUTIONAL ASPECTS TO BE EXAMINED	PROBLEMS IDENTIFIED
1.	Size of organization	There exists large number of personnel relative to service volume.
2.	Qualification of personnel (Number of qualified personnel)	Some aspects of SWM need to be strengthened.
3.	Job assignment	Multiple responsibilities of Public Health Inspectors (PHIs)
4.	Personnel hierarchical structure	Role of some positions (Eg. Senior overseers) are not clear.
5.	Inter-organizational responsibility assignment system	Separation of SWM function from other functions of Health Dept. deserves serious consideration.
6.	Contracting out	"Contracting out" may be appropriately discussed from cost-effectiveness point of view.
7.	Composition of personnel (Eg. ratio of supervisors to laborers, etc.)	Problems, if any, may be identified through the study of operational efficiency of waste collection, etc.
8.	Work incentive (Promotion, rewards, punishment, etc.)	To be studied later.
9.	Enforecement of laws related to SWM	The enforcement is weak.

2.7.2 Problems Identified

This section discusses the problems one by one.

(1) Size of Organization

Both MPPP and MPSP may have large number of personnel involved in the cleansing service relative to the waste amount collected. This point is demonstrated in the following table which compares MPPP and MPSP to Municipal Council of Petaling Jaya (MPPJ) and Tokyo Metropolitan Cleansing Bureau.

Table 2.7-2 Comparison of Numbers of Personnel Involved per Ton of Waste Collected in 1987

	MPPP	MPSP	MPPJ	Tokyo
a. Personnel involved in SWM (person)	1,553	1,000	494	11,737*
b. Personnel involved in Waste collection (person)	182	350	?	8,200
c. Estimated amount of waste collected (ton/day)	360	191	250	14,480
d. Estimated amount of waste collected by own operation (ton/day)	47	145	200	10,000
Ratio of b to d (b/d)	3.9	2.4	?	0.8
Ratio of a to d (a/d) (persons/ton)	33.0	6.9	2.5	1.2

* The personnel number 11,737 does not include those for street sweeping and drain cleansing.

Obviously, the ratio of b to d (number of personnel involved in the collection of a ton of waste) should be obtained for the comparison purpose.

The comparison of the ratios of a to d on the other hand may give an inconclusive result. Such differences existing between the municipalities, however, may be suggestive of relative efficiency of the organizations. (Compare 33.0 in MPPP and 6.9 in MPSP to 2.5 in MPPJ and 1.2 in Tokyo)

Reasons why the value of MPPP is high (30.6-82.5) include 1) great portion of waste collection service -- 96% in summer 1987 and 87% at the end of 1987 -- has been contracted out, 2) majority of MPPP laborers are involved in street sweeping and drain cleansing. Similar comparison should be made to check relative efficiency of drain cleansing and street sweeping.

(2) Qualification of Personnel

In both MPPP and MPSP the following aspects of SWM need to be strengthened.

- Disposal site planning
- Public relations for strengthening residents' cooperation and promoting recycling useful materials
- Cost analysis and control
- Personnel training in SWM
- Research and development
- Industrial waste management

The training of personnel who will be capable of handling the above aspects is very important. The nature of the above aspects, however, are different from that of public health and medicine in which PHIs and managers of Health Dept. are trained. In view of this and increased complication of SWM as well as rising demand for the cleansing service, the organization and operational efficiency will be improved by the separation of SWM function from the remaining functions of Health Departments.

(3) Multiple Responsibilities of Public Health Inspectors (PHIs)

A PHI, at present, is responsible for several different types of jobs such as control of food handlers and traders, licensing, infectious disease control and supervision of cleansing services, etc. There are almost no personnel of PHI qualification level (B rank or diploma holder) who are specialized in SWM. This situation has lead to the relatively weak capacity in the SWM planning, problem solving and possibly daily operation control.

Although the cleansing services contribute much to the improvement of living environment and public health in which PHIs are trained, the daily operation of the cleansing services requires know-how and experience different from those related to public health matters. It would be advisable to have some PHIs or personnel of B rank who will be specialized in SWM in order to strengthen the organization's capacity in SWM.

(4) Enforcement of Laws Related to SWM

The law enforcement together with public education are important means to enhance the residents' cooperation, which would much contribute to the reduction of SWM cost.

The law enforcement, however, is not strong in both MPPP and MPSP. Enforcement officers issue tickets to persons who violate the cleaning by-laws. (Eg. Illegal dumping and littering waste on the streets, etc.) However, it often happens that the charge brought on the violators is either repealed or reduced substantially. This situation makes the enforcement officers feel powerless. Eventually, they tend to be lenient to violators, and the deterrent power of the laws are made very weak. An investigation should be made, in the future, as to why the charge are often repealed or reduced.

A particular problem is that the use of specified waste containers are not generalized in some area. The use of such containers should be thoroughly enforced, then, the collection efficiency will be further improved.

2.8 Legislation and Enforcement

2.8.1 National Policy and Background

(1) Background

Most of the local councils in Malaysia spend as much as 20% - 80% of their total budget for public cleaning services. Despite this large expenditure, solid waste management in these areas has not yet reached a satisfactory standard in both the qualitative and quantitative aspects. Environmental pollution and floods are the main social problems, caused by uncollected waste, illegally dumped into watercourses.

As part of the overall strategy to solve these problems and other urban engineering problems, the Local Government formed the Technical Unit in 1980. Among other duties, the Technical Unit have the responsibility to provide overall planning and technical advisory services to all local authorities in Peninsular Malaysia on matters related to solid waste management. In view of this, the Technical Unit has recently initiated the formulation of the National Solid Waste Management Action Plan which is popularly called the ABC (Action Plan for a Beautiful and Clean Malaysia).

(2) Outline of National Policy

The Technical Unit of the Local Government Division is currently preparing the national policy in view of the background described above and, compiled in November, 1987 in Malaysian Municipal Solid Waste Management Sector Profile which constitutes a part of ABC.

The following 8 national policies to guide local authorities are given in the Profile and their systematic implementation is suggested.

a. Creation of model institutions with the help of motivated Local Authorities and external technical cooperation;

- Formulation and implementation of master plans
- Installation and use of weighbridge
- Introduction of Solid Waste Management Information System (SWMIS)
- Improved equipment management system

- Improved privatization (model contract and supervision)
- Construction and operation of authentic sanitary landfills.

b. Creation of national financing (grant or soft loan) system to promote the formulation of master plans and the installation and use of strategic but not expensive facilities (ex. weighbridges) coupled with the diffusion of standardized SWMIS know-hows;

c. Creation of a permanent training programme which will diffuse the experience and know-hows of the model institutions to other Local Authorities;

d. Introduction of a set of SWM-Macro-Indicators (SWMMI), which will allow the objective of monitoring and evaluation of the performance of public cleansing services. SWMMI will make it possible to compare the performances of an institution at different times as well as those of different institutions. SWMMI shall be introduced together with SWMIS;

e. Promotion of multimunicipal approaches for the final disposal in continuously urbanized metropolitan areas;

f. Promotion of intersectoral approaches such as:

- New housing estates development with due consideration on their solid waste management (coordination with town planning sector)
- Acquisition of future landfill sites in a planned manner (coordination with town planning sector)
- Development of public awareness about cleanliness (coordination with education sector as well as tourist industry promotion agencies such as TDC)
- Development of standardized locally manufactured equipments which are adapted to local conditions (coordination with equipment manufacturing sector)

g. Promotion of formulation and implementation of master plans in all municipal councils;

h. Persuasion of Decision-Makers through the use of good quality auto-slide programme and brochures. Using the opportunities, while meetings with KPSU/PSU/KT, meetings of JKPPP and NCLG.

As existing laws and regulations should be fully utilized for the implementation of these policies, those with strong relevance to solid waste management are listed in 4.3.9.

(3) Strategic Program for the Implementation

12 programs are suggested for the nationwide implementation of ABC.

With the cooperation of EPU, Programe 1 of Master Plan for All Municipalities is currently in progress by the Technical Unit. They intend to complete Program 1 by 1995.

This present survey is regarded as the first step of Program 1, and expected to serve as a model plan for those plans to be prepared by municipalities in subsequent steps.

The following sector programmes are proposed as the strategic programmes to improve municipal solid waste management in a systematic and cost-effective manner:

Programme 1. Institution building

Programme 2. inter-agency and inter-ministerial coodination

Programme 3. Masterplans for all Municipal Councils

Programme 4. Municipal solid waste management improvement in District Council.

Programme 5. Productivity improvement in refuse collection coupled with the use of weighbridges

Programme 6. Sanitary landfill for all Municipal Councils

Programme 7. Establishment of permanent training system of Solid Waste Management(SWM) personnel

Programme 8. Strengthening of SWM inforcement and education

Programme 9. Improvement of equipment management

Programme 10. Careful and successful privatization of SWM services

Programme 11. Development of SWMIS and the monitoring of ABC performance

Programme 12. Promotion of applied researches

2.8.2 Laws and Regulations Related to Solid Waste Management

(1) General

Local Government Division of Ministry of Housing and Local Government is a principal federal organization that is responsible for strengthening the local authorities' capacity in the field of solid waste management. This responsibility until 1983, had been assumed by Department of Environment, Ministry of Science, Technology and Environment.

The following is a list of acts, by-laws, guidelines and code related to solid waste.

- Act 171 or Local Government Act, 1976
- Public Cleansing and Safety By-Laws, 1980 (MPPP)
- Anti-Litter By-Laws, 1983
- Refuse Collection, Removal & Disposal By-Laws, 1983
- Street, Drainage & Building Act, 1974
- Uniform Building By-Laws 1984
- Guideline on the Storage, Collection, Transport and Disposal of Solid Waste in Malaysia
- Guideline on the Privatization of Solid Waste Collection Service in Malaysia, 1987
- Recommended Code of Practice for Disposal of Solid Waste on Land

Public Cleansing and Safety By-Laws, 1980 has been prepared by MPPP, while Recommended Code of Practice for Disposal of Solid Waste on Land has been prepared by Department of Environment, Ministry of Science, Technology and Environment. The rest have been prepared by Ministry of Housing and Local Government (MHLG).

The above listed acts, by-laws, guidelines will be summarized in the subsequent sections.

Town and Country Planning Act, 1976, and Earthworks By-Law, 1975 and Land Acquisition Act, 1960 may be indirectly related to solid waste management in the sense that these acts and by-laws may be used to restrict land use which might affects waste disposal site selection.

Department of Environment, Ministry of Science, Technology and Environment are responsible for preparing regulations related to environmental control. The departments have prepared the following acts and order:-

- Environment Quality Act, 1974
- Environment Quality Amendment Act, 1985
- Environment Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 1987

(2) Act 171

It is Act 171 or Local Government Act, 1976 that gives local authorities the power to carry out solid waste management. Part IX Food, Markets, Sanitation and Nuisances Section 72 stipulates as follows:

A local authority shall have power to do all or any of the following things namely -

(a) to establish, maintain and carry out such sanitary services for the removal and destruction of, or otherwise dealing with, night-soil, slops, rubbish, litter, dead animals and all kinds of refuse and effluent;

In Malaysia there is no comprehensive federal law for solid waste management that must be followed by all the local authorities. There are, however, two by-laws related to solid waste. These by-laws were prepared under Act 171 by Ministry of Housing and Local Government (MHLG). These two By-laws are:

- Anti-litter By-Laws, 1983
- Refuse Collection, Removal & Disposal By-Laws, 1983

It is important to note that it is up to each local authority whether or not they follow such by-laws. As of 1984 only 37 local authorities had adopted those by-laws out of 90 local authorities in Peninsular Malaysia, which are under the jurisdiction of MHLG.

MPPP has not followed those by-laws. Instead, it has its own by-laws related to waste. It is called "Public Cleansing & Safety By-law, 1980".

A local authority's power of making and amending its own by-laws is given under Act 171 Part Iv Section 102. Section 103 of the same Act stipulates that "Every by-law shall not have effect until it is confirmed by the State Authority and published in the Gazette".

Section 36 of Act 171 also gives a local authority the power to enter into contracts for the discharge of any of its functions. Section 36 reads as follows:

36(1) A local authority may enter into contracts necessary for the discharge of any of its functions provided that such contracts do not involve any expenditure in that year in excess of the sums provided in the approved annual estimates for the discharge of such functions unless such expenditure in that year is authorized under Section 56.
(Note: Section 56 prescribes supplementary estimates.)

MHLG intends to revise Local Government Act so that the Act may include some clauses on privatization of solid waste management.

(3) Public Cleansing and Safety By-Laws, 1980

Public Cleansing and Safety By-Law, 1980 have been made by MPPP in exercise of the power conferred by Sections 73 and 102 of Act 171. These by-laws have repealed the following two by-laws:

- The Penang (Municipal) Conservancy and Improvement of the Town By-Laws, 1955
- The Conservancy By-Laws, 1941

The major points related to solid waste may be summarized as follows:

i. No person shall throw or leave any kinds of waste or materials on any street or place where public have access.

ii. The owner or occupier of every building shall provide suitable refuse containers with tight fitting lids of a specification and type approved by the Health Officer and which shall be maintained in good condition by the occupier.

iii. All refuse from the building shall be deposited in such refuse containers which shall be placed daily for emptying either at the gate of the building or at the edge of the five-foot way or in a refuse chamber or adjoining the building or at such places as directed by the Health Officer.

iv. The Council may require the owner of any building comprising more than one storey to provide sufficient refuse chutes, refuse hoppers and chamber of suitable size.

v. No person shall remove anything from refuse containers or carts or Council Dumping Ground.

vi. No person shall cause drains to be blocked.

vii. Carcass of any animal shall be buried within 4 hours after death or 4 hours after daylight if death occurs at night, or arrange for the Council to dispose of it.

viii. Any kind of building debris which fall on any public places shall be removed by the building owner.

ix. Any person who contravenes any of these by-law shall be guilty of an offence, and liable to a fine not exceeding $1,000 or to a term of imprisonment not exceeding 6 months, or both such fine and imprisonment. In the case of a continuing offence, a sum not exceeding $200 shall be paid for each day during which such offence is continued after conviction.

x. The Council may apply any system for waste collection which Council thinks fit.

xi. The fees for removal of domestic refuse, trade refuse, garden refuse, stable refuse, and night-soil, and fee for depositing anything in Council Dumping Ground shall be as determined by the Council from time to time.

(4) Anit-Litter By-Law, 1983

Major points of Anti-Litter By-Law prepared under Act 171 may be summarized as follows.

i. Any person must not litter public places or premises to which public have access.

ii. Any person must not cause drains to be blocked with waste or any things.

iii. President of a local authority can remove waste or any obstacles from littered places or drains, and require the person who caused littering or drain blocking to pay the amount spent by the local authority to remove them.

(5) Refuse Collection, Removal & Disposal By-Laws, 1983

The major points of Refuse Collection, Removal & Disposal By-Laws, 1983 prepared under Act 171 may be summarized as follows:

i. House occupiers must provide refuse bins with capacity not more than 3 cubic feet. The lid must also be provided.

ii. Households must put refuse into plastic bags and fasten before putting it into refuse bins.

iii. Any broken glass, cans and other objects with cutting edges must be safely wrapped and put in a separate disposal receptable and be placed close to refuse bins for collection.

iv. Refuse bin of a sufficient size must be placed in refuse chamber of refuse chute in a multi-storey building by a management corporation of the building or by the building occupier if there is such corporation.

v. An occupier must maintain a refuse chute.

vi. President of a local authority can repair inappropriate refuse chamber, chute and metal door or hopper and recover the amount spent for the repair in the manner provided in Act 171.

vii. Any industrial waste or commercial waste must be disposed of by the respective industry or commercial establishments at one of the dumping grounds maintained by the President or in the manner as directed by the President.

viii. No one must remove anything from, or spill or scatter any of the contents of, any refuse bin.

ix. No one must burn any waste material at unreasonable times or places which may cause nuisance or annoyance to any neighbour or the public.

x. Any building materials, burning charcoal, highly inflammable or explosive substance shall not be put into domestic refuse bins, but shall be disposed of in the manner provided for the removal of industrial waste.

xi. The president may prescribe the amount of fees to be imposed under these by-laws by notification in the Gazette.

xii. Anyone who contravenes any provision of the by-laws commits an offence.

(6) Streets, Drainage & Building Act, 1974

The Street, Drainage and Building Act, 1974 prescribes the procedures required for controlling the building development of any area of a local authority.

Section 47 of this Act stipulates the prohibition of indiscriminate throwing of rubbish. Under this Act, MHLG has prepared Uniform Building By-Law, 1984.

(7) Uniform Building By-Law, 1984

These by-laws has been followed by most local authorities. Some sections of these by-laws refer to refuse chutes to be provided in a building.

Section 118: Refuse chutes and alternate means for disposal of refuse.
Section 119: Handling of refuse chute in the case where purpose of use of a building has been changed from residential to non-residential or vice versa.
Section 120: Design and construction of refuse chutes.
Section 121: Requirement for refuse receptacle chambers.
Section 122: Access to refuse receptacle chambers.

Section 118 is proposed to be removed by the Standing Review Committee on Uniform Building By-Laws. The proposal, however, has not been finalized yet.

(8) Guideline on the Storage, Collection, Transport & Disposal of Solid Waste (January 1984)

This guideline shows recommended practice and methods to be applied to storage, collection, transport and disposal of solid waste. This guideline seems to have been prepared based upon what has been recommended in USA. Guidelines have no legal power. The items covered in the guideline include the following:

i. Number of communal containers required according to number of premises
ii. Advantages and disadvantages deriving from different collection frequency
iii. Type of collection vehicles
iv. Typical transfer center
v. Explanation of various disposal systems (Area method, trench method and depression method)
vi. Explanation of covering soil, facilities and manpower necessary for sanitary landfill
vii. Number of enforcement officer according to population of city (1 to 12,000 citizens)

(9) Guideline on the Privatization of Solid Waste Collection Service in Malaysia (1987)

This guideline has been prepared by Technical Unit of MHLG in collaboration with Dr. K. Sakurai. The guideline has been prepared after studying both the local and foreign experience on privatization. Its intention is to improve the effectiveness and efficiency of refuse collection through "Contracting out" an appropriate portion of collection service to private sector with proper supervision system. The guideline says that it is advisable for the local authority to remain performing collection service to at least 1/3 of the total service area in order to avoid monopolistic situation where the collection service might be disrupted due to possible strikes or bankruptcy of contractors. The guideline has the following contents:

i. Introduction
ii. Objective and Conceptual Framework of Privatization
iii. Legal Basis for the Privatization of Solid Waste Collection Services
iv. Advantages and disadvantages of Privatization
v. Keys for Successful Privatization
vi. Bidding Process
vii. Bidding Documents
viii. Supervision of Contracted Out Collection Service
ix. Remaining Responsibility of Local Authorities

(10) Recommended Code of Practice for the Disposal of Solid Waste

This code has been prepared by Department of Environment, Ministry of Science, Technology and Environment. This code consists of Part I and II.

Part I "Recommended Code of Practice for the Selection of Waste Disposal Site" is concerned with the selection and designation of environmentally acceptable sites, the preparation of a working plan, and site assessment and licensing, where necessary.

Part II "Recommended Code of Practice for Landfill Development and Management" is concerned with the engineering design, development and operational practices at the site, and its preparation for completion and ultimate land utilization.

Like a guideline, a code does not have any legal power.

(11) Environment Quality (Prescribed Activities) (Environmental Impact Assessment) Order, 1987

This new order covers such aspects as water pollution, air pollution, noise and control of development of environmentally sensitive areas and preservation of such areas as forest reserve, mangrove, hill land, stream reserves and coastal areas.

This order prescribes 19 categories of activity for which EIA (Environmental impact assessment) is compulsory: agriculture, airports, drainage and irrigation, land reclamation, fisheries, forestry, housing, industry, infrastructure, ports, mining, petroleum , power generation and transmission, quarries, railways, transportation, resort and recreational development, waste treatment and disposal and water supply.

Environment Quality Order, 1987 will come into force on 1st April 1988.

2.8.3 Environmental Quality Act and Regulations

(1) National Policy

In Chapter IX on "the Environment" of the Fifth Malaysia Plan 1986 - 1990 (FMP), environmental policy objectives spelt out in Chapter IX on "Development and the Environment" of the third Malaysia Plan 1976 - 1980 (TMP) are reiterated as follows:-

i. Enforcement

> The need to maintain a clean and healthy environment requires effective and regular enforcement of all existing environment-related laws, regulations and rules. Every regulatory agency will have to develop a comprehensive system of monitoring and assessment of both specific and general compliance with source and ambient standards..... In order to bring about an improvement in the overall conditions of the environment as well as to induce uniform applications of various laws and regulations, the relevant authorities at the federal and state levels will ensure that joint enforcement programmes be carried out.....

ii. Environmental awareness

Active public support is required to complement the efforts of the government in keeping the environment clean and pleasant as well as promoting and preserving the unique and diverse national and natural heritage. The public will need to be made more aware of the immediate and long-term environmental consequences of their action in carrying out their own daily activities, through the popular massmedia and public campaigns.

iii. Environmental planning in development

The basic need to provide the general population with clean air and water and a healthy environment cannot be overemphasized. It is important, therefore, to maintain the quality of the environment relative to the needs of the growing population of the country, particularly with regard to the productive capacity and sustenance of renewable resources. The impact of the growing population and human activities relating to mineral exploration, deforestation, agriculture, urbanization, tourism and the development of other resources on the environment will be measured, where possible and accounted for..... The maintenance of sound environmental conditions will therefore, be balanced against the goals for socio-economic development and the need to bring the benefits of development to a wide spectrum of the population.

iv. Environmental programmes

Underlying the importance of striking a balance between development and the environment is the need to place more emphasis on prevention through conservation rather than on curative measures. Elements of this strategy will include the enforcement of law and regulations, the conduct of regular environment impact assessment studies prior to the implementation of relevant project, and public awareness and education through special television programmes.

Further developments of ambient air, water and land quality criteria and standard will be undertaken. Co-operation and co-ordination among the ASEAN Governments will be further strengthened since environmental matters transcend national boundaries. Greater co-operation and increased coordination among relevant federal and state authorities and agencies will be fostered through the establishment of appropriate state executive committees on environment.

v. Project implementation

In order to incorporate an environmental dimension in project planning and implementation, it is necessary that the implications of the proposed projects be studied and the costs of the required environmental mitigation measures determined. This will be implemented mainly through the conduct of EIA.

(2) Environmental Quality (Amendment) Act 1985

With the amendment of the Environmental Quality Act 1974, a new section-section 34A has been introduced which requires any person intending to carry out any prescribed activity to submit a report on the impact on the environment to the Director General, Department of Environment for approval. The amendment was gazetted on 9th January 1986. Section 34A of the Environmental Quality (Amendment) Act 1985 reads as follows:-

i. The Minister, after consultation with the Council, may by order prescribe any activity which have significant environmental impact as prescribed activity.

ii. Any person intending to carry out any of the prescribed activities shall, before any approval for the carrying out of such activity is granted by the relevant approving authority, submit a report to the Director General. The report shall be in accordance with the guidelines prescribed by the Director General and shall contain an

assessment of the impact such activity will have or is likely to have on the environment and the proposed measures that shall be undertaken to prevent, reduce or control the adverse impact on the environment.

iii. If the Director General on examining the report and after making such inquiries as he considers necessary, is of the opinion that the report satisfies the requirements of subsection (2) and that the measures to be undertaken to prevent, reduce or control the adverse impact on the environment are adequate, he shall approve the report, with or without conditions attached thereto, and shall inform the person intending to carry out the prescribe activity and the relevant approving authorities accordingly.

iv. If the Director General, on examining the report and after making such inquiries as he considers necessary, is of the opinion that the report does not satisfy the requirements of subsection (2) or that the measures to be undertaken to prevent, reduce or control the adverse impact on the environment are inadequate, he shall not approve the report and shall give his reasons therefore and shall inform the person intending to carry out the prescribed activity and the relevant approving authorities accordingly:

Provided that where such report is not approved it shall not preclude such person from revising and resubmitting the revised report to the Director General for the approval.

v. The Director General may if he considers it necessary require more than one report to be submitted to him for his approval.

vi. Any person intending to carry out a prescribed activity shall not carry out such activity until the report required under this section to be submitted to the Director General has been submitted and approved.

vii. If the Director General approves the report, the person carrying out the prescribed activity, in the course of carrying out such activity, shall provide sufficient proof that the conditions attached to the report (if any) are being complied with and that the proposed measures to be taken to prevent, reduce or control the adverse impact on the environment are being incorporated into the design, construction and operation of the prescribed activity.

viii. Any person who contravenes this section shall be guilty of an offence and shall be liable to a fine not exceeding ten thousand ringgit or to imprisonment for a period not exceeding two years or both and a further fine of one thousand ringgit for every day that the offence is continued after a notice by the Director General requiring him to comply with the Act specified therein has been served upon him.

In exercise of the powers conferred by the above Act, the order, cited as the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987, came into force on the 1st April 1988. The nineteen activities specified in the Schedule are prescribed and the constructions in relation to Municipal Solid Waste are listed below, to be the prescribed activities.

(i) Construction of incineration plant.
(ii) Construction of composting plant.
(iii) Construction of recovery/recycling plant.
(iv) Construction of municipal solid waste landfill facility.

(3) Environmental Quality (Sewage and Industrial Effluents) Regulations 1979

Regulations 6 prescribes the discharge of effluent into inland waters as follows:

Regulation 8: No person shall erect, construct, install, resite or alter any incinerator without prior written approval from the Director-General.

Regulation 9: Every application for written approval to erect, construct, install, resite or alter any incinerator shall be accompanied by:-

a. site plans approved scale indicating clearly the location of the proposed incinerator and buildings within 1000 metres of the proposed incinerator;

b. proposed construction drawings of the incinerator, method of charging and control equipment and calculations and design parameters prepared by a qualified engineer; and

c. type and quantity of waste to be disposed of in the incinerator,and if so directed by the Director-General, a combustion report on the waste sample certified by a qualified chemist.

Regulation 10: Where in the opinion of the Director-General an incinerator is inadequate in design or construction, or is in efficient in operation or inadequately maintained, he may by notice in writing served upon the occupier require him to -

a. repair, alter or replace the incinerator;
b. terminate or suspend the use of the incinerator for any period prescribed; or
c. dispose of the waste in such a manner prescribed, and the occupier shall comply with every such requirement.

Regulation 11: Unless covered by a written approval issued by the Driector-General under regulation 12, no person shall cause, allow or permit open burning of any combustible material or refuse.....

In regulation 14 and 18, colour of smoke emission permissible is prescribed and it is an obligation for any industry to install systems to control smoke density from chimney without leaving the control room.

Regulations 6: No person shall discharge or cause or permit the discharge of any of the following substances into any inland waters:

i. any inflammable solvent;
ii. any tar or other liquids immiscible with water;
iii. refuse, garbage, sawdust, timber, human or animal waste or solid matters.

In Regulations 8, inland waters are divided into two areas, i.e. Standard-A catchment areas and Standard-B catchment areas. Standard-A areas are set for protection of water supply intakes for the purpose of human consumption including drinking. There flow Muda River and Tengah River adjacent to the proposed sites of this project in Seberang Perai, but parts of the rivers are located downstream of the water supply intakes. Therefore, Standard-B is applicable. Standard-B follows that:

Parameter Limits of Effluent of Standard B

	PARAMETER		UNIT	STANDARD B
(i)	Temperature	.....	C	40
(ii)	pH Value	.....	-	5.5 - 9.0
(iii)	BOD at 20 C	.....	mg/l	50
(iv)	COD	.....	mg/l	100
(v)	Suspended Solids	.....	mg/l	100
(vi)	Mercury	.....	mg/l	0.05
(vii)	Cadmium	.....	mg/l	0.02
(viii)	Chromium, Hexavalent	.....	mg/l	0.05
(ix)	Arsenic	.....	mg/l	0.10
(x)	Cyanide	.....	mg/l	0.10
(xi)	Lead	.....	mg/l	0.5
(xii)	Chromium, Trivalent	.....	mg/l	1.0
(xiii)	Copper	.....	mg/l	1.0
(xiv)	Manganese	.....	mg/l	1.0
(xv)	Nickel	.....	mg/l	1.0
(xvi)	Tin	.....	mg/l	1.0
(xvii)	Zinc	.....	mg/l	1.0

Parameter Limits of Effluent of Standard B

	PARAMETER		UNIT	STANDARD B
(xviii)	Boron	.....	mg/l	4.0
(xix)	Iron (Fe)	.....	mg/l	5.0
(xx)	Phenol	.....	mg/l	1.0
(xxi)	Free Chlorine	.....	mg/l	2.0
(xxii)	Sulphide	.....	mg/l	0.50
(xxiii)	Oil and Grease	.....	mg/l	10.0

In addition, where two or more of the metals specified as parameters (xii) to (xvi) are present in the effluent, the concentration of these metals shall not be greater than 3.0 mg/l in total, and 1.0 mg/l in total for soluble forms, and when both phenol and free chlorine are present in the same effluent, the concentration of phenol individually, shall not be greater than 0.2 mg/l and the concentration of free chlorine individually, shall not be greater than 1 mg/l.

Regulation 10 prescribes the discharge of solid waste onto land as:-

Regulations 10: No person shall discharge or cause or permit the discharge of any solid waste or sludge that is generated from any production or manufacturing processes or from any effluent treatment plant in or on any soil or surface of any land without the prior written permission of the Director-General.

(4) Environmental Quality (Clean Air) Regulations 1978

These Regulations shall apply to every chimney in accordance with Regulation 3. In Regulation 7, 8, 9, 10, 11 prescriptions on incinerators are stated.

Regulation 7: No owner or occupier of industrial or trade premises shall burn or cause to be burnt combustible materials, refuse and produce or waste except in an incinerator of such type and design approved by the Director-General.

Regulation 14: The occupier of any industrial or trade premises shall not cause, suffer, allow or permit smoke emissions of any colour from any new facility except fuel burning equipment utilising solid fuel and including but not limited to any chimney which appears to the Director-General or any authorised officer -

a. to be darker than that designated as shade No. 1 on the Ringlemann Chart; or
b. when observed or recorded with such instrument or device as the Director-General may approve to be darker than shade No. 1 on the Ringlemann Chart; or
c. to be of such opacity as to cause obscuration to a degree equivalent to smoke darker than shade No. 1 on the Ringlemann Chart.

In accordance with Regulation 25, the total mass of any smoke, soot, dust, ash (including flyash) cinders, cement, lime, alumina, grit or before admixture with air, smoke, or other gases. Other solid particles of any kind shall not exceed 0.4 g/Nm^3 before admixture with air, smoke, or other gases.

In Regulation 26, emission of Mercury, Cadmium, etc. is limited to the quantities stated below before admixture with air, smoke, or other gases.

Hg: 0.01 g/Nm^3
Cd: 0.015 g/Nm^3
Pb: 0.025 g/Nm^3
Sb: 0.025 g/Nm^3
As: 0.025 g/Nm^3
Zn: 0.1 g/Nm^3
Cu: 0.1 g/Nm^3

And whenever the emission consists of two or more of the above substances, the total mass of the first five shall not exceed 0.04 g/Nm^3 or the sum of individual allowable limits.

Regulation 27 prescribes that HCl shall not exceed the limit, 0.4 g/Nm^3 before admixture with air, smoke, or other gases.

Regulation 32 prescribes to use the best practicable means to prevent the emission of noxious substances.

Regulation 32: An occupier of any industrial or trade premises shall use the best practicable means to prevent the emission of noxious or offensive substances and to render harmless and inoffensive substances necessarily discharged.

(3) Environmental Quality (Control of Lead Concentration in Motor Gasoline) Regulations 1985

It is prescribed that no person shall be in possession, offer or exhibit for sale, sell, deliver for use or exchange for use any motor gasoline which contains lead or lead compounds expressed as lead in excess of 0.40 g/l on and after the 1st January 1986. On and after the 1st January 1990, it will be reduced further to 0.15 g/l.

2.9 Privatization

(1) Factors Affecting the Degree of the Contracting-Out

The future organization scheme much depends on the policy with respect to the contracting-out of the cleansing services.

The promotion of privatization of the government industry and services is a basic policy resorted to by the Malaysian government. The Malaysian government effectively promotes this policy by controlling new recruitment of the government employees, and contracting-out services to public sectors. The rationale behind the policy is to increase the productivity and national output by transferring production base from less efficient sector (government sector) to more efficient sector (private sector). The policy will defeat its objective if the private sector is less efficient than the government sector.

In view of the relatively higher economic efficiency (cost-effectiveness) of the private sector in cleansing services than the council's service, it is rationale that both MPPP and MPSP have contracted out the cleansing service. If we only pursue the short term maximization of economic efficiency, 100% of the cleansing service may be contracted out. In the long term, however, there may be a danger that the cleansing service may be disrupted due to the failure of the contractors. From the view point of securing the continuous services over the long period, it is rational in general, for the councils to keep a certain portion of the service in their hand. Then, a question to be asked is how much the service should be contracted out. There may be no single percentage which is appropriate to all the councils. Degree of the contracting-out differs from one local authority to another, it also differs by type of service.

In some Japanese local authorities, the collection and haulage service is 100% contracted out, while such service is not contracted at all in Kuantan and Petaling Jaya. Petaling Jaya contracts out 90% of the street and drain cleansing as well as road side grass cutting. The percentage (degree) of the contracting-out depends on the factors which include the following:-

1) Magnitude of the difference in the cost-effectiveness between the contractors and the council. (Larger difference will make it feasible to contract out more of the service.)

2) Availability of reliable contractors. (The greater availability of reliable contractors will make it feasible to contract out more of the service.)

3) In the shorter term, degree of current utilization of council's resources (man-power and equipment). (It is not rational to increase the contracting-out when the council's resources are under utilized. Fuller utilization of the council's resources should be promoted before increasing the contracting-out if the council is unable to adjust (reduce) the man-power immediately, which is always the case with the government sectors.)

4) Types of services. (It is more common for local authorities to contract out collection and haulage than disposal service.)

The following table shows the current degree of the contracting-out by MPPP and MPSP.

Table 2.9-1 Current Degree of Contracting-Out by MPPP and MPSP in 1988

TYPE OF SERVICES	MPPP	MPSP
- Collection & haulage	88% (94% in 1987)	24%
- Street & drain cleansing	0%	24%

Note: 1) The contracting-out percentage of collection/haulage service is measured in terms of waste amount collected.

2) MPSP's street/drain cleansing contracting-out percentage (24%) is estimated in view of the fact that contractors employed by MPSP are responsible not only for collection/haulage but also for street/drain cleansing in their respective contract area.

(2) Future Contracting-Out Policy for MPPP

According to the counterpart from MPPP, MPPP intends to maintain the same policy in the near future as the present one with respect to the degree of the contracting-out of both collection/haulage and street/drain cleansing. (Around 90% for collection/haulage, and 0% for street/drain cleansing).

a. Collection/haulage Service

Though 90% seems to be high in Malaysia, to maintain this percentage in the future seems to be alright in view of the MPPP's past experience in controlling the contractors. As mentioned earlier, there are some Japanese local authorities which contract out 100% of the collection/haulage service successfully.

b. Street/Drain Cleansing Service

MPPP currently spends money for street/drain cleansing as much as collection/haulage expenditure. Expenditure for street/drain cleansing shares about 14% of the MPPP's total annual expenditure. In terms of personnel size, street/drain cleansing shares about a quarter of the council's manpower. In view of this fact, it is recommended that MPPP will at least try contracting-out partially; 10% for example in the near future, because there is great prospect for MPPP that street/drain cleansing expenditure may be much reduced by contracting out the service in view of the following situation:

1) MPPP, in 1987, contracted out 99% of the grass cutting for parks and gardens, and 26% of roadside grass cutting service in terms of area. It has been found that the direct unit cost spent for the council's own grass cutting service is at least twice as much as what MPPP has paid to the grass cutting contractors. The council's own cost would be even higher if indirect costs such as overhead and office building depreciation, etc. are included. The contractors' service, however, was found unsatisfactory. The poor contractors' service is partly a result of the lowest tender selection principle resorted to by MPPP. With a more careful selection of contractors and better supervision of the contractors, MPPP would be able to enjoy better service at low costs. As a matter of fact, JKR in Penang Island successfully contracts out 100% of grass cutting service to contractors.

2) According to MPPJ, its Urban Service Department contracts out 90% of street/drain cleansing and road side grass cutting service, and have found the contractors' services satisfactory .

3) Because the street/drain cleansing service does not require large capital investment, there may be a good chance even for small contractors to participate in the service. It is expected that such contractors would aquire some experience in sold waste management through the execution of the contract service. Such experience would be useful to contractors that wish to undertake collection/haulage service in the future.

In order words, the contracting-out of street/drain cleansing to small contractors can be viewed as the provision of SWM training opportunity.

In view of the above situation, it seems to be very much worthwhile for MPPP to try contracting out street/drain cleansing service partially, 10% for example as suggested earlier. The expansion or contraction of the contracting-out should then be determined after reviewing the performance of the contractors.

It is recommended that the contracting-out, if found feasible, should be expanded in the future as a result of 1) natural retirement of the cleansing laborers, and 2) an increase in service volume. Judging from the age structure of MPPP's cleansing laborers, it is estimated that 735 cleansing laborers will retire by the year 2005 which corresponds 53% of 1,387, the existing cleansing laborers (cleansing laborers mean the laborers engaged in either street/drain cleansing or collection/haulage). The remaining cleansing laborers will be 652 (1387 - 735) if there is no recruitment of new laborers, and if no laborers leave before reaching 55, the retirement age.

It is estimated on the other hand that a total of 1,589 laborers (789 for collection/haulage and 800 for street/drain cleansing) will be needed in 2005 if MPPP provides 100% of the cleansing service by using its own manpower, and also if the planned improvement is successfully achieved under Alternative 1. The figure 1,589 has been calculated by the collection planner in the JICA Team based upon some assumptions.

Assuming that MPPP will maintain the contracting-out of collection/haulage service at 90%, MPPP will have to contract out 28% of street/drain service by 2005 as shown in the table 2.9-2

Table 2.9-2 Expected Ratio of the Contracting-Out of Street/Drain Cleansing in 2005

	NUMBER OF LABORERS	REMARKS
1. Existing laborers	1,387	
2. Laborers retiring by 2005	735	See table below
3. Laborers still working in 2005	652	1,387 - 735 = 652
4. Laborers required by 2005 in the case of no contracting-out		
4.1 for collection/haulage	789*	
4.2 for street/drain cleansing	800*	
Total	1,589*	
5.1 The council's laborers required for 10% of collection/haulage service	79	789 x 10%
5.2 Remaining laborers to be deployed for street/drain cleansing	573	652 - 79 = 573
6. Ratio of contracting out of		
6.1 Collection/haulage service	10%	(10% is pre-determined.)
6.2 Street/drain cleansing	28%	(800 - 573)/800 = 28%

Note: 1) Number of cleansing laborers shown in the above table do not include that of Mandors.

2) Figures with asterisk have been estimated by the collection planner of JICA team.

The number of laborers retiring by 2005 has been estimated as shown below based upon the existing age structure of the cleansing laborers of MPPP.

Table 2.9-3 Estimated Number of MPPP's Laborers Retiring in the Future

	TOTAL NUMBER OF LABORERS RETIRING	NUMBER OF LABORERS REMAINING
In 1988	-	1,387 (Number of existing laborers)
By 1993	117 (8.4%)	1,270 (91.6%)
By 1998	311 (22.4%)	1,076 (77.6%)
By 2003	530 (38.2%)	857 (61.8%)
By 2005	735 (53.0%)	652 (47%)

As a conclusion, the following contracting-out policy is recommended for MPPP:-

1) For Collection/Haulage Service
   Maintain the contracting-out ratio of 90%.

2) For Street/Drain Cleansing
   i) Contract-out 10% in the near future.
   ii) Decide on the degree of expansion or contraction upon the review of the performance of contrctors.
   iii) In the selection procedure of contractors, place emphasis on the tenderers' capability and experience instead of resorting to the lowest tender selection principle.

   iv) Speed of the expansion of the contracting-out should depend on the rate of natural retirement. The contracting-out ratio will be 28% in terms of area in 2005 provided that 1) the manpower size is reduced only as a result of natural retirement, 2) no laborers leave before the retirement age and 3) no new cleansing laborers are recruited until 2005, and 4) cleansing service demand and efficiency increase as estimated.

Successful expansion of the contracting-out will generate a great deal of saving for MPPP.

(3) Future Contracting-Out Policy for MPSP

MPSP, currently, contracts out 24% of the collection/haulage service in terms of waste amount. The contracting-out ratio of the street/drain cleansing is estimated also at 24% in view of the fact that all the waste collection contractors employed by MPSP provide street/drain services as well as in their respective contract area.

The current contractors' services are not satisfactory according to the MPSP's Health Department. Reasons for this may be partly attributed to very low contract prices (less than $40 per ton of waste collected), and partly to the council's insufficient supervision of the contractors. As discussed earlier, contractors' experience and capability should be more carefully studied during the selection procedure.

There is a great prospect for MPSP that the cleansing cost will be much reduced by expanding the contracting-out of the cleansing services in view of the large difference in the cleansing costs between the contractors and the council. In 1987, the council spent $3.9 million for the council's own collection and haulage of 47,300 tons of waste, that lead to the unit cost of $82 per ton, which is more 200% of the contractor's unit price.

According to MPSP's Health Department, the department intends to expand the contracting-out up to 50% in the future, which is twice as large as the present level. This seems to be a reasonable target. It should be emphasized that the target can and should be flexible depending on the contractors' performance and other factors. After achieving the target (50%), it might be feasible for MPSP to increase further the contracting-out to a level of 70% - 80%.

As discussed earlier, the contracting-out should be increased as a result of natural retirement and an increase in service volume. It is estimated that it would take about 10 years for MPSP to reach to the target contracting-out ratio of 50% provided tht 1) number of laborers are decreasing only as a result of natural retirement, 2) the required service volume is increasing in the future as estimated, 3) MPSP's own service efficiency is increasing as planned, and 4) the age structure of MPSP's cleansing laborers is same as that of MPPP. (This information has not been made available yet from MPSP). With all these conditions, the contracting-out ratio will be 69% in 2005 as shown in the table below.

Table 2.9-4 MPSP's EXPECTED RATIO OF CONTRACTING-OUT IN THE FUTURE

	TOTAL NUMBER OF LABORERS RETIRING	NUMBER OF LABORER REMAINING	TOTAL LABORERS REQUIRED	EXPECTED RATIO OF CONTRACTING -OUT
In 1988		839 (Existing laborers)	1,036*	24%
By 1995	114 (13.6%)	725 (86.4%)	1,191*	39%
By 1998	188 (22.4%)	651 (77.6%)	1,256*	48%
By 2005	394 (53.0%)	445 (47.0%)	1,449*	69%

Notes: 1. Figures with asterisk are total laborers required for executing 100% of the estimated service volume on the condition that MPSP would achieve fully the planned improvement.

2. Of 1,449 laborers needed for executing 100% of the services in 2005, collection/haulage needs 699 laborers, while street/drain cleansing service needs the remaining 750 laborers.

As a conclusion, the following contracting-out policy is recommended for MPSP:-

i) Increase gradually the contracting-out ratio for both collection/haulage and street/drain cleansing.

ii) Target ratio of 50% is quite reasonable.
(It would take about 10 years to achieve this target on the conditions mentioned above.)

iii) Target ratio, however, should be flexible in the long term. It may be feasible to increase even to 70% - 80% level if performance of the contractors prove to be distinctly better relative to the council's performance.

iv) In the selection of contractors, tenderers' capability and experience should be more carefully studied.

v) Strengthen the monitoring and supervision system.
(Creation of contract-monitoring section within the USD is recommended for this purpose.)

2.10 Finance Cleansing Service Costs Estimation Method

Progress Report (II), Section 2.7 Tables 2.7-1 and 2.7-2 show estimated costs of cleansing services. This chapter explains the method and base data applied to the cost estimation.

The estimation of the cost of each service of solid waste management is possible only by making some assumptions because the separate accounting system has not introduced in local authorities in Malaysia.

1. MPPP

According to MPPP's annual budget, the expenditures for solid waste management is classified as follows:

(unit: $1,000)

	1986(Actual)	1987(Budgeted)	1988(Budgeted)
a. Scavenging - street cleansing	9,841	9,878	10,824
b. Scavenging - domestic and trade refuse removal	9,401	8,906	10,344
c. Refuse disposal - administration & general	13	14	14
d. Refuse disposal - running cost of destructors	105	151	178
e. Refuse disposal - running cost of dumping ground	355	444	572
Total	19,715	19,393	21,932

Source: Belanjaan tahum 1988 of MPP

Note: It is assumed that "Street sweeping" include drain cleansing, grass cutting and beach cleansing as well.

(1) MPPP's budget list shows detailed expenditure items, which are summarized in Table 4.3.11-3 in Progress Report (I).

(2) The expenditures of personnel and contract services shown in Progress Report (1) were revised as shown below by Health Dept. The revised figures are incorporated in Table 2.

(unit: $1,000)

	Planning & administration	Street cleansing	Domestic collection
Personnel expenditure	196	8,234	1,165
Cost of contracts		38	6,768

(3) The expenditures of transport center are summarized as follows:

(unit: $1,000)

	1986(Actual)	1987(Budgeted)	1988(Budgeted)
a. Emolument	921	999	1,031
b. Recurring expenditure			
power/diesel/fuel	230	300	250
tyres	60	130	65
others	8	16	14
c. Maintenance of vehicles	359	435	370
d. Contributions for renewals & reserves	600	600	600
Total running cost of vehicles	2,178	2,480	2,330

The transport charges are rechargeable expenditure, therefore they can be subdivided into the following items:

(unit: $1,000)

	Street cleansing	Refuse removal	Refuse disposal
Transport charge	270	600	110
- Maintenance of vehicles including personnel expenditure (corresponds to Items a. & c. above)	172	382	70
- Fuels & others (corresponds to Item b. above)	33	73	13
- Depreciation of vehicles (corresponds to Item d. above)	65	145	27

(4) The cost of each service of "street cleansing" which include drain cleansing, grass cutting and beach cleansing were calculated in proportion to the number of employees and/or vehicles involved in each service as shown in Table 1.

(5) The cost of street cleansing, etc. executed by other departments and Penang State government were calculated based upon the number of employees.

(6) The calculation result is shown in Table 2.

(7) Table 2. is modified as Table 3. according to the new information about the grass cutting expenditures of other dept. of MPPP and Penang State government. (Table 2 is exactly same as Table 2.7-1 of Progress Report 1.)

Table 1. Base Data to Calculate the Cost by Services

	Number of personnel	
	Penang Island	Seberang Perai
Local Authority		
Health dept.	(2204)	(1168)
Cleansing	(1608)	(1009)
Administration	47	23
Refuse collection	109*	445*
driver	(-)	(38)
Street sweeping	601*	222*
Drain sweeping	748*	278*
Grass cutting	30*	12*
Beach cleansing	73*	20*
Refuse disposal	-	9
Anti-mosquito (drain cleansing)	126	-
Engineering dept.		
Refuse disposal	5	-
Work shop (maintenance)	22	42
Transport center driver	23	
Secretary dept. (grass cutting)	168	117
Road sect. (grass cutting)	47	-
State		
JKR (Grass cutting)	5	110
Drainage & irrigation dept. (drain cleansing)	21	21
Total of employees	2025	1299

	Number of vehicles	
	Penang Island	Seberang Perai
Administration		1
Refuse collection	28	61
Streetsweeping	2	-
Refuse disposal	2	1
Total of vehicles	32	63

Note to Table 1: Method and Assumptions Used for the Estimation of the Personnel Numbers with Asterisks.

(1) Penang Island

The numbers of personnel involved in respective services (refuse collection, street sweeping, drain sweeping, grass cutting and beach cleansing) with asterisks are not directly available. Those numbers have been estimated by using the data obtained through the interviews with 5 overseers who supervise 257 laborers altogether. The data obtained are shown in the column (A) of the following table:

TYPE OF SERVICE	NUMBER OF LABORERS (SAMPLE DATA) (A)	(B)	ESTIMATED NUMBER OF PERSONNEL 1,561X(B) = (C)	REVISED PROPORTION (D)	ADJUSTED NUMBER OF PERSONNEL 1,561X(D) = (E)
1. Refuse collection	12	4.7%	73	7%	109
2. Street weeping	64	24.9%	389	38%	601
3. Drain cleansing	80	31.1%	486	48%	748
4. Grass cutting	3	1.2%	19	2%	30
5. Beach cleansing	8	3.1%	48	5%	73
Sub-total	167	65.0%	1,015	100%	1,561
6. Mixed work	90	35.0%	546	-	-
Total	257	100%	1,561	100%	1,561

As many as 90 laborers, which represent 35% of the total sample personnel number (257) are involved in the mixed work, which consist of the 5 different types of cleansing services as shown above. For the purpose of the estimation of the costs of respective cleansing services, it is assumed that the mixed work laborers provide 5 different types of cleansing services at the same proportions as those found in the existing group of laborers engaged in respective service, i.e., 7%, 38% 48%, 2% and 5% respectively.

The numbers of personnel involved in the respective services estimated as in column (C) are adjusted as in column (E) through multiplying the rivised proportions by the total cleansing personnel number excluding administration personnel (1,608 - 47 = 1,561).

(2) Seberang Perai

The numbers of personnel involved in respective services (refuse collection, street sweeping, grass cutting and beach cleansing) with asterisks are not directly available in MPSP either. Those numbers have been estimated by using the data obtained through the interviews with 3 overseers who supervise 86 workers (laborers and drivers). The data obtained are shown in the column (A) of the table below:

TYPE OF SERVICE	NUMBER OF LABORERS (SAMPLE DATA) (A)	(B)	ESTIMATED BREAKDOWN OF MIXED WORK LABOR FORCE (B)	ESTIMATED LABOR FORCE SIZE WITHIN SAMPLE GROUP = (C)	(D)	ESTIMATED LABOR FORCE SIZE 977* X (B) = (E)	ADJUSTED LABOR FORCE SIZE 977* X (D) = (F)
1. Refuse collection	24	28%	16(30%)	40	46%	273	445
2. Street weeping	4	5%	16(30%)	20	23%	45	222
3. Drain cleansing	4	5%	21(40%)	25	29%	45	278
4. Grass cutting	1	1%	0	1	1%	11	12
5. Beach cleansing	0	0%	0	0	1%	-	20
Sub-total	33	38%		86	100%	375	977
6. Mixed work	53	62%		-	-	602	-
Total	86	100%		86	100%	977	977

* The total cleansing personnel number excluding administration personnel and refuse disposal personnel is obtained by the following calculation: 1,009 - 23 - 9 = 977.

As many as 53 workers, which represent 62% of the total sample personnel number (86) are involved in the mixed work, which consist of refuse collection, street sweeping and drain sweeping. For the purpose of the estimation of the costs of respective services, it is assumed that the mixed labor force provide those three services at the proportions shown in the column (B): 30% for refuse collection, 30% for street sweeping and 40% for drain cleansing. The reasons for making such assumption include the following:

- The collection work labor force size seems to be about same as the street sweeping labor force size.
- The drain cleansing labor force is larger than the street sweeping labor force.

The estimated labor force sizes of respective services shown in the column (E) have been adjusted as shown in the column (F) according to the revised proportion of respective services shown in the column (D).

Table 2. Cost of Cleansing Services in Penang Island (in 1987)

($1,000)

	Administration	Street Cleaning				Refuse collection	Refuse disposal	Total
		Street cleansing	Drain cleansing	Grass cutting	Beach cleansing			
Personnel expenditure	196	3,408	4,242	170	414	1,165	135	9,730
Contract services			38			6,768		6,806
Material & tool		57	72	2	4	30	2	167
Other expenditure		229	285	11	28	80	5	638
Maintenance		72	89	4	9	394	206	774
Vehicle		(71)	(88)	(4)	(9)	(382)	(70)	(624)
Others		(1)	(1)			(12)	(136)	(150)
Fuel & others		30	35	2	4	73	227	371
Vehicle		(14)	(16)	(1)	(2)	(73)	(13)	(119)
Others		(16)	(19)	(1)	(2)		(214)	(252)
Land rent								
Depreciation		27	33	1	3	145	27	236
Vehicle		(27)	(33)	(1)	(3)	(145)	(27)	(236)
Others								
Cleansing section Sub-Total	196 [1.0]	3,823 [20.4]	4,794 [25.6]	190 [1.0]	462 [2.5]	8,655 [46.2]	609 [3.3]	18,729 [100.0]
Other dept. of MPPP				1,220				1,220
State			119	158				277
Total	196 [0.9]	3,823 [18.9]	4,913 [24.3]	1,568 [7.8]	462 [2.3]	8,655 [42.8]	609 [3.0]	20,226 [100.0]

Note:

1. Any amounts less than $500 is shown as 0.
2. ( ) shows breakdown cost
3. [ ] shows share (%)
4. Source: Belanjaan tahun 1988 of MPPP

Table 3. Cost of Cleansing Services in Penang Island (in 1987)

($1,000)

	Administration	Street Cleaning				Refuse collection	Refuse disposal	Total
		Street cleansing	Drain cleansing	Grass cutting	Beach cleansing			
Personnel expenditure	196	3,408	4,242	170	414	1,165	135	9,730
Contract services			38			6,768		6,806
Material & tool		57	72	2	4	30	2	167
Other expenditure		229	285	11	28	80	5	638
Maintenance		72	89	4	9	394	206	774
Vehicle		(71)	(88)	(4)	(9)	(382)	(70)	(624)
Others		(1)	(1)			(12)	(136)	(150)
Fuel & others		30	35	2	4	73	227	371
Vehicle		(14)	(16)	(1)	(2)	(73)	(13)	(119)
Others		(16)	(19)	(1)	(2)		(214)	(252)
Land rent								
Depreciation		27	33	1	3	145	27	236
Vehicle		(27)	(33)	(1)	(3)	(145)	(27)	(236)
Others								
Cleansing section Sub-Total	196 [1.0]	3,823 [20.4]	4,794 [25.6]	190 [1.0]	462 [2.5]	8,655 [46.2]	609 [3.3]	18,729 [100.0]
Other dept. of MPPP				1,728				1,728
State			119	94				213
Total	196 [0.9]	3,823 [18.5]	4,913 [23.8]	2,012 [9.7]	462 [2.2]	8,655 [41.9]	609 [2.9]	20,670 [100.0]

Note:

1. Any amounts less than $500 is shown as 0.
2. ( ) shows breakdown cost
3. [ ] shows share (%)
4. Source: Belanjaan tahun 1988 of MPPP

2. MPSP

In MPSP, the budget for solid waste management is included in that of Health dept.

(1) The expenditures by item were informed by Finance department as follows:

(unit: $1,000)

	1987
Personnel expenditure	
Salary/wage	7,718
Overtime	376
Fuel & Others	
Fuels	
Others	29
Cost of contractors	1,832
Maintenance	143
Total	10,098

(2) The personnel expenditures mentioned above include those for all employees of Health department, therefore the personnel expenditure related to SWM alone is calculated in proportion to the number of employees involved in SWM shown in Table 1. (86.4% = 1,009/1168) Other expenditures for transport & travelling are also calculated in the same way.

(3) The budget of the workshop of Engineering department is as follows:

(unit: $1,000)

	1986	1987	1988
Maintenance of vehicles	423	394	550
Fuels	149	150	

The share of solid waste management is assumed to be a half of the budget of the workshop.

(4) The following costs are added according to the information obtained by Finance Dept.

(unit: $1,000)

	1987
Purchase of material & tool (pushcarts & trolleys)	8
Land rent) (refuse dumping ground)	29

(5) Vehicles was not purchased regularly. 1988 MPSP budget includes the purchase of 6 collection vehicles of which prices are estimated as follows.

(unit: $1,000)

Close truk	3 X	$58 =	$174
Compactor	2 X	$100 =	$200
Crane lorry	1 X	$76 =	$76
Total			$450

It is assumed that the annual depreciation cost of the existing 63 collection vehicles is equal to the purchase cost of the 6 collection vehicles.

(6) The purchase of other machines was not made regularly either. The purchase of fogging machines were made three times for the period from 1983 to 1987. The total purchase amounted to $10,795. The average expenditure is about $4,000.
In the same way, the purchase expenditure of grass-cutting machines is calculated.

(7) The cost division by services are made in proportion to the number of employees and/or vehicles shown in Table 1.

(8) The calculation result is shown in Table 4.
Table 4. is modified as Table 5. according to the new information on the grass cutting expenditures of Secretariat Dept. and State Government (JKR).

Table 4. Cost of Cleansing Services in Sebrang Perai (in 1987)

($1,000)

	Admini stra-tion	Mixed Work				Refuse colle-ction	Refuse dispo-sal	Total
		Street clean-sing	Drain clean-sing	Grass cutt-ing	Beach clean-sing			
Personnel expenditure	160	1,538	1,926	83	139	3,083	62	6,991
Contract services						1,832		1,832
Material & tool		2	3		3			8
Other expenditure		21	27	1	2	43	1	95
Maintenance		32	40	2	3	251	11	339
Vehicle						(187)	(10)	(197)
Others		(32)	(40)	(2)	(3)	(64)	(1)	(142)
Fuel & others		7	8		1	84	4	104
Vehicle						(71)	(4)	(75)
Others		(7)	(8)		(1)	(13)		(29)
Land rent							29	29
Depreciation			4	12		427	23	466
Vehicle						(427)	(23)	(450)
Others			(4)	(12)				(16)
Cleansing section Sub-Total	160 [1.6]	1,600 [16.2]	2,008 [20.4]	98 [1.0]	145 [1.5]	5,723 [58.0]	130 [1.3]	9,864 [100.0]
Secretariat Dept.				817				817
State Government			146	762				908
Total	160 [1.4]	1,600 [13.8]	2,154 [18.6]	1,677 [14.5]	145 [1.3]	5,723 [49.4]	130 [1.1]	11,589 [100.0]

Note:

1. Any amounts less than $500 is shown as 0.
2. ( ) shows breakdown cost
3. [ ] shows share (%)
4. Source: Belanjaan tahun 1988 of MPPP

Table 5. Cost of Cleansing Services in Sebrang Perai (in 1987)

($1,000)

	Administration	Mixed Work				Refuse collection	Refuse disposal	Total
		Street cleansing	Drain cleansing	Grass cutting	Beach cleansing			
Personnel expenditure	160	1,538	1,926	83	139	3,083	62	6,991
Contract services						1,832		1,832
Material & tool		2	3		3			8
Other expenditure		21	27	1	2	43	1	95
Maintenance		32	40	2	3	251	11	339
Vehicle						(187)	(10)	(197)
Others		(32)	(40)	(2)	(3)	(64)	(1)	(142)
Fuel & others		7	8		1	84	4	104
Vehicle						(71)	(4)	(75)
Others		(7)	(8)		(1)	(13)		(29)
Land rent							29	29
Depreciation			4	12		427	23	466
Vehicle						(427)	(23)	(450)
Others			(4)	(12)				(16)
Cleansing section Sub-Total	160 [1.6]	1,600 [16.2]	2,008 [20.4]	98 [1.0]	145 [1.5]	5,723 [58.0]	130 [1.3]	9,864 [100.0]
Other dept. of MPSP				661				661
State Government			146	2354				2500
Total	160 [1.2]	1,600 [12.3]	2,154 [16.5]	3,113 [23.9]	145 [1.1]	5,723 [43.9]	130 [1.0]	13,025 [100.0]

Note:

1. Any amounts less than $500 is shown as 0.
2. ( ) shows breakdown cost
3. [ ] shows share (%)
4. Source: Belanjaan tahun 1988 of MPPP

2.10.2 Forecast on Financial Capability of MPSP

(1) Deficit in the 1989 Budget

The budget of MPSP in 1989 shows a deficit of $6.7 million as illustrated in Table 2.5-1. The total revenue is estimated at $44.0 million, of which $28.8 million are derived from the ordinary revenue and $15.2 million from the sewerage project.

Assessment (tax) shares $24.6 million which is 85.4% of the total ordinary revenue. On the other hand, the expense are estimated at $50.7 million, of which $35.8 million are spent on ordinary expenses and $15.0 million on the sewerage project. The difference is a deficit in revenue of $6.7 million in 1989. Therefore, there are no financial resources available of MPSP for new projects at present.

(2) Budget on Sewerage Projects

Revenue in the sewerage budget in 1989 are $13.7 million, funded yearly until 1991, $1.0 million from development grants and $0.5 million from users charge. Expenses consists of the repayment of loans which will continue yearly at $13.7 million form 1988 to 1995 and $11.5 million yearly from 1996 to 2002. In addition to this, $1.2 million will be paid out as construction expenses.

Therefore, from 1992 to 2002, MPSP should obtain new financial resource for the loan repayment. However, obtaining new financial resource seems to be quite difficult unless the Federal and State Governments give subsidies or grants to MPSP.

(3) Assessment Rates

Table 2.6-1 shows the breakdown of the assessments actually collected in 1988 (Budget shows the potential amount).

Table 2.10-3 Income and Expenses Summary 1989

	Income Summary					Expenses Summary			
	Source of Income	Estimation 1988	Estimation 1989	+% -		Expenses	Estimation 1988	Estimation 1989	+% -
60000	Taxes	23,836,400	24,591,565	+ 3.17	1.	Secretariat	3,525,410	3,569,070	+ 1.24
70000	Non-taxes revenue	905,000	970,000	+ 7.18	2.	Enforcement	615,600	635,600	+ 1.67
72000	Services and Services Payment	1,010,010	1,258,310	+ 24.59	3.	Health	11,914,610	12,060,500	+ 1.22
73000	Revenue from Sales	2,000	2,000	-	4.	Engineering	12,569,610	12,260,190	- 2.46
74000	Rent	626,960	519,160	- 17.19	5.	Building	960,600	998,840	+ 1.86
75000	Interest and Investment Dividends	1,014,000	1,010,000	- 0.39	6.	Town Planning	578,000	588,960	+ 1.90
76000	Fines and Compound	190,000	280,000	+ 47.37	7.	Treasury	2,119,810	1,639,630	- 22.65
80000	Non-Revenue Earnings	10,000	5,000	- 50.00	8.	Appraisement	1,001,400	1,014,080	+ 1.27
82000	Earning from Government Agencies	157,510	157,500	- 0.01	9.	Veterinary	346,500	356,850	+ 2.99
					10.	Special Expenses and Capital	2,840,870	2,643,370	- 6.95
		27,751,880	28,793,535				36,492,410	35,766,540	
VIII	Sewage Treatment Project	14,320,010	15,220,000	+ 6.28	11.	Sewage Treatment Project	14,355,030	14,962,510	+ 4.23
		42,071,890	44,013,535						
	Deficit	8,775,550	6,715,515						
		50,847,440	50,729,050				50,847,440	50,729,050	

Note: Budget on Sewerage Projects in 1989

Revenue		Expenses	
Fund*	13,720,000	Repayment***	13,720,000
Development	1,000,000	Construction	1,242,510
Fee Charge**	500,000		
Total	15,220,000	Total	14,962,510

* Fund until 1991
** Users charge $3/unit
*** Repayment Schedule
From 1988 to 1995 13,720,000/year
From 1996 to 2002 11,539,000/year

Table 2.10-4 Amount and Breakdown of Assessment Collected in 1988 from MPSP

CLASSIFICATION	NO. OF PREMISES	YEARLY VALUE ($1000)	ASSESSMENT ($1000)	ASSESSMENT Rate (%)
Commercial	7,388	34,586	4,627	13.4
Industry	748	55,149	6,883	12.5
Housing Scheme	28,008	55,696	6,237	11.0
Village Dwellings	54,807	26,186	802	3.1
Land	5,329	45,218	1,010	2.2
Total	96,280	217,837	19,559	9.0 (Average)

Village dwellings shares 57% of the total number of premises and 12% of yearly value but only 4.1% of the total assessment. Population of MPSP is estimated to be 531,300 in 1987 and 754,100 in 2005. Therefore $32.3 million from assessment in 2005 (1.65 times of present) can be expected based on following assumptions.

a. Commercial, industrial and land will increase at the same rate as increase in population which is 1.42 times of the present.
b. Total number of premises for housing schemes and village dwellings will increase at the same rate as population but with the number of village dwellings remains the same.
c. Assessment rate remains the same as the present rates.

Table 2.10-5 Estimation of Future Assessment

CLASSIFICATION	NO. OF PREMISES	YEARLY VALUE ($1000)	ASSESSMENT ($1000)	ASSESSMENT Rate (%)
Commercial	10,490	49,112	6,581	13.4
Industry	1,062	78,311	9,789	12.5
Housing Scheme	62,791	124,865	13,735	11.0
Village Dwellings	54,807	26,186	802	3.1
Land	7,567	64,209	1,412	2.2
Total	136,717	338,683	32,319	9.0 (Average)

Total budget scale will be $46.1 millions on the assumption that the same present budget structure is maintained. This means that the potential amount in assessment is 1.22 times and shares 85.4% of the ordinary revenues.

$32.3 million x 1.22 ÷ 0.854 = 46.1

(4) Measures to Realize the Proposed Increase in Revenue

Almost all of urban service demands will increase as the regional economics growth, which is expected at 4.8% per year in real terms. Therefore the budget scale in 2005 will require $82.9 million, which is 1.8 times more than the above estimation.

To overcome this difference, combination of many measures are required and the menu program to acquire finance resources is shown in Table 2.6-3. Anyway, the evaluation of assessments are essential to create strong financial base because the assessment constitute more than 85% of resources.

The above target will only be achieved by changing and re-evaluating the assessment rates and yearly values. Reevaluation should be as follows:-

Case a: Change the assessment rates only

9.0% x 1.8 = 16.2% (average)

Case b: Change the yearly value only

$338.7 million x 1.8 = $609.6 million (total)

Case c: Multiple change i.e. 50% change in yearly value and 50% change in assessment rate

Assessment rate

9.0% x 1.34 = 12.1% (average)

Yearly value

$338.7 million x 1.34 = 453.8 million

The conclusion is that the assessment rate will not exceed the upper limits which is 35% of yearly value, regulated in the Local Act 1976, Clause 127 and 130. This change will be difficult in social and political terms but it is possible to base it on the present Acts.

Table 2.10-6 Menu Programs to Acquire Finance Resources

1) Increase Revenue of MPSP

Base of Revenue
- Increase of Population
- Invite Industries

Rate of Assessment
- Reevaluate Properties
- Raise Assessment Rates
- Expand Town Area

Special Revenue of S.W.M.
- Commercial Waste
- Bulky Waste
- Tipping Fee at Disposal Sites
- Licence Fee

2) Acquire Grant from Federal Government

3) Acquire Loan of Lower Interest Rate

4) Introduce Subsidy for Interest of Loan

Menu Programs of Cost Down of S.W.M.

5) Improvement Collection & Cleansing Work

6) Degrade Sanitary Landfill Level

7) Privatization