

## Chapter 13. Phased Implementation Plan for MPSP

### 13.1 Stage Plan

#### 13.1.1 Basic Policy of Stage Plan

Stepwise approach is necessary to achieve the targets of the master plan considering the financial limitation and difficulty of obtaining public cooperation.

Phased development plan is proposed as follows in accordance with national Malaysia Plans which have a planning period of 5 years.

- a. Phase I        1991 - 1995
- b. Phase II      1996 - 2000
- c. Phase III     2001 - 2005

Before commencement of Phase I project, immediate improvement projects and interim measure are proposed in order to contribute to successful implementation of the Phase I project.

Table 13.1-1 shows the stage plan for MPSP reflecting the result of the feasibility study for Phase I projects described in Part III. The stage plan is prepared based on the following consideration.

- a. 3 times a week/door to door collection system in the whole residential area should be introduced by 1995. 3 times a week/station collection should be introduced in Phase II and Phase III.
- b. Once a week street sweeping and drain cleansing in residential area with team work system should be established until 1995. These system will be continued in Phase II and Phase III.

- c. Level 3 sanitary landfill sites should be constructed at Kuala Muda and Pulau Burong in 1991. It is proposed that level 4 sanitary landfill system should be realized in Phase III. Solid waste will be disposed of at present disposal sites through mounting up method until 1992.
- d. It is also proposed that an independent organization for solid waste management called as Urban Service Department which will contribute to specialization will be established in Phase I.

Table 13.1-1 Phased Plan for MPSP

	Immediate Improvement Interim Measure		Phase I	Phase II	Phase III
	1989	1991	1995	2001	2005
1) Collection	<ul style="list-style-type: none"> <li>- Replacement of old collection vehicles</li> <li>- Rearrangement of collection vehicle's routes in the North District</li> </ul>	<ul style="list-style-type: none"> <li>- To change the type of collection vehicles</li> <li>- Introducing 3 times a week collection</li> <li>- Plastic bag discharge</li> <li>- Reduction of street/drain cleansing frequency</li> </ul>	- Introduction Station collection		
2) Final disposal	<ul style="list-style-type: none"> <li>- Immediate improvement of existing dump site</li> <li>- Interim measure for final disposal</li> <li>- Detail design of 1st phase landfill sites at K.Muda &amp; P.Burong</li> </ul>	<ul style="list-style-type: none"> <li>- Construction of the third level sanitary landfill sites at: &lt;ha&gt; &lt;cu.m&gt; K.Muda 17.9 560,000 P.Burong 16.7 660,000</li> </ul>	<ul style="list-style-type: none"> <li>- Third level sanitary landfill &lt;ha&gt; &lt;cu.m&gt; 30.0 720,000 23.7 850,000</li> </ul>	<ul style="list-style-type: none"> <li>- Forth level sanitary landfill &lt;ha&gt; &lt;cu.m&gt; 30.0 700,000 23.7 830,000</li> </ul>	
3) Organization Manpower plan	<ul style="list-style-type: none"> <li>- Collection - 350 laborers</li> <li>- Street/drain - 550 laborers</li> </ul>	<ul style="list-style-type: none"> <li>- Establishment of USD</li> <li>- 240 laborers</li> <li>- 430 laborers</li> </ul>		<ul style="list-style-type: none"> <li>- 340 laborers</li> <li>- 470 laborers</li> </ul>	
4) Financial plan	<ul style="list-style-type: none"> <li>- Fee collection amount - M\$0.0 million</li> <li>- Annual budget - M\$9.9 million in 1987</li> <li>- Investment - M\$0.0 million</li> </ul>	<ul style="list-style-type: none"> <li>- M\$ 1.4 million in 1995</li> <li>- M\$16.2 million in 1995</li> <li>- M\$15.6 million</li> </ul>		<ul style="list-style-type: none"> <li>- M\$21.4 million</li> </ul>	<ul style="list-style-type: none"> <li>- M\$4.5 million in 2005</li> <li>- M\$30.0 million in 2005</li> <li>- M\$34.4 million</li> </ul>
5) Privatization	<ul style="list-style-type: none"> <li>- Waste collection - 50 t/d</li> <li>- Street/drain - 25%</li> </ul>	<ul style="list-style-type: none"> <li>- 170 t/d in 1995</li> <li>- 50%</li> </ul>		<ul style="list-style-type: none"> <li>- 240 t/d</li> <li>- 55%</li> </ul>	<ul style="list-style-type: none"> <li>- 320 t/d</li> <li>- 60%</li> </ul>

### 13.1.2 Storage and Collection Week/Station Collection

It is indispensable to get resident's cooperation to achieve 3 times a week/station collection which requires following discharge manner.

- a. Use of Plastic bag
- b. Discharge at 3 days in a week designated by municipality
- c. Bring out waste and discharge at collection point (waste station) designated by municipality

Alternate day collection which is almost same to 3 times a week collection are employed in the Municipalities of Petaling Jaya and Quantan which has positive experience to introduce alternate day collection with door to door service together with using plastic bag and standard household bin.

Bringing out the waste by residents is conducted in Kampong and some high rise building as only a practical method to provide the collection service in those areas. Therefore, and 3 times a week/station collection should be introduced based on the these experience in a systematic manner.

It is also recommended that the introduction of new collection system should start as a pilot project in a model area where the local conditions satisfy the criteria described in 7.2.2 and then expand to other areas. Experience to be gained through the implementation of a pilot project will be useful in diffusing the same system to other area.

Under the condition of present service in MPSP where daily and door to door collection is provided, two pilot projects should be introduced, that is, one for introduction of 3 times a week collection and the other for station collection. After that, 3 times a week/station collection will be introduced as shown in Fig. 13.1-1.

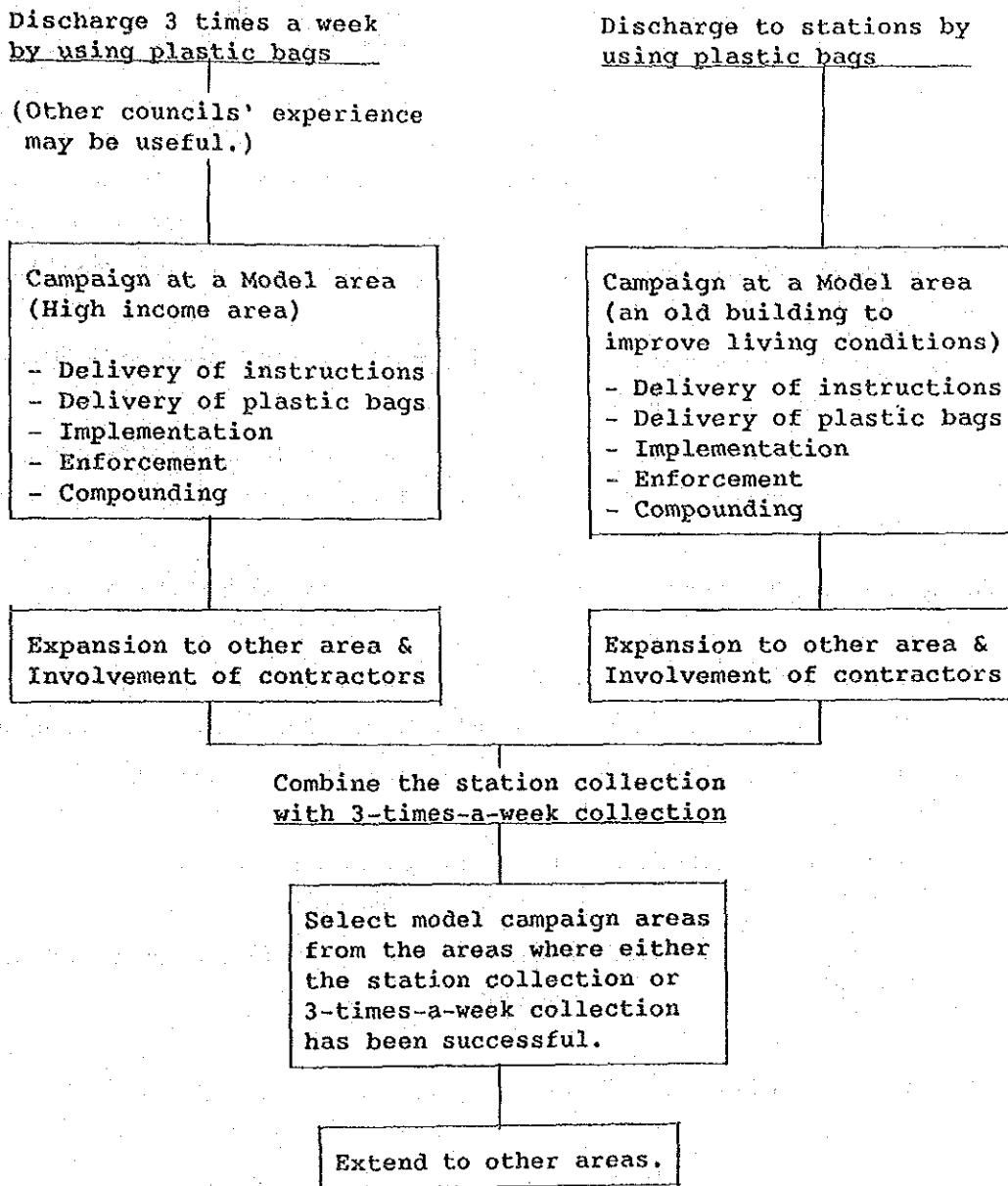


Fig. 13.1-1 Approach to the Introduction of a New Collection System

Considering above conditions, stage plan for collection is summarized as follows.

a. Introduction of New Collection System

- Introduction of 3 times/week and door-to-door collection in North District by 1992
- Introduction of collection 3 times/week and door-to-door in all residential areas by 1995
- Introduction of station collection in residential areas from 1995 till 2005
- Establishment of large amount collection on system
- Establishment of of periodical bulky waste collection by 1995

b. Change to Compactor Vehicle Instead of Open Truck

- Replacement of side loader vehicles with  $10\text{ m}^3$  compactor by 1992.
- Modification of collection zones for private contractors because of employment of  $10\text{ m}^3$  compactor.

c. Provision of Collection Service in New Developed Area

- provision of collection services newly developed areas of 662 ha. by 1995 and 1,297 ha. by 2005.

13.1.3 Street Sweeping and Drain Cleansing

Citizens' cooperation is required to reduce littering of waste.

Littering can be reduced through providing reliable and regular waste collection service, while the illegal dumping can be reduced by the strong enforcement of the law. Therefore, the improvement of cleansing service has been planned as follows:.

a. Introduction of once a week cleansing in residential area

- Introduction of once a week cleansing with team work system by 1995

b. Mechanization

- Mechanization of grass cutting
- Mechanization of street sweeping of main road

13.1.4 Final Disposal

It is unrealistic from the financial viewpoint to construct in Phase I all the facilities related to the KMDS and PBDS, which would meet whole disposal demand up to 2005. Therefore, the master plan for MPSP will be implemented as follows:

a. Phase I

The inland part of KMDS (17.9ha) will be used for landfill operation which will be completed at the end of 1996.

The southern section of the Byram Forest Reserve (16.7ha) will be used for landfill operations which will be completed at the end of 1996.

- Commencement of Construction : 1991
- Period of Landfill Operation : 1992 - 1996
- Design Disposal Amount : KMDS: 210 t/day (1996)  
: PBDS: 250 t/day (1996)
- Design Landfill Volume : KMDS: 0.56 million m<sup>3</sup>  
: PBDS: 0.66 million m<sup>3</sup>  
(total volume between 1992 and 1996 including covering soil)
- Landfill Site Area : KMDS: 17.9 ha  
: PBDS: 16.7 ha

b. Phase II

The lagoon part of KMDS (60ha) will be used for a subsequent landfill operation which will be completed at the end of 2005.

The northern section of the Byram Forest Reserve (12.4ha) and Pulau Burong (35ha) will be used for landfill operation which will be completed at the end of 2005.

- Commencement of Construction : 1996
- Period of Landfill Operation : 1997 - 2001
- Design Disposal Amount : KMDS: 264 t/day (2001)  
PBDS: 312 t/day (2001)
- Design Landfill Volume : KMDS: 0.72 million m<sup>3</sup>  
PBDS: 0.85 million m<sup>3</sup>  
(total volume between 1997 and 2001 including covering soil)
- Landfill Site Area : KMDS: 60 ha (lagoon)  
PBDS: 47.4 ha (Pulau Burong included)

c. Phase III

- Commencement of Construction : 2001
- Period of Landfill Operation : 2002 - 2005
- Design Disposal Amount : KMDS: 311 t/day (2005)  
PBDS: 368 t/day (2005)
- Design Landfill Volume : KMDS: 0.70 million m<sup>3</sup>  
PBDS: 0.83 million m<sup>3</sup>  
(total volume between 2002 and 2005 including covering soil)
- Landfill Site Area : KMDS: 30 ha (lagoon)  
PBDS: 23.7 ha  
(Pulau Burong included)



Based on the above stage plan, the actual preparation and construction of the landfill sites for MPSP as proposal as shown in Figs. 13.1-2, 13.1-3 and 13.1-4.

In view of the facts that the promotion of project which requires substantial investment against limited financial resources may destroy the financial basis of the Council and that the balanced development of the infrastructure (including sewage system) in addition to the solid waste management system is essential for the cost-effective preservation of a healthy environment for urban life, it has been decided that the KMDS and PBDS to be constructed in Phase I and II will be of Level 3 where the system of leachate circulation will be introduced, and that these will be improved to Level 4 in Phase III onwards. This decision is also supported by the environmental impact assessment results showing the impact of Level 3 disposal site on the surrounding environment to be minimal.

Proposed KMDS and PBDS are planned to be opened in January 1992. It is proposed that the following interim measures be taken until the opening of the new disposal sites.

- i. Mounting up of present PPDS
- ii. Use of the extension area of PPDS
- iii. Use of present PBDS (Pulau Burong Disposal Site)

Upon consideration of the above-mentioned aspects, a stage plan is proposed and illustrated as follows:

- From January 1988 the December 1991;  
Mounting-up landfill at the present PPDS and landfill at the extension area of the PPDS (Level 2) and trench method landfill at the PBDS (Level 2)

- From January 1992 to December 2001;  
Landfill at the KMDS and PBDS Phase I and II sites (Level 3)
- From January 2002 to 2005;  
Landfill at the KMDS and PBDS Phase III sites (Level 4)

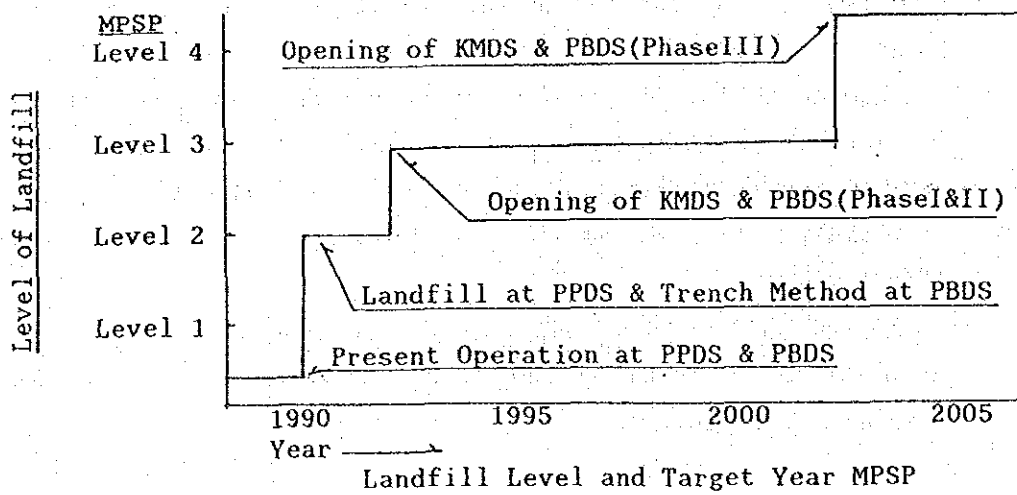
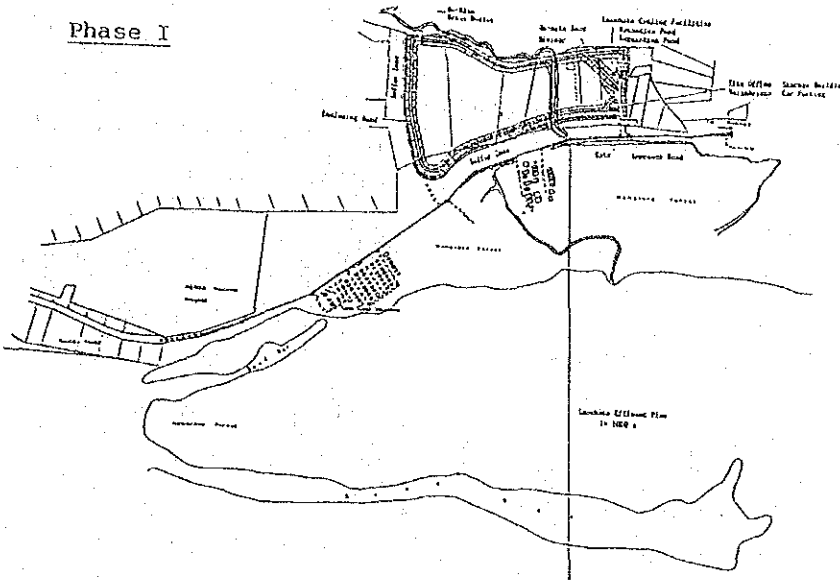
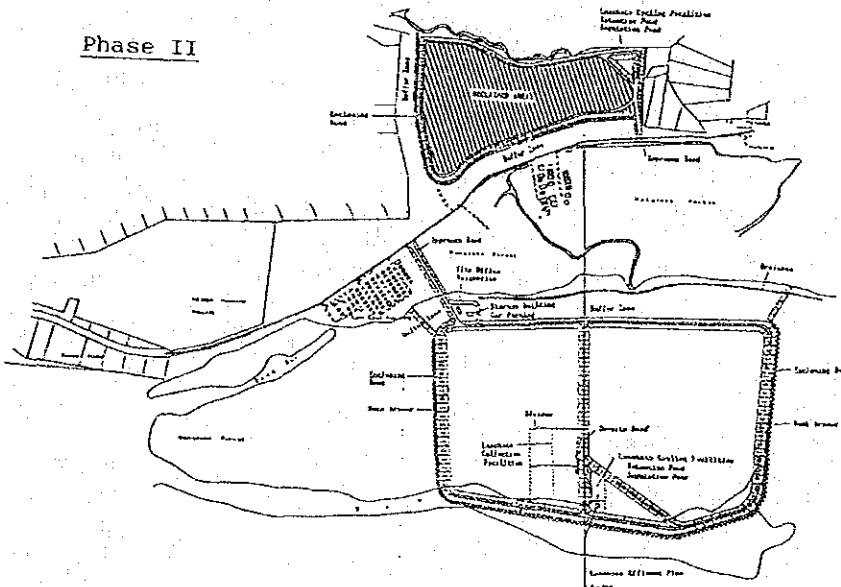


Fig. 13.1-2 Stage Plan of Final Disposal for MPSP

Phase I



Phase II



Phase III

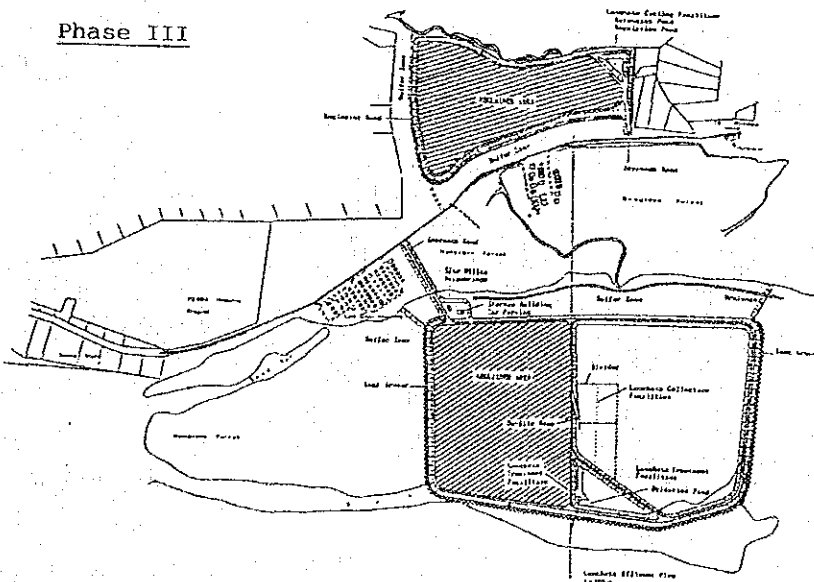
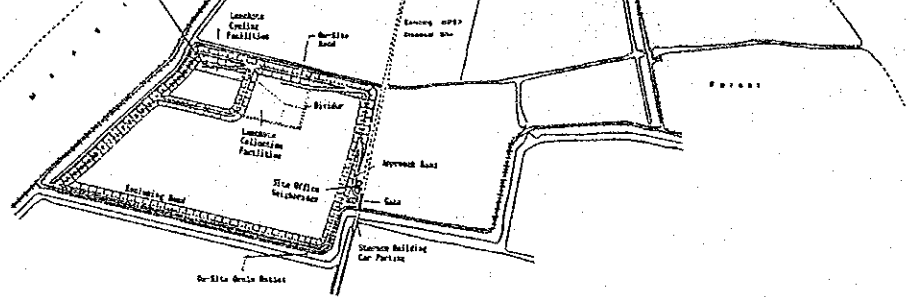


Fig. 13.1-3 Stage Site Development Plan for KMDS

Phase I

STRAITS OF MALACCA

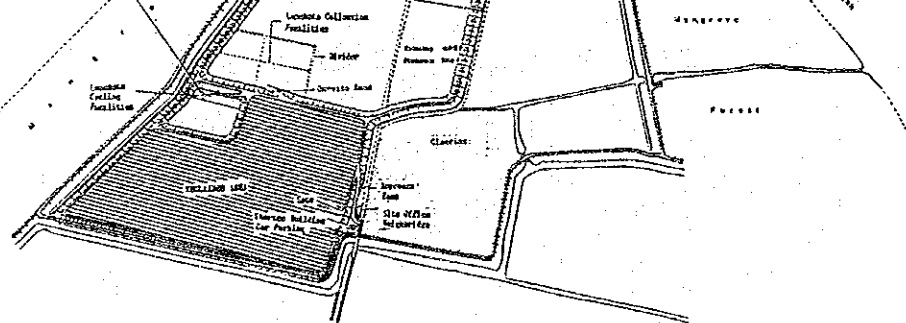
Landuse Effluent Outlet  
1:2000



Phase II

STRAITS OF MALACCA

Landuse Effluent Outlet  
1:2000



Phase III

STRAITS OF MALACCA

Landuse Effluent Pipe  
1:2000

Landuse Freshwater  
Facilities  
1:2000

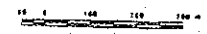
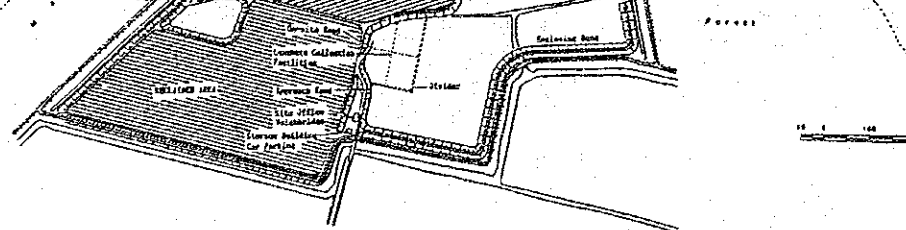


Fig. 13.1-4 Stage Site Development Plan for PBDS

## 13.2 Financial Plan

Based on the results of the feasibility study, the financial plan for the implementation of the Master Plan is proposed in this section.

### 13.2.1 Required Fund

The investment cost and annual expenses have been estimated based upon Part III Tables 3.1-4 and 3.2-4 making the following assumptions:

- a. An additional budget amounting to 15% of the original construction cost may be required for engineering services and allowance for contingency.
- b. Annual expenses except emolument will increase at the rate of 1.5% per year. Emolument will increase at the rate of 2.5% per year.
- c. Rates of interest on long term, middle term and short term loans will be 7%, 9% and 13.5% respectively instead of 6%, 8% and 12%.

#### (1) Investment Cost Required

Implementation of the Master Plan requires MPSP to make a direct investment amounting to M\$71.5 million during the period 1990-2005. Another M\$25 million approximately is assumed to be invested by the contractors, which will be eventually borne by MPSP through the payments to the contractors.

It is proposed that the investment will be made in three phases as shown below:

- Phase I: 1991 - 1995
- Phase II: 1996 - 2000
- Phase III: 2001 - 2005

A phased investment schedule is proposed, as shown in Table 13.2-1.

Table 13.2-1 Phased Investment Schedule

	(M\$ million)				
	<u>Interim Period</u>	<u>Phase 1</u>	<u>Phase 2</u>	<u>Phase 3</u>	<u>Total</u>
1) Collection	-	5.7	6.6	6.1	18.4
2) Cleansing	-	1.6	1.9	1.5	4.9
3) Disposal	0.1	8.5	12.8	26.8	48.2
4) Total	0.1	15.6	21.4	34.4	71.5

Note: (1) The total investment cost excludes the amounts to be invested by contractors.

(2) Inflation is considered as shown in Item b of Section 12.2.1.

(3) It is expected that some expenditures for engineering services will be necessitated in 1990. Such expenditures are included in the above investment costs.

(2) Annual Expenses

Annual expenses comprises of annual operation/maintenance costs and annually allocated depreciation as well as interest to be paid on loans as shown in Table 13.2-2.

Table 13.2-2 MPSP's Estimated Annual SWM Expenses

	(M\$ million)				
	1987	1992	1995	2000	2005
Management	1.0	1.1	1.2	1.3	1.5
Collection	4.4	7.7	8.3	10.5	13.0
Cleansing	4.4	5.1	5.7	6.9	8.4
Disposal	0.1	2.3	2.6	3.1	9.5
Interest on Loans	0.0	1.2	1.5	3.9	4.7
Total	9.9	17.4	19.3	25.7	37.1

Note: Inflation is considered as shown in Item b of Section 12.2.1.

Table 13.2-2 shows that the Master Plan requires an annual expense of M\$37.1 million in 2005 which is about 3.7 times greater than the annual expense in 1987. This implies that the average increase of the annual expense is about 6.9% per year. On the other hand, budget allocation to SWM is assumed to increase by 6.4% annually till 2005. It is also assumed and expected that MPSP will increase its revenues from tipping and commercial waste collection fees, and will obtain as much as M\$4.5 million in 2005. The amount of those fee revenue is about same as the estimated amount of interest to be paid on the loans.

The reasons of increment of annual SWM expense are as follows:

- a. Introduction of sanitary landfill
- b. Increment of solid waste volumes
- c. Expansion of collection services
- d. Increment of personnel cost
- e. Effect of inflation (1.5% per annum)

#### 13.2.2 Major Assumptions Made in the Financial Plan

Numerous assumptions were made in estimating cost. This section shows some critical assumptions and other major assumptions made. MPSP would be forced to follow a different financial scenario than what is indicated in the preceding sections, if these assumptions should turn out to be inaccurate.

##### (1) Critical Assumptions

- a. MPSP and its contractors will successfully achieve a significant reduction in the unit cost of waste collection and haulage by introducing a 3 times/week collection system. Average unit cost of collection and haulage after introducing a 3 times/week collection system is assumed to decrease by about 30%.

b. MPSP will also achieve a significant cost reduction of street/drain cleansing services by reducing the service frequency.

c. MPSP will receive revenue from both commercial waste collection and tipping fees at disposal site in the future. In 1992, MPSP will recover, from the service recipients, 87% of the annual expenses (a total of annual depreciation and operation/maintenance) incurred for provision of these services. These service fees will increase step by step in the future, and will reach 90% in 2005 as shown in Table 13.2-3.

Table 13.2-3 Estimation of Fee Collection (MPSP)

		(in 1987 price)		
MPPP		1995	2000	2005
Waste Amount (t/d)	- Total disposal	437.1	550.8	679.4
	: Direct haul	95.4	116.4	139.9
	: Council	170.9	173.7	215.8
	: Contractor	170.8	260.7	323.7
	- Commercial waste to be collected	80.7	98.5	118.4
Total Cost (M\$1000/year)	- Disposal	2,196	2,426	5,653
	- Collection	3,339	3,431	3,520
Unit Cost (M\$/ton)	- Disposal	13.8	12.1	22.8
	- Collection	53.5	54.1	44.7
	Total	67.3	66.2	67.5
Fee Tariff (M\$/ton)	- Disposal	13.6	15.6	16.1
	- Commercial (B)	58.4	58.4	60.8
	(B/A)	(87%)	(88%)	(90%)
Efficiency of Fee Collection	- Tipping	100%	100%	100%
	- Commercial waste	45%	67%	100%
Fee Collection (M\$1000/year)	- Tipping	474	663	822
	- Commercial waste	767	1,392	2,628
	Total	1,241	2,055	3,450



d. MPSP's Revenue and Budget Allocations to SWM

MPPP's revenue and budget allocations to SWM are shown in Table 13.2-4:

Table 13.2-4 MPPP's Revenue and Budget Allocation to SWM

	(M\$ million)					
	1987	1992	1995	2000	2005	Annual Increase Rate
MPSP's Revenue (a)	31.4	42.9	51.7	70.4	95.9	6.4%
Allocation to SWM from the General Budget (b)	9.9	13.4	16.2	22.0	30.0	6.4%
(b)/(a) x 100 (%)	31.5	31.2	31.3	31.3	31.3	

Note: Inflation is considered as shown in Item b of Section 12.2.1.

(2) Major Assumptions Made with Respect to Loans and Other Financial Sources Available

a. Financial Sources

Different types of financial sources will be available for investments. Proportion of respective financial sources will be as shown in Table 13.2-5.

Table 13.2-5 Financial Resources for the Investment

	(M\$ million)				
	Interim Period	Phase 1	Phase 2	Phase 3	Total
Long Term Loans		8.5	-	-	8.5
Middle Term Loans		4.8	-	-	4.8
MPSP Funds	0.1	2.4	21.4	21.0	44.9
Grant	-	-	-	13.4	13.4
Total	0.1	15.6	21.4	34.4	71.5

Note: 1. MPSP Funds mean internal reserve plus short term loan.  
2. Inflation is considered as shown in Item b of Section 12.2.1.

b. Conditional of the Loans

The following loan conditions are assumed.

Table 13.2-6 Loan Conditions

	REPAYMENT SCHEDULE	INTEREST RATE	
		REAL	NOMINAL
Long Term Loans	Repayment over 20 years with a 3 year grace period	6%	7.0%
Middle Term Loans	Repayment over 10 years with a 2 year grace period	8%	9.0%
Short Term Loans	Repayment in the following year	12%	13.5%

13.2.3 Resources of Revenue

If all residents pay 1% of their annual income towards solid waste management, the annual total will amount to M\$11.7 million in 2005. In addition, M\$2.9 million can be expected from the commercial sector provided that 0.3% of gross regional domestic product (GRDP) of commercial sector is paid towards solid waste management.

Similarly, M\$9.1 million can also be recouped from the industrial sector on the basis of a 0.3% contribution from the GRDP of industrial sector. However, a large proportion of industrial waste will require special treatment. From the macroeconomic viewpoint, therefore, it will be difficult to cover the entire cost of solid waste management by collecting fees.

When the experiences of other municipalities imposing solid waste collection fees are referred to, however, many problems can be observed in the direct collection of fees from residents and, therefore, MPSP may find such fee collection difficult. It is preferable that MPSP will continue the existing indirect collection method under which the solid waste collection fee is included in the assessment rate.

In the commercial sector, the solid waste collection fee can be collected as a surcharge on the water bill, and then increased in a step by step manner in the future.

The rates of the fee should be assessed based upon the amount of waste of each waste generator.

Tipping fee should be assessed based upon the amount of waste brought into the Council's disposal site, and increased in a step by step manner.

As a method of collection of the tipping fee, a pre-paid ticket system may be suitable.

If this direction is selected, data control on beneficiaries must be strictly conducted by demonstrating the correspondence between the generated solid waste volume and the surcharge amount for each company and area. This is to ensure that the cost is fairly shared by all. If fees are imposed on commercial site operation and maintenance costs in both Phases 1 and 2, it will result in a lower budgetary allocation requirement.

Management costs for the project considering inflation are to be born by a portion the assessment (property), fees for commercial waste collection and tipping fees for landfill, as shown in Table 13.2-7.

Table 13.2-7 Resources of Revenue

	(M\$ million)			
	1992	1995	2000	2005
Appropriation from Assessment revenue	13.4	16.2	22.0	30.0
Fee Collection				
- Commercial Fee	0.8	0.9	1.7	3.4
- Tipping Fee	0.5	0.5	0.8	1.1
Total	14.7	17.6	24.5	34.5

Note: Inflation is considered as shown in Item b. of Section 12.2.1.

#### 13.2.4 Cash Flow and Relevant Problems

Fig. 13.2-1 shows the cash flow for the Master Plan in current prices. The figure shows that MPSP's total remaining debt would steadily decrease after 2001, and that the debt amount would decrease to M\$35 million in 2005. The reason why MPSP would have such a big debt is that Master Plan proposes that level 4 sanitary land fill site be constructed in Phase 3. If MPSP would construct a sanitary land fill of level 3 instead of level 4, MPSP would be able to repay all the debt by 2005 as shown in Supporting Report Volume I Chapter 7.

If the revenue of MPSP is assumed to increase at the same rate as the domestic economic growth, the solid waste management cost in MPSP's budget in 2005 will be as large as 31.5%, including the new vehicle procurement cost. Moreover, repayments for the sewage project will continue to be a heavy burden on MPSP's budget, indicating a difficult financial environment for the implementation of the present solid waste management project.

Therefore, it is necessary to execute the following multi-programs to secure financial resources.

##### (1) Increase Revenue of MPSP

###### a. Base of Revenue

- Development of Industries
- Development of Town Area

###### b. Rate of Assessment

- Reevaluate Properties
- Raise Assessment Rates

###### c. Special Revenue of SWM

- Commercial Waste
- Bulky Waste
- Tipping Fee at Disposal Sites
- Licence Fee

##### (2) Securing Fund

- a. Acquire Grant from Federal Government
- b. Acquire Loan of Lower Interest Rates
- c. Acquire Subsidy for the Payment of Interest of Loan

(3) Menu Programs of Cost Reduction of SWM

- a. Improvement of Collection & Cleansing Work
- b. Degrade Sanitary Landfill Level
- c. Privatization

On the other hand, in view of the result of the above analysis, it is essential that a subsidy should be sought from the Federal and/or State Governments for the initial project investment, especially for disposal site construction. It is also necessary that further examination of possible investment cost reductions will be conducted in the Phase II and III in cooperation with the related ministries and agencies.

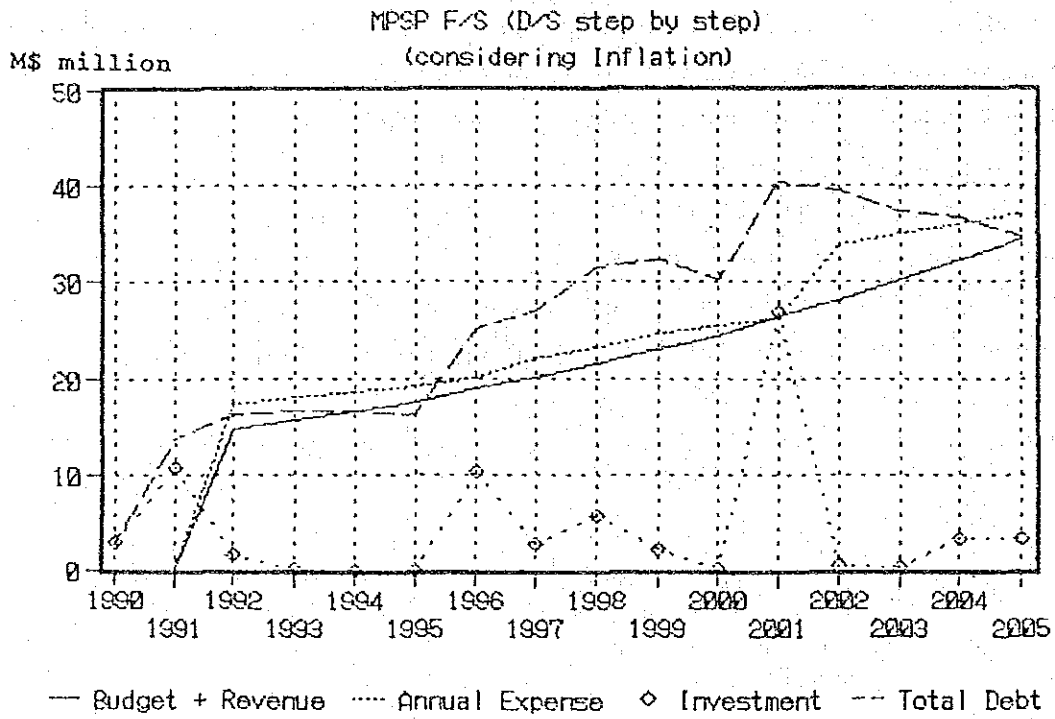


Fig. 13.2-1 Cash Flow for the MPSP Master Plan

## Chapter 14. Further Study Needs

### 14.1 Studies to be Carried Out by MPPP and MPSP

#### (1) Development of Station Collection System

The enlistment of public cooperation in regard to taking their solid waste to stations is essential in order to employ the station collection system in all residential areas by 2005. An immediate improvement programme has been implemented in Bayan Baru where the 3 times-a-week collection system using plastic bags and the once-a-week cleansing system have been adopted. It has been proven that these systems are acceptable to the public.

As these experiments show, the promotion of public cooperation must be pursued through the successful demonstration that the station collection system is acceptable to the public.

The station collection system has in fact already been adopted in some kampongs and by some flats. However, there are problems of whether or not the sanitary conditions of a subject area are acceptable for the introduction of the system and also of the public's acceptance of the system.

These problems must be solved by means of the active provision of an appropriate discharge method and education of the public on the importance of the station collection system.

#### (2) Evaluation and Improvement of Dust Chute System and Study on Appropriate Storage and Discharge

Dust chutes are widely used by shops, flats and commercial buildings, etc. To provide dust chutes in new commercial buildings are currently prohibited from the view point of fire prevention, while dust chute in flats is not prohibited although urgent improvement is required in view of the insanitary and dangerous aspects. As yet, however, improvement efforts have made little progress due to the following reasons.

- a. It is costly to provide sufficient number of dust chutes and space for storage containers in the existing buildings.
- b. In the case of new flats, the provision of a sufficient number of dust chutes at appropriate locations is difficult, mainly because of the limited construction budget.
- c. Most dust chutes are not accessible by collection vehicles. Double handling system therefore is used, which greatly reduces the collection efficiency.

Given the above difficulties, it is recommended that priority be given to the establishment of sanitary conditions by permitting the use of existing dust chutes in buildings where the number of dust chutes and the storage space capacity are satisfactory.

Those dust chutes in buildings with unsatisfactory facilities should be closed down and the discharge of solid waste by the public to stations should be introduced. The public cooperation is essential for the introduction of this system (station collection system). A pilot study should be carried out to prove the feasibility of such system.

### (3) Study on Leachate

There are currently 230 municipal solid waste disposal sites in the Peninsular Malaysia, which are of level 2 or lower standard, and the leachate from them is not controlled. No data or study results on the environmental impact of this leachate are currently available.

It will be necessary for MPPP and MPSP to understand the present quality of leachate and the degree of its influence on groundwater and other water bodies in the neighbouring areas before adopting the sanitary landfill method and a relevant study must be conducted by MPPP and MPSP in cooperation with the MHLG and the DOE.



#### (4) Recovery of Useful Resources and Minimization of Discharge Volume

The recovery of useful resources is currently conducted by private organizations and no public organization is involved in this operation. Although the present recovery system is functioning relatively well, the involvement of the public sector in the resource recovering will be necessary to promote it. The actual conditions of the recovery of useful resources by private organizations have not been adequately recorded. Therefore, a study on the following items should be jointly implemented by MPPP and MPSP in cooperation with the Federal Government and State Government.

- Actual conditions of recovery operation
- Extent of involvement of any public organization in the recovery of useful resources
- Appropriate method for recycling of useful resources at places of generation
- Possibility of introducing separate collection

With regard to the recovery of useful resources and the minimization of the discharge volume at places of generation, it is recommended that self-reliant recovery by the public be promoted through the education of the public on the importance of resource conservation. MPPP and MPSP should be actively involved in the operation in terms of coordinating the residents' organization and private recovery companies.

#### (5) Disposal Site Monitoring

Continuous study and monitoring of disposal sites will be necessary to prevent an adverse environmental impact and to develop the relevant technologies and should consist of the following.

- Regular analysis of gas and leachate
- Continuous collection of data on hauled solid waste in both the quantitative and qualitative aspects
- Regular measurement of settlement of waste disposed of

(6) Preparation of Safety and Sanitary Work Standards

Solid waste collection work not only tends to be insanitary but also involves a high risk of injuries and accidents. A study on improving the sanitary conditions and the safety of the work should be conducted by MPPP and MPSP so that safety and sanitary work standards can be prepared based on the study results.

(7) Solid Waste Management Cost Analysis

Since a proper understanding of the cost is essential to achieve efficient solid waste management, the scope of the costs involved in solid waste management should be clearly defined so that at least the collection cost, disposal cost and cleansing cost can be compared with those of other municipal councils.

(8) Study on Public Health at Non-Collection Areas and Squatter Areas

There still exist areas such as squatter areas where no waste collection service is provided. A study should be carried out on the public health conditions in and waste collection and disposal methods suitable to such areas in order to improve the public health conditions of the areas as much as possible. This should be carried out by MPPP and MPSP in cooperation with the Ministry of Housing and Local Government and the Ministry of Health.

## 14.2 Studies to be Carried Out by Ministry of Housing and Local Government (MHLG)

### (1) Technical Development of and Data Accumulation on Level 3 Disposal Site

There is no doubt that the Level 3 disposal sites proposed in Phase I will constitute a significant improvement compared with the disposal system currently in use in Malaysia.

During the present study, it was agreed that the Project would commence with the provisional construction of a Level 3 disposal site due to the financial constraints assuming the site's upgrading to a Level 4 disposal site as soon as possible prior to the target year of 2005.

A problem still remains in that Malaysia has no experience of Level 3 disposal sites, and, therefore, it is desirable that concrete data be collected and analyzed and that the disposal performance and environmental impact of Level 3 disposal sites be verified by the construction and the monitoring of the Kulim Disposal Site proposed by the MHLG as soon as possible. The design criteria for a sanitary landfill disposal site should then be consolidated on the basis of the above experience.

### (2) Study on Appropriate Incineration Plants

The introduction of an incineration plant in Phase I has not been proposed, mainly due to financial limitation. However, the current difficulty in securing disposal sites indicates that the introduction of incineration plants will be inevitable in the near future.

While an incineration plant with a capacity of 100 tons/day was constructed at Kuala Terengganu in July, 1987, this plant has been little used due to many reasons. A study on the construction of appropriate incineration plants in the future should be encouraged and should take those reasons incapacitating the use of the Kuala Terengganu incineration plant into consideration.

### 14.3 Studies to be Carried Out by Department of Environment (DOE)

#### (1) Development of Toxic and Hazardous Waste Treatment and Disposal System

The realistic classification of toxic and hazardous waste, the introduction of appropriate disposal methods for each category of such waste and the development of the treatment and disposal system are essential for the effective control of toxic and hazardous waste.

By definition, any municipal solid waste disposal site is incapable of disposing of toxic and hazardous waste. Therefore, the early construction of a toxic and hazardous waste disposal site should be promoted by the DOE.

In addition, haulage control should be conducted to study a possible system to prevent the haulage of toxic and hazardous waste to municipal solid waste disposal sites by MPPP and MPSP in cooperation with the MHLG and DOE.

## APPENDICES

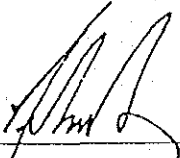


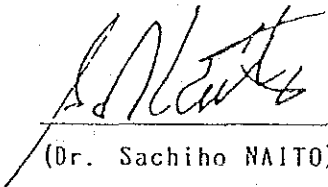
SCOPE OF WORK  
FOR  
SOLID WASTE MANAGEMENT STUDY  
FOR  
PULAU PINANG AND SEBERANG PERAI MUNICIPALITIES

AGREED UPON BETWEEN  
THE ECONOMIC PLANNING UNIT  
OF  
THE PRIME MINISTER'S DEPARTMENT  
ON BEHALF OF  
THE GOVERNMENT OF MALAYSIA  
AND  
THE JAPAN INTERNATIONAL COOPERATION AGENCY

KUALA LUMPUR

NOVEMBER 6, 1987

  
\_\_\_\_\_  
(Mr. Helmi bin Mohd. Noor)  
DEPUTY DIRECTOR GENERAL  
ECONOMIC PLANNING UNIT  
PRIME MINISTER'S DEPARTMENT  
ON BEHALF OF  
THE GOVERNMENT OF MALAYSIA

  
\_\_\_\_\_  
(Dr. Sachiho NAITO)  
LEADER OF THE JAPANESE  
PRELIMINARY STUDY TEAM  
ON BEHALF OF  
THE JAPAN INTERNATIONAL  
COOPERATION AGENCY

## I. INTRODUCTION

In response to the request of the Government of Malaysia, the Government of Japan has decided to conduct a Solid Waste Management Study for Pulau Pinang and Seberang Perai Municipalities ( hereinafter referred to as " the Study " ) and in accordance with the relevant laws and regulations in force in Japan, the Japan International Cooperation Agency ( hereinafter referred to as " JICA " ), the official agency responsible for the implementation of the technical cooperation programmes of the Government of Japan, will undertake the Study in close cooperation with the authorities of Malaysia.

The Present document sets forth the Scope of Work with regard to the Study.

## II. OBJECTIVE OF THE STUDY

The objective of the Study is to develop a comprehensive Solid Waste Management System for the Municipal Council of Pulau Pinang ( hereinafter referred to as " MPPP " ) and Municipal Council of Seberang Perai ( hereinafter referred to as " MPSP " ), with the aim to improve and safeguard public health and protect environmental quality.

The Study will formulate a Solid Waste Management Master Plan, and carry out a Feasibility Study for the first phase project based on the Master Plan.

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### III. STUDY AREA

The Study covers the operational area of Solid Waste Management under the jurisdiction of MPPP and MPSP.

### IV. SCOPE OF THE STUDY

The Study will deal with municipal solid wastes in the study Area and will be carried out in two (2) successive stages;

- (1) Master Plan Study Stage
- (2) Feasibility Study Stage

And each of them will be conducted with field surveys in Malaysia and analysis works both in Malaysia and in Japan. The Master Plan Study will cover the period from 1990 to 2005.

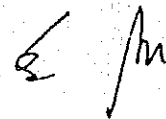
#### (1) Master Plan Study Stage

1. Analysis of the present conditions
  - 1-1 Collection of data and existing documents
  - 1-2 Comprehension of the present Solid Waste Management system and identification of problems
2. Presumption of solid waste generation and composition
3. Confirmation of the planning framework
  - 3-1 Determination of basic criteria for the design of the plan
  - 3-2 Determination of the future system components based on the comparative analysis of alternatives

4. Formulation of the Master Plan
  - 4-1 Solid waste generation and discharge control plan
  - 4-2 Collection and transfer plan
  - 4-3 Processing and final disposal plan
  - 4-4 Organization and management plan
  - 4-5 Financial Plan

(II) Feasibility Study Stage

1. Confirmation of the planning framework
  - 1-1 Target year
  - 1-2 Planning area
  - 1-3 Necessary service level
  - 1-4 System components
2. Examination of the least cost combination of the system components
  - 2-1 Preparation of system component alternatives
  - 2-2 Comparative study for the selection of the least cost combination
3. Preliminary design of facilities
  - 3-1 Transfer stations
  - 3-2 Disposal sites
4. Examination of material and equipment
5. Cost estimation
6. Consideration of institution and organization
7. Project evaluation
  - 7-1 Economic evaluation
  - 7-2 Financial evaluation
  - 7-3 Social and environmental evaluation
8. Project implementation
  - 8-1 Implementation schedule
  - 8-2 Financial plan



## V. STUDY SCHEDULE

The Study will be executed in accordance with the attached tentative schedule.

## VI REPORTS

JICA shall prepare and submit the following reports to the Government of Malaysia.

1. Inception Report  
Twenty (20) copies within one (1) month from the date of the commencement of the Study in Malaysia.
2. Progress Report ( I )  
Twenty (20) copies, at the middle of the fourth month.
3. Progress Report ( II )  
Twenty (20) copies, at the middle of the sixth month.
4. Progress Report ( III )  
Twenty (20) copies, at the end of the eighth month.
5. Interim Report  
Twenty (20) copies, at the beginning of the eleventh month.
6. Progress Report ( IV )  
Twenty (20) copies, at the end of the twelfth month.

7. Draft Final Report

Twenty (20) copies, at the middle of the fifteenth month.

The Malaysian Government will provide the Study Team with their comments within one (1) month after receipt of the Draft Final Report.

8. Final Report

Fourty (40) copies, at the middle of the eighteenth month. All comments given by the Malaysian Government will be compiled in the preparation of the final report.

The Study Team should ensure that all data, information, maps, materials and findings connected with the Study are kept confidential and not revealed or disposed of to any third party except with the prior written consent of the Government of Malaysia. Such maps and aerial photographs are to be returned to the Government of Malaysia immediately upon completion of the Study. All reports when finalized and submitted to the Government of Malaysia shall remain the property of the Government of Malaysia.

VII. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

To facilitate the smooth conduct of the Study the Government of Malaysia shall take the following necessary measures;

1. To inform the members of the Study Team of any existing risk in the study area and to take any measures deemed necessary to secure the safety of the Study Team.
2. To ensure the necessary entry permits for the Study Team to conduct field surveys in Malaysia and exempt them from consular fees.
3. To exempt the members of the Study Team from taxes and duties, as normally accorded under the provision of Malaysian General Circular No. 1 of 1979, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study.
4. To exempt the members of the Study Team from Malaysian income tax on their official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources.
5. To provide the necessary facilities to the Study Team for remittance as well as utilization of funds introduced into Malaysia from Japan in connection with the conduct of the Study.
6. To secure permission for entry into private properties or restricted areas for the conduct of the Study.

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7. To provide the Study Team with medical services when needed but the expenses will be chargeable to the members of the Study Team.
8. To make arrangements for the Study Team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia, in order to prepare the reports.
9. To provide the Study Team with available data, maps, and information necessary for the execution of the Study.
10. To appoint counterpart personnel to the Study Team during the study period.
11. To provide the Study Team with suitable office space with clerical service and necessary office equipment in Georgetown, MPPP and Butterworth, MPSP.
12. To provide the Study Team with adequate means of local transport for official travel only.
13. To indemnify any member of the Study Team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct, and

*S / v*

14. To nominate the Ministry of Housing and Local Government to act as counterpart agency for the Study and the Economic Planning Unit as the main coordinating body in relation to MPPP, MPSP and other relevant governmental and non-governmental organizations.

#### VIII. UNDERTAKINGS OF JICA

In order to conduct the Study, JICA shall take the following measures:-

1. To dispatch, at its own expense, the Study Team to Malaysia,  
and
2. To pursue technology transfer to the Malaysian counterpart personnel in the course of the Study.

#### IX. CONSULTATION

JICA and the Government of Malaysia shall consult each other in respect of any matter that is not agreed upon in this document and which may arise from or in connection with the Study.

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Attachment

TENTATIVE STUDY SCHEDULE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Mobilization																			
Master Plan Study																			
Feasibility Study																			
Presentation of Reports																			
		▲		▲				▲			▲				▲				▲
		IC/R		P/R I				P/R II			IT/R		P/R IV		DE/R				F/R

▲ : Reports

□ : Home Work in Japan

≡ : Field survey and/or Explanation of Reports

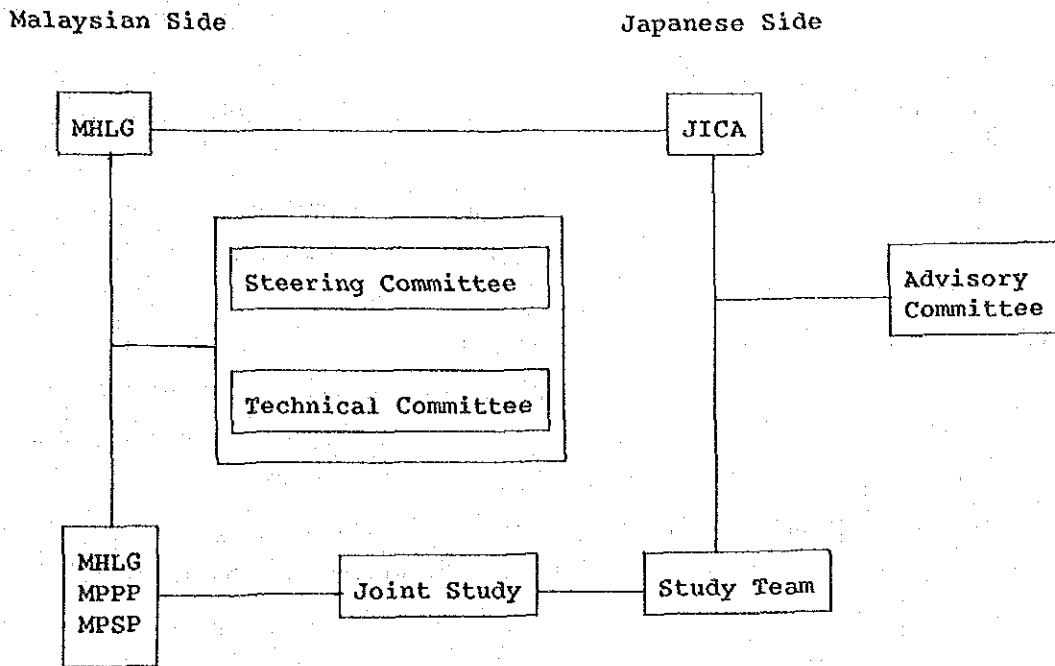
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Appendix 2 Study Organization and Persons Involved

The Study was conducted under the organization as shown in the Figure belows:

Organization Chart



Members of the Steering Committee

1. Mr. Mohd Akbar bin Baba  
Chairman  
Director  
Social Services Section  
Economic Planning unit  
Prime Minister's Department
2. Mr. Tan Hoo  
Director, Technical Section  
(until Nov. 88)  
Local Government Division  
Ministry of Housing and Local Government
3. Dr. Kunitoshi Sakurai,  
JICA Expert (until Nov. 88)  
Local Government Division  
Ministry of Housing and Local Government
4. Prof. Yasushi Matsufuji  
JICA Expert (from Dec. 88)  
Local Government Division  
Ministry of Housing and Local Government
5. Mrs. Habibah bte Abdul Hadi  
Assistant Secretary (until July 88)  
State Government of Penang
6. Mrs. Hiswani bte Harun  
Assistant Secretary (from Aug. 88)  
Penang State Government
7. Mr. Kazal Sinha  
Senior Public Health Engineer  
Local Government Division  
Ministry of Housing and Local Government
8. Mrs. Wan Norma bte Wan Daud  
Assistant Director  
Foreign Aid Section  
Economic Planning Unit  
Prime Minister's Department

9. Mr. Mohd Ridhuan Ismail  
Public Health Engineer  
Local Government Division  
Ministry of Housing and Local Government
10. Mrs. Kalsom bte Abdul Ghani  
Environmental Control Officer  
Department of Environment
11. Mr. Mohd Yasin Mohd Salleh  
Principal Assistant Director  
Social Service Section  
Economic Planning Unit  
Prime Minister's Department
12. Tuan Hj. Zolkifly Hj. Che Din  
Director of Administration  
Municipal Council of Pulau Pinang
13. Dr. Khoo Thean Chin  
Director of Health Services Department  
(until Sep. 88)  
Municipal Council of Pulau Pinang
14. Mr. Zakaria Mohd Taib  
Secretary  
Municipal Council of Seberang Perai
15. Dr. Mohamed Haroon  
Director of Health Department  
(until Sept. 88)  
Municipal Council of Seberang Perai
16. Mr. Muhamad bin Hamzah  
Principal Assistant Director  
Social Services Section  
Economic Planning Unit  
Prime Minister's Department
17. Mrs. Nooraini bte Mohd Ali  
Secretary  
Assistant Director  
Social Services Section  
Economic Planning Unit  
Prime Minister's Department

Members of the Technical Committee

1. Y.B. Dato' Kamaruddin Mahmood    Chairman  
Secretary General  
Ministry of Housing and Local Government
2. Mr. S. Veloo    Director General (until June 88)  
Local Government Division  
Ministry of Housing and Local Government
3. Mr. Lim Cheng Tatt    Director General (from Oct. 88)  
Local Government Division  
Ministry of Housing and Local Government
4. Mr. Tan Hoo    Director  
Technical Section (until Nov. 88)  
Local Government Division  
Ministry of Housing and Local Government
5. Mr. Kazal Sinha    Senior Public Health Engineer  
Local Government Division  
Ministry of Housing and Local Government
6. Dr. Kunitoshi Sakurai    JICA Expert (until Nov. 88)  
Local Government Division  
Ministry of Housing and Local Government
7. Prof. Yasushi Matsufuji    JICA Expert (from Dec. 88)  
Local Government Division  
Ministry of Housing and Local Government
8. Tuan Hj. Zolkifly Hj. Che Din    Director of Administration  
Municipal Council of Pulau Pinang
9. Dr. Khoo Thean Chin    Director of Health Services Department  
(until Sept. 88)  
Municipal Council of Pulau Pinang

10. Dr. S. Velaiutham  
Acting Director  
Health Services Department (from Oct. 88)  
Municipal Council of Pulau Pinang
11. Mr. Zakaria Mohd Taib  
Secretary  
Municipal Council of Seberang Perai
12. Dr. Mohamed Haroon  
Director of Health Department  
(until Sept. 88)  
Municipal Council of Seberang Perai
13. Mr. Yaacob Nordin  
Director  
Penang Town and Country Planning  
Department  
State Government of Penang
14. Mr. Idris Abdul Rahim  
Assistant Director  
Penang Town and Country Planning  
Department  
State Government of Penang
15. Mrs. Hiswani bte Harun  
Assistant Secretary  
State Government of Penang
16. Mr. Sugunan Pillay  
Chief Public Health Engineer  
Engineering Services Division  
Ministry of Health
17. Mr. Peter Ho Yueh Chuen  
Principal Assistant Director  
Department of Environment
18. Mr. Hashim Malik  
Environmental Control Officer  
Department of Environment
19. Mr. Abdul Rahman Awang  
Environmental Control Officer  
Department of Environment

20. Mrs. Kalsom bte Abd. Ghani      Environmental Control Officer  
Department of Environment
21. Mr. Ibrahim Abd. Majid      Environmental Control Officer  
Northern Regional Office  
Department of Environment
22. Mrs. Nooraini bte Mohd Ali      Assistant Director  
Social Services Section  
Economic Planning Unit  
Prime Minister's Department
23. Mr. M. Raju      Health Inspector  
Municipal Council of Seberang Perai
24. Mr. Mohd Ridhuan Ismail      Secretary  
Public Health Engineer  
Local Government Division  
Ministry of Housing and Local Government

Members of the Advisory Committee

Dr. Sachiho Naito

Chairman  
Chancellor, Kanto Gakuin University

Dr. Kunitoshi Sakurai

Acting Chairman (from Dec. 88)  
Environmental Health Development  
Specialist  
Institute for International Cooperation  
JICA

Mr. Yoshio Yagi

Waste Management Division  
Water Supply and Environmental  
Sanitation Department  
Environmental Health Bureau,  
Ministry of Health and Welfare

Mr. Hisaya Aoki

General Director  
Bureau of Environment  
Yokohama City

Mr. Masahisa Nakamura

Chief Researcher  
Lake Biwa Research Institution  
Shiga Prefecture

Miss Sachiko Misumi  
(Study Coordinator)

Study Coordinator  
Social Development Cooperation Department  
JICA

## Members of Study Team

Mr. Kango Mito	Project Manager
Mr. Toshiro Hamada	Regional Development Planner
Mr. Hiroshi Abe	Collection and Haulage Planner
Mr. Kouji Kusunoki	Collection and Haulage Planner
Mr. Hayato Shiotsuki	Treatment Planner
Mr. Susumu Shimura	Disposal Planner
Mr. Takeyasu Kikuta	Geological Surveyor
Mr. Jun-ichi Nagamura	Facility Planner
Mr. Masayuki Ishiya	Operation Planner and Programmer
Mr. Kiichiro Sakaguchi	Organizational and Institutional Analysist
Mr. Kozo Baba	Economic and Financial Analysist
Mr. shinya Kawata	EIA Expert
Mr. Shigeru Kondo	Solid Waste Analysist



## Appendix 3 Results of Immediate Improvement Plan

### A3.1 Collection and Cleansing for MPPP

#### (1) Execution of Immediate Improvement Plan

- a. As mentioned in Chapter 7, the pilot project for introduction of 3 times a week collection and once a week cleansing system in Bayan Baru are being implemented from beginning of March 1989.
- b. MPPP had a meeting with the residents association of Bayan Baru in the middle of February 1989 and provided 15 standard plastic bags and notices. A information van was sent out everyday and the overseers also went around to explain the new scheme to the residents. A special compactor vehicle has been prepared, specially painted with a slogan "Pilot Cleansing Project".
- c. As planned, the scheme was launched on 1st March 1989. A total of ten laborers are used in this scheme, four for the refuse collection excluding a driver and six for the cleansing service.
- d. After the end of March 1989 when residents should start to buy new standard plastic bags by themselves, a lot of complaints were made. Accordingly MPPP had adopted the following two decisions:
  - To sell the standard plastic bag which is requested to use for waste discharge at a subsidized rate of 10 cents per bag.
  - To allow people use any type of plastic bags.
- e. After that, complaints were reduced and it has been operating smoothly. Now, a side loader is used instead of a compactor, because of small amount of waste in the area.
- f. As a result of the pilot project, it is proved to save the amount of labour in comparison with the previous operation. Now, MPPP is planning to expand the area of the new operation.

g. The following indicators have been being monitored from the beginning of the pilot project.

- Number of standard plastic bags used for waste discharge.
- Number of other plastic bags used.
- Number of plastic bags torn and scattered.
- Number of illegal dumpings in the area.
- Complaints
- Waste amount collected
- Dumping time

(2) Results of the Pilot Project

- a. It seems that residents in Bayan Baru has accepted the new system.
- b. The pilot project is proved to save laborer by half.
- c. Complaints by residents are mainly about purchasing of plastic bag and once a week cleansing and not about 3 times a week collection.
- d. Cleansing drains once a week poses a problem in certain places where inverts of the drain are sunken and provide a potential breeding ground for mosquitoes.
- e. Relocation of laborers is necessary which will be a big problem to introduce the proposed system.

### A3.2 Disposal for MPPP

#### (1) Execution of the Immediate Improvement Plan

Considering the present situation of final disposal in MPPP, the proposed immediate improvement plan has been modified and executed by MPPP as follows:

##### a. Construction of buffer zone

The proposed buffer zone has been modified and constructed by Engineering Department of MPPP.

The modified buffer zone is basically the construction of a bund with imported earth and a gas removal facility and planting of trees which MPPP Engineering Department managed to obtain for free.

The estimated cost by Engineering Department for the construction of the bund and the gas removal facility are \$4,000 and \$6,000 respectively.

##### b. Construction of an enclosing net fence

The Engineering Department has examined the way to reduce the construction cost of the enclosing net fence by utilizing local materials. However, MPPP has made the decision to apply mounting-up of the BSDS and the JMPDS for the interim period.

Owing to the short term sea reclamation by the waste at the BSDS and estimated construction cost, MPPP has given up the construction of the enclosing net fence.

Mounting-up landfill operation at the BSDS commenced from December 17th, 1988.

c. Reinforcement of landfill operation

Preparation of weekly/monthly operational plan and regular topographic survey at a 3-4 months interval has been accepted and commenced execution by the Engineering Department. However, the ultimate use plan for the completed landfill has not been made yet because land ownership of the BSDS belongs to the Penang state government.

d. Reconsideration of disposal fee system

The new system of disposal fee as well as operation hour of the disposal site was made as follows and has been implemented since January 1st, 1989.

ITEMS	PREVIOUS SYSTEM	NEW SYSTEM
1. Disposal Fee and Permit	M\$60/month per an applicant without limitation in disposal amount	M\$80/month or M\$10/day per a vehicle without limitation in disposal amount
2. Method of Payment and Issue of Permit	When application is approved at the workshop, payment is made at KOMTAR. The permit is given out when receipt of payment is shown.	When the application is approved at the workshop, payment is made at the Vehicles Department/Office situated at the workshop. Applicant may collect the permit after producing receipt of payment made.
3. Work Hours	7:00 AM - 1:30 PM (except Sunday and public holidays)	8:00 AM - 6:00 PM (Daily)

e. Close collaboration with departments

MPPP has taken necessary actions on this subject, especially on the revision of disposal fee system that was made in collaboration with other departments.

f. Recognition of the importance of sanitary landfill for final disposal and consent to the increase in the final disposal cost

MPPP including Council, Adhoc Committee and administrators have paid favourable attention to the above subjects.

This is proven by the decision on sanitary landfill at the PADS which requires considerable financial burden on MPPP owing to the great increase of transportation and disposal cost.

(2) Improvement and Results following the Execution of Immediate Improvement Plan

Most of the proposed immediate improvement subjects have been executed with some modifications and revision of the original proposals; i.e. the construction of an enclosing net fence has been replaced with mounting-up landfill operation. Improvement and results following the execution of immediate improvement plans are described below.

a. Improvement of the surrounding environment

Due to the change of landfill operation at the BSDS from sea reclamation to mounting-up, the surrounding environment, especially sea, has been improved. An enclosing bund on the already reclaimed area of the BSDS prevent the sea from being directly polluted by the floating waste and leachate. These improvements are shown in following photos:



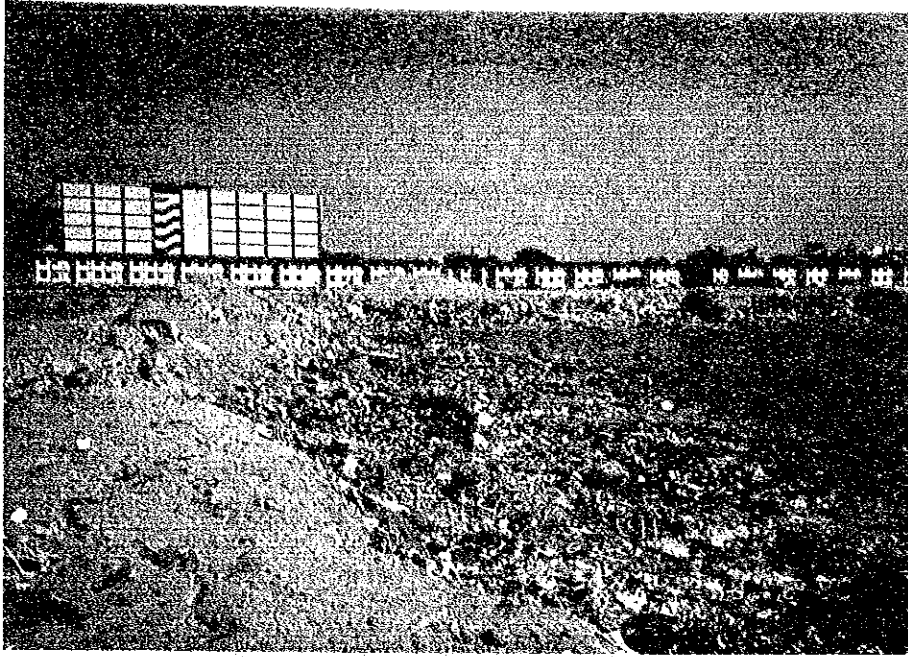


Photo 1 The BSDS before Execution of Immediate Improvement Plan,  
February 20th 1988

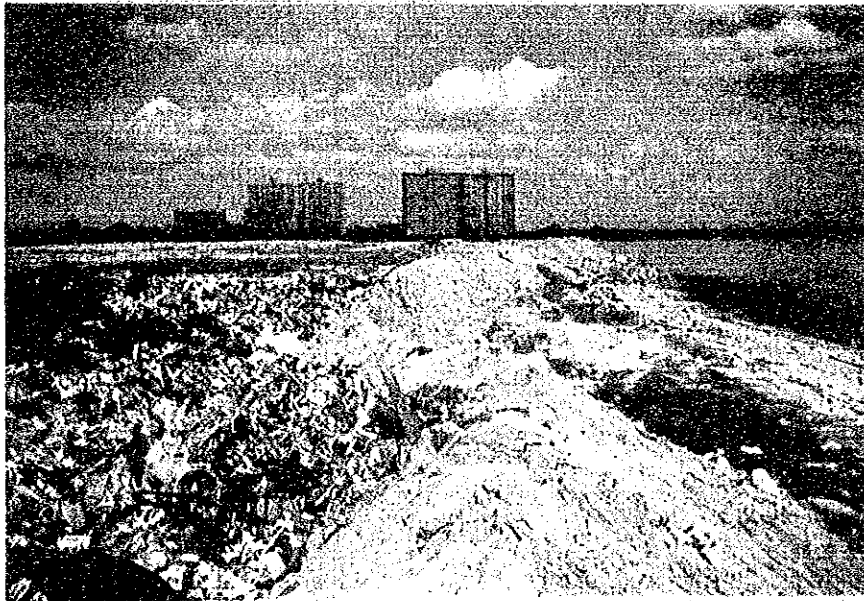


Photo 2 The BSDS after the Execution of Immediate Improvement Plan,  
January 1989





b. Decrease in complaints from surrounding residents

Due to the improvement of the environment, the complaints from surrounding residents have been decreased in numbers. The following figures show the number of complaining letters to the local newspapers about the operation of the BSDS,

- From May to December 1987            4 times
- 1988                                        3 times
- From January to June 1989            once

c. Smooth operation of the BSDS

(3) Issues following the Execution of Immediate Improvement Plan

The increase in total amount of disposal fee collected and direct hauled waste by private sector had been expected after the execution of the new system of disposal fee. However, the result was the opposite to the expectation as follows:

i. Amount of disposal fee collected

- 1987 (from May)                        \$11,760/year
- 1988                                        \$ 7,860/year
- 1989 (up to June 26)                \$ 3,420/year

ii. Amount of direct hauled waste by private sector except the contractor of MPPP

- 1987 (from May)                        15,275 ton/year
- 1988                                        25,320 ton/year
- 1989 (up to April)                    5,156 ton/year

Although, the above mentioned results indicate a great possibility of the increase of the illegal dumping, it has not been identified by MPPP, because of the lack of statistic system on illegal dumping such as information and registration system for illegal dumping. However, upon consideration of the above mentioned figures, MPPP should take necessary measures for the improvement of the results. The Study Team proposes the following measures:

- i. Strict enforcement of the Anti-Litter By-Laws, 1983
- ii. In case that the above mentioned measure is difficult to implement or is not effective, the disposal fee system should be reconsidered again. (The original proposal of the Team was "M\$80/month or M\$5/day per an applicant". However, it was changed by the full council meeting to "M\$80/month or M\$10/day per a vehicle.)

### A3.3 Collection and Cleansing in MPSP

#### (1) Execution of Immediate Improvement

- a. As mentioned in Chapter 7, low efficiency of collection vehicles in some area is pointed out and it is proposed to set-up a vehicle control system for improvement of efficiency and for preparation of stand-by vehicles.
- b. The data of weighbridge did not indicate whether this low efficiency was due to irregular collection or too small collection zone for the vehicle. In order to find this out, time and motion study was carried out on all vehicles in Butterworth.
- c. The President and the Secretary of the Council called for a meeting between the Senior Health Inspectors and Health Inspectors on zonal basis on the dates. During these meetings, the Health Inspectors were briefed on the findings of the Study. Finally, both the management and the officers accepted the findings of this Study. The President of MPSP directed the officers to implement the findings immediately.
- d. The officers are in the process of implementing the findings. The monitoring at the weighbridge goes on. Feedbacks are being sent to the officers for their implementation. It requires further planning and rerouting. The officers have been given a free hand on rerouting.
- e. A new routing in the case of central district was carried out.

#### (2) Results of the Immediate Improvement Plan

- a. The Study indicates all the vehicles in Butterworth area are under-utilised owing to the inefficient routing and overlapping routes. Instead of the existing 25 vehicles, all Butterwoth needs are 13 vehicles. This is a conclusion of the Study. Infact, all the time it was thought there is an inadequate number of vehicles to cope with

day to day collection. This Study for the first time indicated that MPSP has excess vehicles.

However, this could only be achieved through rerouting of the vehicles to cover a wide area and take over the work of 12 zones where excess vehicles were identified. The identification of excess vehicles could save operating expenditure and also future investment cost.

- b. It is proposed these excess vehicles would be reallocated for standby vehicles. These standby vehicles would enable MPSP to maintain the existing fleet of vehicles in tip top condition. Infact it is planned that these standby vehicles could be put to serve the regular areas and the regular vehicles could be laid off for effective preventive maintenance, e.g. overhaul, painting, welding, etc. This would enable MPSP to create a fleet of vehicles that could deliver uninterrupted service to public and reduce public complaints and overtime expenditure.
- c. The study not only had indicated excess vehicles but also an excess of 54 workers operating the excess vehicles. This is a great saving on manpower. These extra workers could be used for vehicles preventive maintenance team, for vehicles and others. They could also be utilised to create 'flying squads' to deal with urgent problems and complaints. This manpower saving also had brought about great saving in operational cost.
- d. A certain Health Inspector's zone in central district had two compact loaders and two open trucks. The Study indicated that the zone only needed one compact loader and two open trucks. This was tested and the reduction of one compact loader was found feasible.
- e. This attempt brought results beyond the wildest dream of anyone. No one ever expected MPSP could save millions of dollars in a short period of time.

#### A3.4 Disposal for MPSP

##### (1) Execution of the Immediate Improvement Plan

Considering the present situation of final disposal in MPSP, the proposed immediate improvement plan has been modified and executed by MPSP as follows:

###### a. Improvement of the on-site road at the PPDS

Improvement of the on-site road commenced in late August 1988.

Waste along the line of the proposed on-site road was initially levelled and compacted and then earth transported from the borrow pit was levelled and compacted over it. Finally, gravel was laid as pavement.

MPSP had spent M\$18,312 in 1988 and in 1988 (until June) to purchase gravel for the on-site road. Currently the road is in good condition.

###### b. Application of cover

The application of cover soil at the disposal site commenced at the same time as the improvement of on-site road. In the beginning, earth for the construction was obtained from a borrow pit within the PPDS.

Now, the cover materials have been purchased by contractor since January 1989. The Council had finalised the public tender for the purchase of cover materials. So far M\$42,295 (up to June 1989) was spent for the purchase of cover material.

###### c. Establishment of disposal site boundary at the PPDS

The site boundary along the drainage canal, which lies in northern and eastern edge of the PPDS, was cleared and levelled. However, owing to limited finance, the proposed enclosing bund has not been constructed yet. Instead of it, an enclosing drain has been constructed.

d. Reinforcement of organization for final disposal

The Council administrators and Coucillors acknowledged and understood the importance of the above subjects. Reorganization of the present organization on SWM in MPSP has been planed, which involves in few of the related departments, i.e. the Health Department, Engineering Department etc.

In response to the above, a civil engineer for the preparation of operational plan and an overseer for the inspection at the PBDS were assigned from the Engineering and Health Department respectively.

Several waste collection vehicles have also been utilized as tipper trucks for transportation of cover soil since late August 1988.

e. Preparation of operational plan

The civil engineer from Engineering Department was assigned and assisted in the preparation of operational plan. However, weekly/monthly operational plan was made in verbal form and a regular topographic survey has yet to be carried out. The ultimate use plan for the completed landfill has not been made because ownership of the PPDS belongs to the Penang state government.

f. Recognition on the importance of sanitary landfill for final disposal and consent to the increase in final disposal cost

MPSP including the Council and administrators have paid favourable attention to the above subjects.

This is proven by the decision on sanitary landfill at the KMDS and PBDS which requires considerable financial burden on MPSP owing to the great increase of transportation and disposal cost. And MPSP spent totally \$218,240 for the improvement of the PPDS from August 1988 to June 1989. This is almost double of the final disposal budget in 1988.

(2) Improvement and Results following the Execution of Immediate Improvement Plan

Most of the proposed immediate improvement subjects have been implemented with some modifications and revision of the original proposals, i.e. the construction of an enclosing bund has been replaced with the construction of enclosing drain. Improvement and results following the execution of immediate improvement plans are described below:

a. Improvement of the surrounding environment

Owing to the execution of the immediate improvement plan, specially application of cover materials, the surrounding environment of the PPDS has been considerably improved. This is proven by the number of the days when the PPDS had fire, i.e. in 1989 (up to July), it was only less than four days, while it was more than five months in 1988. In fact, the fire and smoke were the symbol of the PPDS which people could identify from Pulau Pinang. This improvement is shown in following photos,







Photo 1 The PPDS before Execution of Immediate Improvement Plan,  
February 1988

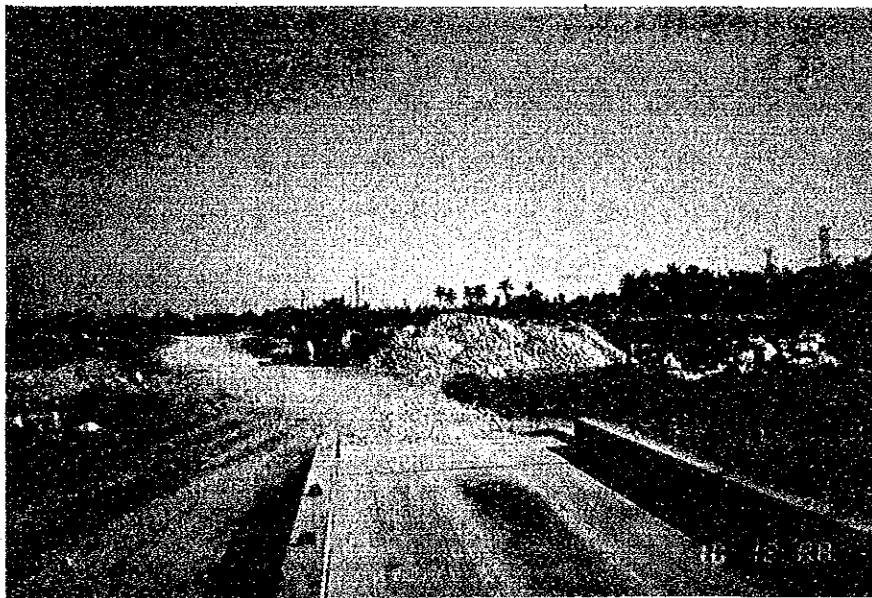


Photo 2 The PPDS after the Execution of Immediate Improvement Plan,  
December 10th 1988



b. Decrease in complaints from surrounding residents

Owing to the improvement of the environment, the complaints from surrounding residents have been decreased in numbers. The following figures show the number of complaining letters to the local newspapers about the operation of the PPDS,

- 1987            more than 10 times
- 1988            more than 10 times
- 1989            not received yet

c. Working time reduction for collection vehicles at the PPDS at the PPDS because of good and smooth on-site road

d. Increase in efficiency of landfill equipment operations

e. Establishment of the organization for the operation of disposal sites.

f. Decrease in complaints from workers at the PPDS

g. Smooth operation of the PPDS

In addition to the above-mentioned improvements and results, it is emphasized that the Council is now considering to introduce a disposal fee collection system, because the introduction of the sanitary landfill requires a considerable amount of money, while previous open dumping needed much less amount of it.

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