

10. Proposed Arrangements for Reorganization, Finance and Privatization

10.1 Arrangements Proposed for MPPP

10.1.1 Organization and Labor Management

Section 10.1.1 presents the following four proposals:

- 1) Functional Specialization in SWM by Public Health Inspectors
- 2) Establishment of an Independent Department Responsible for Solid Waste Management (SWM)
- 3) Review of the Role of the Ad Hoc Committee on SWM
- 4) Improvement on the Labor Management

(1) Functional Specialization in SWM by Public Health Inspectors

a. Necessity for Functional Specialization

The realization of functional specialization through the establishment of an independent department responsible for SWM is one of the most important recommendations related to the institutional building. The functional specialization is recommended due to the following reasons.

- 1) SWM requires increasingly more professional knowledge and skill in the future than in the past.
- 2) Operational nature of SWM is very different from that of licensing for food handlers and other health related matter, although both the former and the latter have a common goal: i.e., the promotion of public health and environmental sanitation. (It is a historical fact that productivity of goods and services has increased through the functional specialization.)

b. Necessity for Establishing an Independent Department Responsible for
SWM

Establishment of an independent department (herein referred to as Urban Service Department - USD) responsible for SWM will result from the specialization in SWM by a department and its head. Such departmental specialization in SWM is strongly recommended in view of the following:

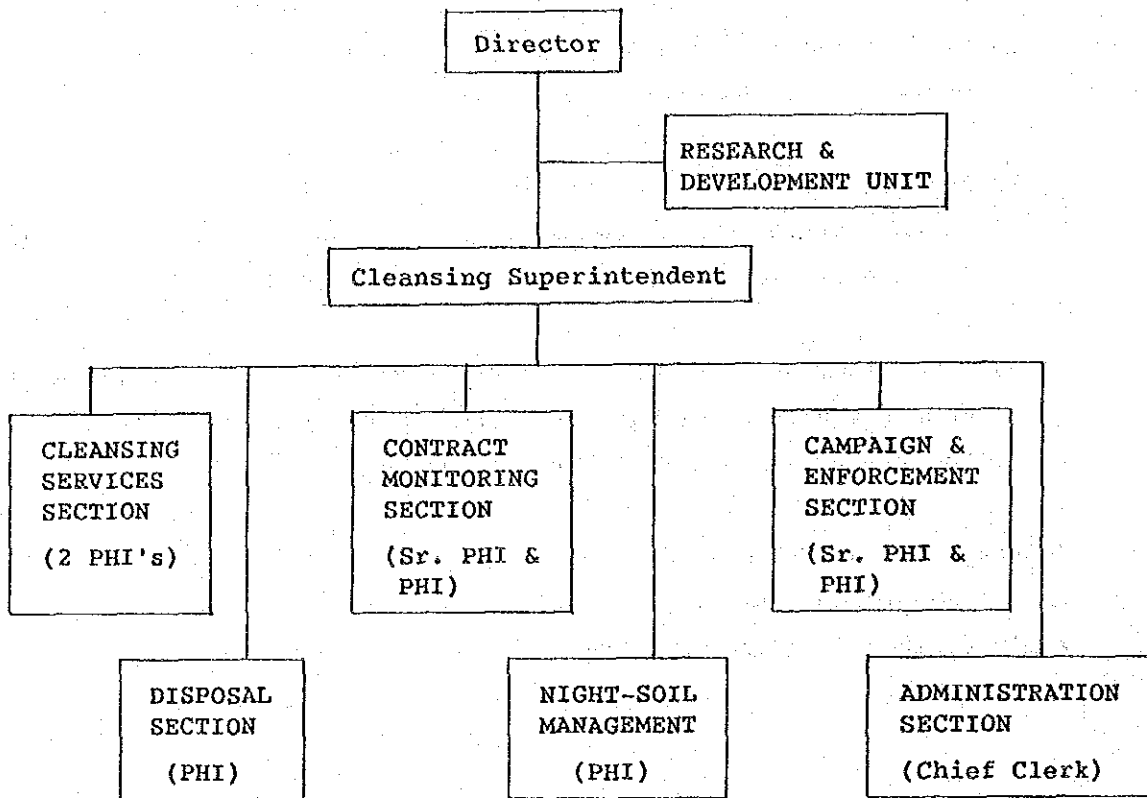
- 1) Solid waste management (SWM) of MPPP is important and large enough to deserve receiving an USD. SWM shares 38% of the Council's total manpower and 26% of its expenditure.
- 2) The demand for solid waste management service will further increase in the future both in terms of quantity and quality. The demand for higher technological standard will also increase.
- 3) Establishment of an USD can naturally lead to the specialization in SWM at the level of both PHIs and departmental head, through which their managerial capacity can be strengthened.

To establish an USD does not basically require money. Whether or not to establish it depends on the decision of the Council's top administrators. It seems there is no major reasons to delay its establishment.

(2) Proposed Scheme for the New Department (USD) Responsible for SWM

a. Organizational Framework Proposed

An organization scheme as shown in the chart below is proposed for the new Urban Service Department of MPPP. The organizational scheme of the USD proposed below is the one that can be implemented immediately by deploying the existing cleansing personnel.



Note:

- 1) The responsibility of Cleansing Services Section will include street and drain cleansing as well as collection and haulage.
- 2) Positions shown below the names of sections indicate the heads of these sections. Actual appointments, however, should be made based upon the merits of individual persons.

Fig. 10-1 Proposed Organization of the Urban Services Department for MPPP

b. Features of the Organization Proposed

The organization proposed has the following features:-

- i. In line with the government's policy of reducing the size of personnel in civil service, the new department is proposed in such a way that it does not require the Council to recruit new employees except for the head of the department. All other personnel required can be deployed from the existing Health Department.
- ii. The new department will have seven sections as shown below.
 - 1) Cleansing Service Section
 - 2) Contract Monitoring Section *
 - 3) Campaign & Enforcement Section *
 - 4) Disposal Site Planning & Management Section *
 - 5) Night-soil Management Section
 - 6) Research & Development Section*
 - 7) Administrative Section

Note: Sections marked with asterisks will perform new functions which have not been performed under the existing Health Department.

- iii. All the sections except the Administrative Section are headed by either Sr. PHI's or PHI's. The heads of the sections are directly answerable to the Cleansing Superintendent. This is to eliminate unnecessary time-consuming formalities.
- iv. The new department will absorb collection vehicle drivers who are currently placed under the Engineering Department.

c. Function of Each Section

i. Cleansing Service Section

This section is responsible for the execution of all the Cleansing Services which are provided by the workers of the existing Health Department. The cleansing services include street and drain cleansing, collection and haulage of solid wastes.

ii. Contract Monitoring Section

The duty of this Section is to make sure that contractors provide required service in a satisfactory manner. MPPP currently receives service from six contractors.

Sr. Overseers will be responsible for the daily close monitoring of the contract service. Each overseer will be responsible for the supervision of two contractors.

iii. Campaign and Enforcement Section

Campaign and enforcement are necessary if MPPP wishes to improve its collection efficiency through the introduction of a new system such as usage of plastic bags and standardized bins on the part of residents and introduction of alternate-day collection system in selected areas.

iv. Disposal Site Planning and Management Section

In view of the increasing difficulty in securing disposal sites and also increasing importance of sanitary disposal of waste, systematic acquisition of disposal sites as well as the site-planning and management have already become important enough to have some personnel specialized in this field.

Ideally speaking, there should be some environmentalists or public health engineers with a university degree qualification.

v. Night-Soil Management Section

At present, Health Department has ten overseers responsible for the supervision of night-soil collection and haulage. In view of the decreasing demand for this service, it would be realistic to replace five Overseers with five mandors. (Overseers who will be made redundant are transferred to Campaign and Enforcement Section in the proposed scheme.)

vi. Research and Development Unit

The functions of this unit include the following:

- 1) Monitoring the performance of cleansing services
- 2) Development or research for improvement

Monitoring the performance of the services and measuring the efficiency are important steps towards the identification of problems and improvement on efficiency of services. Monitoring will also enable the Council to assess its progress towards the Master Plan Targets. The person in charge of this unit should develop some performance indicators.

vii. Administration Section

Under the proposed scheme, judging from the personnel size of the department, one Chief Clerk and ten other personnels including clerks, typists and office boys would be sufficient to the new Department.

d. Role of Personnel Expected

In order to strengthen the solid waste management, personnel in respective level (Departmental head, PHI, and overseers, etc.) are expected to perform more positive roles than currently practised. Roles of personnel expected are summarized in Table 10-1.

Table 10-1 Roles of Personnel Expected

PERSONNEL RESPONSIBLE	ROLES TO BE PLAYED
Council Administrators	<ul style="list-style-type: none"> - Support of work-morale - Disciplinary control - Provision of training - Target, Strategy & Policy
Departmental Head	<ul style="list-style-type: none"> - Over-all management - Fair evaluation of employees' work performance
Cleansing Superintendent	<ul style="list-style-type: none"> - Measurement of Productivity and cost-control - Over-all supervision
PHI's and Sr. PHI's	<ul style="list-style-type: none"> - Monitoring the service performance - Identification of fundamental problems - Working out implementation plans for system-improvement - Training of overseers - Management of data-base
Overseers	<ul style="list-style-type: none"> - Discipline of laborers - Attending to day-to-day routine, solving problems and reporting - Preparation of weekly work-schedule
Mandors	<ul style="list-style-type: none"> - Supervision and control of laborers
Labourers	<ul style="list-style-type: none"> - Execution of cleansing work

(3) Review of the Role of the Ad Hoc Committee on SWM

The following is the view presented by the Study Team.

a. Background

The Ad Hoc Committee was formed in 1981 to correct the ills of the Health Department at a time of contracting out its cleansing services. The same Committee, has performed very well, and achieved its aim in overcoming almost all the problems that overshadowed the Health Department's progress. But even after achieving this target, the Committee still continued to control the department's activities.

The Ad Hoc Committee, at present, holds a monthly meeting with contractors to evaluate their monthly performance, and to discuss and solve problems related to their services. The Committee checks such matters as:

- Daily waste collection tonnages in comparison to the tonnage expected
- Daily work-finishing-time to check lateness of the service
- Appropriateness of locations of some communal-bins

It seems that such deep involvement of the Committee in the day-to-day affairs has lead to a situation where the functional powers of the department have eroded to a great extent that it has affected the general morale of the personnel in the department.

The power of the Ad Hoc Committee can be best utilized for attending to more important matters such as the strengthening of the law enforcement and receiving citizens' cooperation with respect to waste discharge manner.

b. Recommendations

As a responsible Committee, it should recommend to the Council the abolition of the Committee and passing over the responsibility back to the Health Department. Or alternatively, the President of MPPP should ask the Ad Hoc Committee to review the managerial capability of the Health Department to take over the responsibility of SWM by itself, and submit a report to him. At the same time, he can also ask the Department itself to submit a report reassuring of its readiness to take over the functions of the Ad Hoc Committee and run the SWM by itself.

If the President, after receiving the reports, feels that the Health Department still cannot stand on its own feet, then the role of the Committee should be reviewed. It should function in a different manner more like a policy-maker and consultant on SWM. Implementation of these policies should be left to the Health Department. The Committee should not have any dealings directly or indirectly with the contractors, which is essentially an administrative matter of the department.

(4) Improvement on Labor Management

a. Necessity for Effective Disciplinary Control and Work-Morale Support

The Council's labor management is generally weak and loose in terms of its disciplinary control and work-morale support. The loose management, in fact, is an important element which explains why the Council is lower than the contractors in terms of waste collection efficiency.

The degree of severity of disciplinary actions, in some cases, has been reduced substantially as compared to what was originally proposed by the departmental heads. Another drawback of the Council's disciplinary system is that it takes such a long time for the Council to reach to a final decision. It often took one and a half years before the final decision is made.

b. Solution to the Problem

The root of this problem is so deep that it requires not only the proposed organizational reform but also more importantly requires serious attention of the Council's Administrators. What is equally required is the reduction of the political interference by the Councillors in the Council's administrative and managerial affairs.

The power of making decision on the disciplinary matters, in the present set-up, is entirely in the hands of the disciplinary action committee members comprising of the Council's Administrators and Councillors. This implies that the problem, though serious, may possibly be solved quickly and simply upon the change in the attitude of those decision makers.

10.1.2 Finance

(1) Financial Sources for the Operation and Maintenance

The target SWM cost in 2005 is estimated to be 130% of the cost in 1987 in real term provided that all the improvement measures would be successfully implemented as proposed in the Master Plan. In the view of the necessity for securing the sufficient fund for SWM and other services of the Council, the following recommendations are presented.

- 1) Increase of the assessment revenue through:
 - Review (increase) of the assessment rates
 - Reduction of arrear through better information system and stronger collection activity

- 2) Establishment of "Beneficiary-Pay-Principle" under which the following two types of fee should be collected:
 - Fees for Commercial Waste Collection Service
 - Tipping fees for disposal service

The following table shows types of SWM services and persons who should bear the costs of the services.

Table 10-2 Proposed Sources of Fund for SWM Service

<u>TYPE OF SWM SERVICES</u>	<u>PROPOSED SOURCES OF FUND</u>
1. Domestic Waste Collection	Assessment (Local Property Tax)
2. Commercial Waste Collection	Fees to be collected from service recipients.
3. Disposal of Waste Privately Brought into Municipal Disposal Sites	Tipping fees to be collected from the service recipients.
4. Waste Collection/Haulage and Cleansing for Public Premises (Roads, Parks, Facilities, etc.)	Owners of premises

Both the tipping fees and the fees for commercial waste collection should be gradually raised so that those fees would be sufficient enough to fully (100%) cover the costs of those services in 2005.

The Council can keep the same amount of the appropriation to SWM from its general budget over the long period provided that those fee revenue would increase as proposed above.

The sources of the fund for SWM services in 2005 are estimated as shown below provided that the two kinds of fees are collected as proposed above.

- The Assessment will cover 84% of the SWM expense in 2005.
- Commercial waste collection fees will cover 14% of the SWM expense in 2005.
- Tipping Fees will cover 2% of the SWM expenses in 2005.

(2) Financial Sources for Investment

a. Construction Cost of Final Disposal Facilities

It is recommended that both the Federal Government and the State Government provide financial assistance (grants or low-interest-rate-loans) to cover the major portion of investment costs. This recommendation is presented in view of the following.

- i. Under the existing tax system in Malaysia where the Local Authorities receive a very small portion of the aggregate tax paid by all Malaysians, the Local Authorities including MPPP and MPSP are financially not capable of undertaking large investment projects such as the construction of disposal facilities.
- ii. On the other hand, the Federal Government (DOE) has recently set high standards regarding environmental quality, and requires the Local Authorities to meet such standards. With respect to waste disposal, a sanitary landfill system would be the only choice that would meet the standards. The construction of sanitary landfills, however, requires a large investment.

In view of the above situation, it is simply impossible for the Council to meet the disposal standards without having financial support from the Federal or State Government.

It is strongly hoped that the Sixth Malaysia Plan of the Federal Government will include sufficient budget for the development of sanitary disposal system and for the improvement on some other aspects of SWM in Malaysia.

b. Replacement of Collection Vehicles

The existing collection vehicles (mainly side-loaders) should be replaced with large-sized compactor vehicles in the near future in view of the long distance from collection points to the future disposal site.

It is advised that the Council will prepare sufficient budget for the timely replacement of the vehicles.

(3) Establishment of an Independent Accounting System for SWM

It is strongly recommended that the Council should establish an independent accounting system for SWM in view of the necessity to accurately identify SWM costs. An accurate identification of SWM costs is a first step for the evaluation of the efficiency and progress of SWM performance.

10.1.3 Privatization

(1) Waste Collection and Haulage

MPPP currently uses five contractors for the solid waste collection and haulage. Those contractors collect 87 % of the waste in MPPP area. Though MPPP had many problems in managing the contractors in its initial stage of the privatization, it had overcome most problems. Most contractors are satisfactory in their performance. The contract prices are competitively low.

In view of the situation mentioned above, it is advised that MPPP would maintain the same policy regarding the use of contractors for the collection service.

(2) Privatization of MPPP's Clinics

MPPP has clinics for child and welfare, and clinics for the Council's employees. There are about 70 staff working for the clinics. Those clinics have been giving financial burden to the Council. The operation and maintenance of those clinics requires large expenditures as MPPP basically provides free medical services to patients except for costs of medicines charged at the child and welfare clinics.

Besides, MPPP's financial situation is not favorable. Its deficit is estimated to be 17.8 million Malaysia dollar which corresponds 32 % of the estimated revenue in 1989.

According to the Malaysian Laws, the provision of medical services is not the responsibility of the Local Governments, it is the responsibility of the Federal Government.

Considering all the above points, it is recommended that all the Council's clinics should be privatized by transferring its ownership and management responsibility. This will allow MPPP to save considerable amount of money every year, which in turn would help the Council to improve the standard of the other services including waste disposal service.

10.2 Arrangements Proposed for MPSP

10.2.1 Organization and Labor Management

Section 10.2 presents the following three proposals:

- 1) Functional Specialization in SWM by Public Health Inspectors
- 2) Establishment of an Independent Department Responsible for Solid Waste Management (SWM)
- 3) Improvement on the Labor Management

(1) Functional Specialization in SWM by Public Health Inspectors

a. Necessity for Functional Specialization

The realization of functional specialization through the establishment of an independent department responsible for SWM is one of the most important recommendations related to the institutional building. The functional specialization is recommended due to the following reasons.

- 1) SWM requires increasingly more professional knowledge and skill in the future than in the past.
- 2) Operational nature of SWM is very different from that of licensing for food handlers and other health related matter, although both the former and the latter have a common goal: i.e., the promotion of public health and environmental sanitation. (It is a historical fact that productivity of goods and services has increased through the functional specialization.)

b. Necessity for Establishing an Independent Department Responsible for SWM

Establishment of an independent department (herein referred to as Urban Service Department - USD) responsible for SWM will result from the specialization in SWM by a department and its head. Such departmental specialization in SWM is strongly recommended in view of the following:

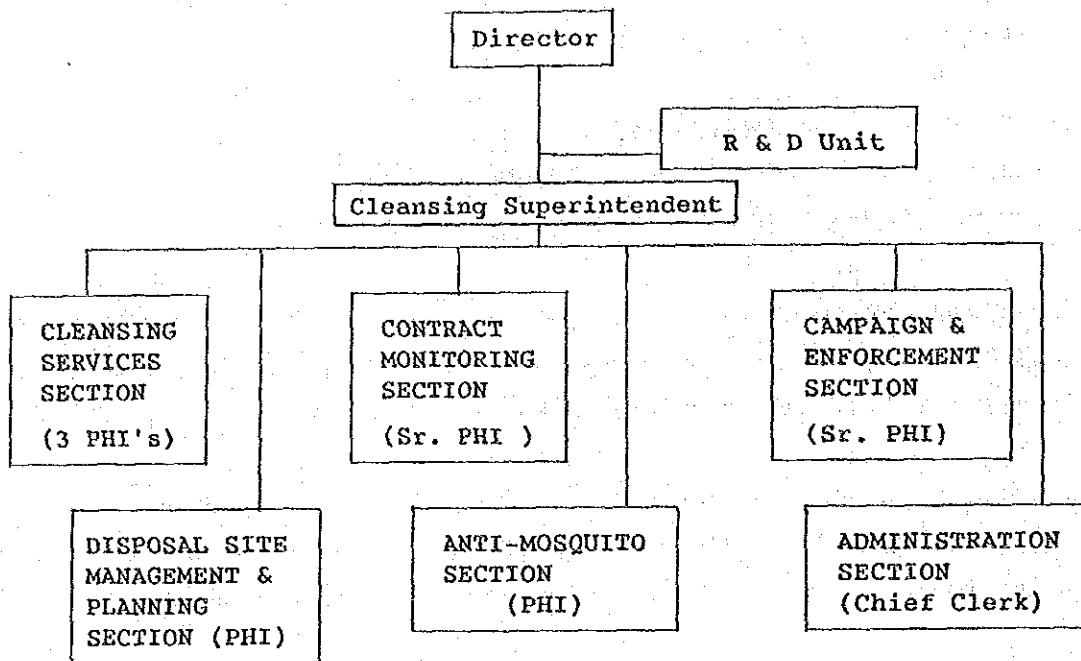
- 1) Solid waste management (SWM) of MPSP is important and large enough to deserve receiving an USD. SWM shares 56% of the council's total manpower and 31% of its expenditure.
- 2) The demand for solid waste management service will further increase in the future both in terms of quantity and quality. The demand for higher technological standard will also increase.
- 3) Establishment of an USD can naturally lead to the specialization in SWM at the level of both PHIs and departmental head, through which their managerial capacity can be strengthened.

To establish an USD does not basically require money. Whether or not to establish it depends on the decision of the Council's top administrators. It seems there is no major reasons to delay its establishment.

(2) Proposed Scheme for the New Department (USD) Responsible for SWM

a. Organizational Framework Proposed

An organization scheme as shown in the chart below is proposed for the new Urban Service Department of MPSP. The organizational scheme of the USD proposed below is the one that can be implemented immediately by deploying the existing cleansing personnel.



Notes:

- 1) Position shown below the names of sections indicate the heads of these sections proposed. Actual appointment, however should be made based upon the merits of individual persons.
- 2) The responsibility of Cleansing Services Section will include collection/haulage and street/drain cleansing.

Fig. 10-2 Proposed Organization of the Urban Services Department for MPSP

b. Features of the Organization Proposed

The organization proposed has the following features:-

i. In line with the government's policy of reducing the size of personnel in civil service, the new organization is proposed in such a way that it does not require MPSP to recruit new employees except for the head of the department.

ii. It has seven sections as shown below.

- 1) Cleansing Service Section
- 2) Contract Monitoring Section*
- 3) Campaign & Enforcement Section*
- 4) Disposal Site Management & Planning Section*
- 5) Research & Development*
- 6) Anti-Mosquito Section
- 7) Administration Section

The four sections marked with asterisk will perform new functions.

iii. All the sections except the Administrative Section are headed by either Sr. PHI's or PHI's. The heads of the sections are directly answerable to the Cleansing Superintendent. This is to eliminate unnecessary time-consuming formalities.

c. Function of Each Section

Functions to be assigned to each section are explained as follows:-

i. Cleansing Service Section

This section will be responsible for street/drain cleansing and collection/haulage. In the proposed scheme, this section will be managed by three PHIs. In view of the wide-spreadness of respective district in Seberang Perai, it is proposed that each PHI will be responsible for one of the three districts: North, Central and South.

ii. Contract Monitoring Section

The duty of this Section is to make sure that contractors provide required service in a satisfactory manner. MPSP currently receives service from seven contractors.

iii. Campaign and Enforcement Section

Campaign and enforcement are essential if MPSP wished to introduce a new system such as alternate-day collection and usage of plastic bags and standardised bins on the part of residents.

iv. Disposal Site Management and Planning

In view of the increasing importance of sanitary disposal of waste, the site management and planning have already become important enough to have some personnel specialized in this field.

It is recommended that MPSP will recruit some environmentalists or public health engineers with a university degree qualifications in the future.

v. Research and Development Unit

In the proposed scheme, one PHI is assigned to Research and Development Unit. A person to be assigned to this Section should be creative and keen to identify problems. This unit is expected to perform the new functions including the following:

- 1) Analysis of information obtained at the weigh-bridge
- 2) Developing or searching for new tools and equipment
- 3) Analysis of current practice

vi. Anti-Mosquito Section

This section will execute anti-mosquito activity that has been carried out by the existing Health Department. In the proposed scheme, this section will be placed under the Urban Service Department in view of the operational nature of this service; major anti-mosquito operation is the cleansing of some drains. Currently this service is provided only in Butterworth.

vii. Administration Section

In the proposed scheme, all the existing personnel (One Chief Clerk and 21 other personnel including clerks, typists, etc.) in the Administrative Unit of the Administrative Section of the Health Department will be transferred to the new department. The existing Licencing Unit and Computer Unit of the Administrative Section will remain in the Health Department.

d. Role of Personnel

In order to strengthen the solid waste management, personnel in respective level (Departmental head, PHI, and overseers, etc.) are expected to perform more positive roles than currently practised. Roles of personnel are summarized in Table 10-3.

Table 10-3 Roles of Personnel Expected

PERSONNEL RESPONSIBLE	ROLES TO BE PLAYED
Council Administrators	<ul style="list-style-type: none"> - Support of work-morale - Disciplinary control - Provision of training - Target, Strategy & Policy
Departmental Head	<ul style="list-style-type: none"> - Over-all management - Fair evaluation of employees' work performance
Cleansing Superintendent	<ul style="list-style-type: none"> - Measurement of Productivity and cost-control - Over-all supervision
PHI's and Sr. PHI's	<ul style="list-style-type: none"> - Monitoring the service performance - Identification of fundamental problems - Working out implementation plans for system-improvement - Training of overseers - Management of data-base
Overseers	<ul style="list-style-type: none"> - Discipline of laborers - Attending to day-to-day routine, solving problems and reporting - Preparation of weekly work-schedule
Mandors	<ul style="list-style-type: none"> - Supervision and control of laborers
Labourers	<ul style="list-style-type: none"> - Execution of cleansing work

(3) Improvement on Labor Management

a. Necessity for Effective Disciplinary Control and Work-Morale Support

The Council's labor management is generally weak and loose in terms of its disciplinary control and work-morale support. The loose management, in fact, is an important element which explains why the Council is lower than the contractors in terms of waste collection efficiency.

The degree of severity of disciplinary actions, in some cases, has been reduced substantially as compared to what was originally proposed by the departmental heads. Another drawback of the Council's disciplinary system is that it takes such a long time for the Council to reach to a final decision. It often took one and a half years before the final decision is made.

b. Solution to the Problem

The root of this problem is so deep that it requires not only the proposed organizational reform but also more importantly requires serious attention of the Council's Administrators. What is equally required is the reduction of the political interference by the Councillors in the Council's administrative and managerial affairs.

The power of making decision on the disciplinary matters, in the present set-up, is entirely in the hands of the disciplinary action committee members comprising of the Council's Administrators and Councillors. This implies that the problem, though serious, may possibly be solved quickly and simply upon the change in the attitude of those decision makers.

10.2.2 Finance

(1) Financial Sources for the Operation and Maintenance

The target SWM cost in 2005 is estimated to increase to 270% of the cost in 1987 in real term provided that all the improvement measures would be successfully implemented as proposed in the Master Plan.

In the view of the necessity for securing the sufficient fund for SWM and other services of the Council, the following recommendations are presented.

- 1) Increase of the assessment revenue through:
 - Review (increase) of the assessment rates
 - Reduction of arrear through better information system and stronger collection activity

- 2) Establishment of "Beneficiary-Pay-Principle" under which the following two type of fee should be collected:
 - Fees for Commercial Waste Collection Service
 - Tipping fees for disposal service

The following table shows types of SWM services and persons who should bear the costs of the services.

Table 10-4 Proposed Sources of Fund for SWM Service

<u>TYPE OF SWM SERVICES</u>	<u>PROPOSED SOURCES OF FUND</u>
1. Domestic Waste Collection	Assessment (Local Property Tax)
2. Commercial Waste Collection	Fees to be collected from service recipients.
3. Disposal of Waste Privately Brought into Municipal Disposal Sites	Tipping fees to be collected from the service recipients.
4. Waste Collection/Haulage and Cleansing for Public Premises (Roads, Parks, Facilities, etc.)	Owners of premises

In order to match revenue to the expected future SWM expenditures, the following has to be realized.

- 1) MPSP should increase the appropriation to SWM from the general budget at a rate same as the average annual growth rate of the Council's future revenue which is estimated at 4.8% in real term (6.4% in nominal term) in the Structure Plan.
- 2) In addition, the revenues from both commercial waste collection fees and disposal tipping fees must increase to the extent that those revenue would cover 90% and 70% of actual costs of those services respectively in the year 2005.

The sources of the fund for SWM services in 2005 are estimated as shown below provided that the two kinds of fees are collected as proposed above.

- The Assessment will cover 87% of the SWM expense in 2005.
- Commercial waste collection fees will cover 10% of the SWM expense in 2005.
- Tipping Fees will cover 3% of the SWM expenses in 2005.

(2) Financial Sources for Investment

a. Construction Cost of Final Disposal Facilities

It is recommended that both the Federal Government and the State Government provide financial assistance (grants or low-interest-rate-loans) to cover the major portion of investment costs. This recommendation is presented in view of the following.

- i. Under the existing tax system in Malaysia where the Local Authorities receive a very small portion of the aggregate tax paid by all Malaysians, the Local Authorities including MPPP and MPSP are financially not capable of undertaking large investment projects such as the construction of sanitary disposal facilities.
- ii. On the other hand, the Federal Government (DOE) has recently set high standards regarding environmental quality, and requires the Local Authorities to meet such standards. With respect to waste disposal, a sanitary landfill system would be the only choice that would meet the standards. The construction of sanitary landfills, however, requires a large investment.

In view of the above situation, it is simply impossible for the Council to meet the disposal standards without having financial support from the Federal or State Government.

It is strongly hoped that the Sixth Malaysia Plan of the Federal Government will include sufficient budget for the development of sanitary disposal system and for the improvement on some other aspects of SWM in Malaysia.

b. Replacement of Collection Vehicles

The existing collection vehicles (mainly side-loaders) should be replaced with large-sized compactor vehicles in the near future in view of the long distance from collection points to the future disposal site.

It is advised that the Council will prepare sufficient budget for the timely replacement of the vehicles.

(3) Establishment of an Independent Accounting System for SWM

It is strongly recommended that the Council should establish an independent accounting system for SWM in view of the necessity to accurately identify SWM costs. An accurate identification of SWM costs is a first step for the evaluation of the efficiency and progress of SWM performance.

10.2.3 Privatization

(1) Degree of Privatization

MPSP, currently, contracts out 25 % of the collection/haulage service in terms of waste amount. The privatization ratio of the street/drain cleansing is estimated also at 25 % in view of the fact that all the contractors employed by MPSP provide street/drain cleansing service as well in their respective contract areas.

There is a great prospect for MPSP that costs of waste collection and street/drain cleansing services will be much reduced by increasing the degree of privatization in view of the large difference in the waste collection costs between the contractors and the Council itself. The Council, in 1987, spent \$3.9 million for the Council's own collection and haulage of 47,300 tons of waste, that leads to the unit cost of M\$82 per ton, which is more than 200 % of the contractors's unit price (less than M\$40).

The necessity for the privatization of these services will grow in view of the growing future demand for the services.

Considering the future demand for the services as well as the number of laborers who would retire, the degrees of the future privatization is proposed as follows:

Table. 10-5 Degree of Privatization of Waste Collection and Street/Drain Cleansing Services

YEAR	DEGREE OF PRIVATIZATION	
	COLLECTION/HAULAGE (In terms of Collection Amount)	STREET/DRAIN CLEANSING (In terms of population served)
1989	25%	25%
1995	56%	50%
2000	58%	50%
2005	60%	50%

(2) Needs for Careful Selection of Contractors and Establishment of a System for Monitoring Contractors' Performance

The current contractors' services are not satisfactory according to the MPSP's Health Department. Reasons for this may be partly attributable to a very low contract prices. In view of this situation, the following recommendations are presented.

- 1) MPSP should examine more carefully the experience and capability of tenderes in the selection of contractors, rather than resorting always to the lowest-tender selection principle.
- 2) MPSP should have a better system of monitoring contractors' performance. Such monitoring is important enough to necessitate the specialization of some public health inspectors in this job as discussed in Section 10.2.1 (1).

11. Proposed Arrangements for Laws, Public Education and Training

This Chapter is meant for both MPPP and MPSP.

11.1 Laws and Enforcement

11.1.1 Laws and Regulations

(1) Aspects of Solid Waste Management Which Need Legal Control

Some legal control is necessary in the following aspects of solid waste management.

- 1) Waste storage and discharge method to be applied to households and business establishments.
- 2) Commercial waste collection fee and tipping fee
- 3) Control of toxic waste
- 4) Control of illegal dumping
- 5) Control of anti-littering

(2) Laws and Regulations Required

a. Regulations Regarding Waste Storage and Discharge

Both Public Cleansing and Safety By-Laws of MPPP, 1980 and Refuse Collection By-Laws of MPSP, 1975 stipulate general requirements to be followed by citizens regarding waste storage and discharge. It is recommended that both Councils will prepare some regulations which stipulate detailed methods to be followed by the citizens with respect to the following aspects:

- 1) Discharge days (to keep waste in each house until collection service day comes.)
- 2) Discharge time
- 3) Discharge location

- 4) Use of standard bins and plastic bags
- 5) Discontinuation or control of the use of dust-chute in high-rise buildings

The above items 1) to 4) are closely related to a collection system that the Councils wish to apply. Clear instructions should be given to citizens with respect to those items through delivery of campaign leaflet.

The discontinuation of the use of dust-chute (Item 5) is an important issue, which is studied by the Federal Government. This Master Plan recommends the discontinuation of dust-chute from the view point of its low collection efficiency (time-consuming), difficult maintenance and sanitation problem.

Once the discontinuation of the use of dust-chute is decided by the Councils, relevant laws and regulations should be changed accordingly.

b. Commercial Waste Collection Fee and Tipping Fee

This Master Plan recommends:

- Introduction of those fees for MPSP
- Gradual increase of those fees for MPPP

Those fees will be important source of revenue for the Councils in the future. From this view point, it is recommended that the existing regulations be revised accordingly.

c. Control of Toxic Waste

Control of toxic waste will be increasingly important in the future. Laws and regulations regarding toxic waste control should be prepared at both federal and local level. At local level, the regulations should include the following:

- 1) Definition of waste type not to be accepted at municipal disposal sites
- 2) Registration of factories which generate toxic waste
- 3) Registration of contractors which transport or dispose of toxic waste
- 4) Penalty to be applied to offenders of the toxic waste regulations

d. Control of Illegal Dumping

The necessity for control of illegal dumping will increase as the Councils wish to impose higher tipping fee. This is because the strong imposition of higher tipping fee would increase illegal dumping if the control of illegal dumping is not strongly enforced. It is recommended that the existing By-Laws should include some articles on the penalty to be applied specifically to those who committed an illegal dumping.

11.1.2 Law Enforcement

Both Councils are weak and poor in the law enforcement as has been discussed in Section 3.10. The weak enforcement is attributable to the weak attitude of the Councils' decision makers which include the Councils' Administrators and Councillors.

An important problem regarding the enforcement is that there exists some political interference by the Councillors in the administrative affairs. Such interference is very harmful to the Councils in the sense that it would not only weaken the law enforcement but also affect general morale of the Councils' executive officers.

Whether or not the Councils can strengthen the law enforcement depends entirely on the intention of the Councils' Administrators and Councillors. Their firm determination on the enforcement is much desired. It should be remembered that the strong law enforcement would serve for the interest of majority of the citizens.

11.2 Public Education

11.2.1 Objective of Public Education

The objective of public education is to strengthen the citizens' cooperation with respect to the following aspects.

- 1) Proper storage and discharge manner
- 2) Reducing litter in public places
- 3) Eliminating illegal dumping of waste
- 4) Resource recycling

Both Federal and Local Governments should be responsible for the public education.

11.2.2 Public Education by the Federal Government

It is recommended that some education on waste should be given at primary or secondary school level. The solid waste education should include the following;

- 1) Waste and public health
- 2) Necessity for proper discharge and storage
- 3) Importance of keeping public places clean
- 4) Waste flow from generation to final disposal
- 5) Waste amount and cost
- 6) Waste disposal and environment
- 7) Importance of resource recovery (recycling)

The Municipal Council of Musashino in Tokyo Metropolitan Area has its own education programme and a text book on SWM for elementary school children. Such programme and text may be of reference to Malaysia.

11.2.3 Public Instructions and Education by Local Governments

Public instructions and education to be given by local governments should be the one that would help the local governments to achieve their specific improvement targets with respect to waste collection and disposal. If a local government wishes to introduce a new collection system such as a 3 times/week collection, public instructions should be given with respect to the following:

- Days of waste discharge (to keep waste inside the house until the collection day comes)
- Discharge time
- Discharge location
- Use of plastic bags and standard bins if required
- Separation of waste if required

The public instruction and education can be most effective if they are given in the form of an organized campaign.

11.3 Training of SWM Personnel

11.3.1 Personnel Who Should Receive Training and Education on SWM

Personnel who should receive training and education can be categorized as follows:

- 1) Top administrators or decision makers at both local and federal levels
- 2) SWM staff such as departmental head, public health inspectors (PHIs) and overseers
- 3) Drivers and workshop personnel
- 4) Mandors/laborers

Types and contents of training differ according to level (category) of personnel involved in SWM.

11.3.2 Education (in broader sense) for Top Administrators and Decision Makers at Both Local and Federal Level

Many administrators and decision makers still share a view like... Solid waste management is only a matter of scavenging and dumping waste, so there are not so much systematic and scientific things needed for SWM and it is useless to spend much money on waste disposal ...

What is most needed for such top administrators and decision makers is to replace such view with a new view on SWM like:

- SWM can be improved considerably by applying more systematic approach.
- Collection and haulage costs can be reduced greatly by changing storage and collection systems.
- Sanitary disposal will be increasingly important for improving environmental conditions and public health.
- A considerable amount of capital investment is required to develop a sanitary disposal system.

It can be fairly said that most SWM problems would be solved quickly, if the above views are clearly understood by the top administrators and decision makers at both federal and local level. A kind of education to change their view is very much needed for the top administrators and decision makers.

11.3.3 Training and Education for SWM Staff inclusive of Departmental Heads, PHIs and Overseers

(1) Training and Education to be Provided at Federal Level

It is recommended that the Federal Government should establish or continue, if already exist, the education/training programmes as shown below.

- a. A Formal Post-Diploma Course on SWM for PHIs and Other Relevant Personnels

The Public Health Institute of Malaysia offers a 3-year diploma course for public health inspectors (PHIs). This course, however, provides very little training on solid waste management, i.e., only about 4% of the course programme in terms of lecture hours is used for the training on SWM. In view of an increasing demand for personnel specialized in SWM, it is recommended that the Federal Government should establish a formal post-diploma course on SWM for PHIs and other relevant personnels. The duration of the course may be from 6 to 12 months. Such post-diploma course should be given recognition and accorded with an appropriate status by the Federal Government to encourage PHIs and other relevant personnels to take up such course.

b. Sanitary Engineering Course at University

There exist no such courses at present. In view of an increasing demand for sanitary disposal system in Malaysia, establishment of this course will contribute much to the improvement of the environmental sanitation standard of Malaysia.

In view of the situation where graduates of the Environmental Studies of UPM have not been well received by the public sector, it is important to change the current employment and job structure in such a manner as to absorb the graduates of those courses.

c. Seminar/Workshop on SWM

Ministry of Housing and Local Government has held seminars/workshop on some topics of SWM from time to time. Such seminars/workshop should continue in the future. It is recommended that more opportunities should be provided in seminars/workshop to exchange views and discuss problems among the participants. It is also suggested that there should be some workshops for overseers.

(2) Training and Education to be Provided at Local Level

It is recommended that Local Authorities should provide SWM training in the following forms:

- To promote discussion horizontally among same level of positions and vertically among different level of positions in order to identify and solve problems.
- To give PHIs and overseers opportunities to visit other Local Authorities to observe their SWM systems and exchange opinions.
- On-the-job-training

For example, the Councils' SWM staff can be attached to suitable agencies or some other Local Authorities to gain experience through working with experienced staff of such establishments for a period of time. On their return, these personnels can then become trainers to provide on-the-job training for other staff of the Councils.

11.3.4 Training of Drivers and Workshop Personnel

Actual economic life and operation efficiency of waste collection vehicles and other equipment depend much on the degree of maintenance of those vehicles and equipment. From this view point, the Councils should provide workshop personnel and drivers with a training on the maintenance of vehicles, preventive maintenance in particular.

11.3.5 Training of Laborers

The training of laborers is required with respect to the following:

- 1) Scope and manner of their job
- 2) Waste storage and discharge methods which citizens have to follow
- 3) Work safety
- 4) Maintenance of equipment used by laborers
- 5) Polite manner needed in communicating with citizens.

In addition to the above-mentioned training of laborers, disciplinary control and work-morale support of laborers are very important in view of increasing the efficiency of the waste collection and street/drain services.

12. Phased Implementation Plan for MPPP

12.1 Stage Plan

(1) Storage and Collection

a. Appropriate Collection Service

- Introduction of door-to-door 3 times/week collection in 50% of MPPP area by 1992
- Introduction of door-to-door 3 times/week collection in the entire area by 1995
- Introduction of station collection during Phase II and III
- Establishment of bulky waste collection system by 1995

b. Measures vis-a-vis Distant Disposal Site

- Conversion to 10m³ compactors by 1992
- Enlargement of collection zone for private contractors

c. Measures vis-a-vis Volume Increasing of Solid Waster

- Provision of collection service to newly developed areas of 770ha by 1995 and 1,620ha by 2005

(2) Street Sweeping and Drain Cleansing

a. Clarification of Responsibility (JKR, DID, MPPP)

b. Establishment of Appropriate Service Level

c. Establishment of Appropriate Work System

- Introduction of once-a-week cleansing in residential area with team work system by 1995
- Mechanization of street sweeping of main roads by 1992
- Mechanization of grass cutting by 1992

(3) Disposal

Phased development plan of PADS is shown below.

a. Phase I

The northern section of PADS disposal site will be used for landfill operations during Phase I.

- Commencement of Construction : 1991
- Period of Landfill Operation : 1992 - 1996
- Design Disposal Amount : 560 t/day (1996)
- Design Landfill Volume : 1.54 million m³ (total volume between 1992 and 1996 including covering soil)
- Landfill Site Area : 25 ha

b. Phase II and III

The southern section of PADS disposal site will be used for landfill operation during Phases II and III.

- Commencement of Construction : 1996
- Period of Landfill Operation : 1997 - 2005
- Design Disposal Volume : 770 t/day
- Design Landfill Volume : 3.59 million m³ (total volume between 1997 and 2005 including covering soil)
- Landfill Site Area : 58 ha

Table 12-1 shows a stage plan for implementation of the Master Plan including immediate improvement plans and interim measure.

Table 12-1 Phased Plan for MPPP

Immediate Improvement Interim Measure	1989	1991	Phase I	1995	Phase II	2001	Phase III	2005
1) Collection	- Replacement of old collection vehicles	- To change the type of collection vehicles	- Introducing 3 times a week collection	- Introduction Station collection				
	- Experimental operation of 3 times a weeks collection in the Bayan Baru	- Plastic bag discharge	- Reduction of street/drain cleansing frequency					
2) Final disposal	- Mounting-up of present and previous disposal sites	- Detail design of 1st phase landfill site at P.Acheh	- Construction of the third level sanitary landfill site at: <ha> <cu.m> P.Acheh 25.0 1,540,000	- Forth level sanitary landfill <ha> <cu.m> 58.0 3,590,000				
3) Organization			- Establishment of USD					
Manpower	- Collection 200 laborers	- Street/drain 1,138 laborers	- 94 laborers in 1995	- 784 laborers in 1995	- 98 laborers in 2005	- 800 laborers in 2005		
4) Financial plan	- Fee collection amount	- Annual budget	- Investment					
	- M\$0.4 million	- M\$18.7 million in 1987	- M\$1.4 million in 1995	- M\$24.0 million in 1995	- M\$5.1 million in 2005	- M\$27.8 million in 2005		
			- M\$9.6 million	- M\$24.6 million	- M\$3.8 million			
5) Privatization	- Waste collection	- Street/drain						
	- 310 t/d	- 0%	- 410 t/d in 1995	- 500 t/d	- 580 t/d			
			- 0%	- 0%	- 0%			

12.2 Financial Plan

(1) Investment Cost Required

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 12-2.

Table 12-2 Phased Investment Schedule

(M\$ million)

	<u>Interim Period</u>	<u>PHASE I</u>	<u>PHASE II</u>	<u>PHASE III</u>	<u>TOTAL</u>
Collection	-	1.9	2.7	2.4	6.9
Cleansing	-	1.5	1.6	0.8	3.9
Disposal	0.3	6.2	20.3	0.7	27.5
Total	0.3	9.6	24.6	3.8	38.3

Note: (1) The above investment costs exclude the cost of investment directly made by contractors.

(2) Inflation is assumed as follows: Emolument rates of the Council's employees will increase by 2.5% annually, while all the other costs will increase by 1.5%.

(2) Annual Expenses and Revenues

Annual expenses comprise of annual operation/maintenance costs and annually allocated depreciation expenses, as well as interest to be paid on loans.

Annual revenues comprise of two types of fees: commercial waste collection and tipping fees. Both fees are assumed to be collected from the recipients of the services.

Table 12-3 and 12-4 show annual expenses and revenues for the solid waste management respectively.

Table 12-3 Annual Expenses

	(M\$ million)				
	<u>1987</u>	<u>1992</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
Management	1.0	1.2	1.3	1.5	1.7
Collection	8.3	11.3	11.8	14.6	17.5
Cleansing	8.8	7.3	6.5	7.5	8.9
Disposal	0.6	1.9	2.1	4.2	4.8
Interest on Loans	0.0	0.7	0.5	0.3	0.2
Total	18.7	22.4	22.2	28.2	33.1

Note: Inflation is assumed as follows: Emolument rates of the Council's employees will increase by 2.5% annually, while all the other costs will increase by 1.5%.

Table 12-4 Resources of Revenues

	(M\$ million)			
	<u>1992</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
Assessment	22.9	24.0	25.9	27.8
Fee Collection				
- Commercial Fee	1.2	1.4	2.6	4.5
- Tipping Fee	0.2	0.2	0.4	0.6
Total	24.3	25.5	28.8	32.9

Note: Annual inflation of 1.5% is assumed.

(3) Major Assumptions Used for the Financial Plan

- a. MPPP 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, although haulage distance would be longer when a disposal site is provided at Pantai Acheh.
- b. MPPP will also achieve a significant cost reduction in street/ drain cleansing services by lowering the service frequency and reducing the number of laborers involved.
- c. MPPP will increase its fee revenues from both commercial waste collection and final disposal in the future.
- d. MPPP's revenue and budget allocation to SWM will increase as shown in Table 12-5.

Table 12-5 Revenue and Budget Allocation to SWM

	(M\$ million)					
	<u>1987</u>	<u>1992</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>ANNUAL INCREASE RATE</u>
MPPP's Revenue (a)	68.9	94.3	113.5	154.7	210.4	6.4%
Allocation to SWM from the General Budget (b)	18.7	22.9	24.0	25.9	27.8	1.5%
(b)/(a) x 100 (%)	27.1	24.3	21.1	16.7	13.2	

Note: Annual inflation of 1.5% is assumed.

(4) Financial Projection

Fig. 12-1 shows a financial projection for the MPPP Master Plan. The figure clearly indicates that the possibility of debt repayment will be completed in 2000.

From a long-term perspective, it will be possible for MPPP to implement its solid waster management in accordance with the Master Plan.

In view of the large investment costs required, and also the financial situation of MPPP, the loans from the Federal Government will be indispensable for the realization of the Master Plan.

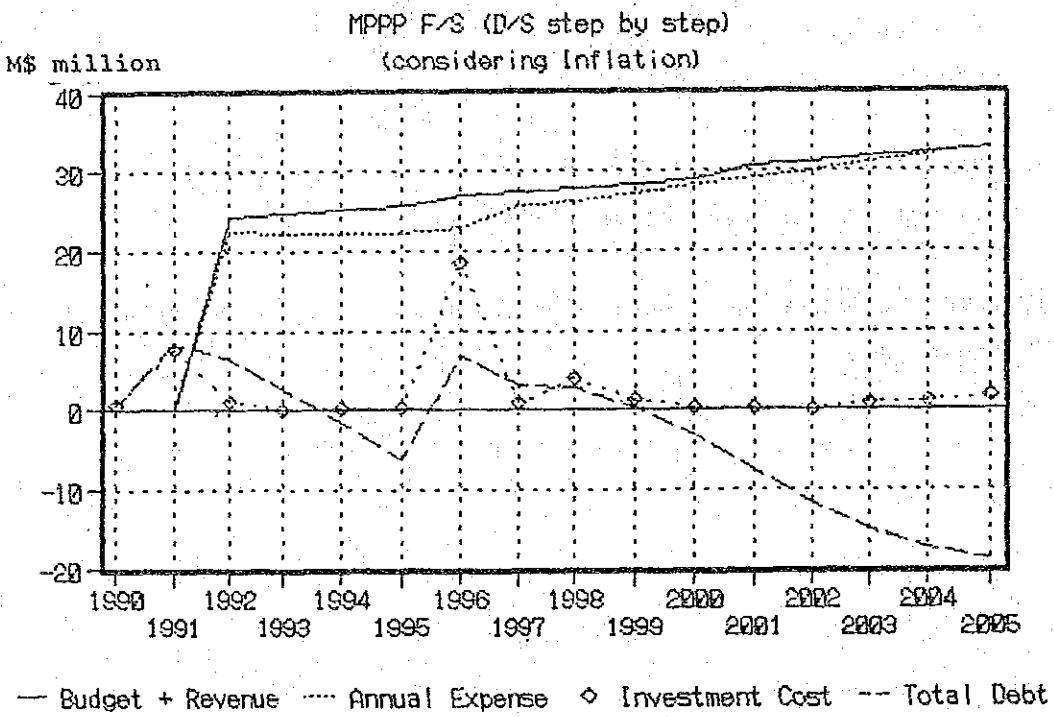


Fig. 12-1 Cash Flow in MPPP

13. Phased Implementation Plan for MPSP

13.1 Stage Plan

(1) Storage and collection

a. Appropriate Collection Services

- Introduction of door-to-door 3 times/week collection in North District by 1992
- Introduction of door-to-door 3 times/week collection in all residential areas by 1995
- Introduction of station collection in residential areas during Phase I and III
- Establishment of improved collection system, including bulky waste and large amount collection, by 1995

b. Measure vis-a-vis Distant Disposal Sites

- Conversion to compactors
- Enlargement of collection zone for private contractors when contracts are renewed in 1992

c. Measure vis-a-vis Volume Increasing of Solid Waste

- Provision of collection services to newly developed areas of 1,198 ha by 1995 and 2,441 ha by 2005

(2) Street Sweeping and Drain Cleansing

a. Clarification of Responsibility (JKR, DID, MPSP)

b. Establishment of Appropriate Service Level

c. Establishment of Appropriate Work System and Expansion of Collection Service

- Introduction of once-a-week cleansing in residential area with team work system by 1995
- Mechanization of main road sweeping by 1992
- Mechanization of grass cutting by 1992

(3) Disposal

The Master Plan for MPSP will be implemented in the following three phases.

a. Phase I

The inland section of KMDS disposal site will be used for landfill operation, and southern part of the Byram Forest Reserve during Phase I.

- 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 m³
: PBDS: 0.66 million m³
(total volume between 1992 and 1996 including covering soil)
- Landfill Site Area : KMDS: 17.9 ha (inland)
: PBDS: 16.7 ha

b. Phase II

The lagoon section of KMDS disposal site will be used for landfill operation, and northern part of the Byram Forest Reserve and Pulau Burong during Phases II and III.

- Commencement of Construction : 1996
- Period of Landfill Operation : 1997 - 2001
- Design Disposal Volume : KMDS: 264 t/day (2001)
: PBDS: 312 t/day (2001)

- Design Landfill Amount : KMDS: 0.72 million m³
: PBDS: 0.85 million m³
(total volume between 1997 and 2001 including covering soil)
- Landfill Site Area : KMDS: 30 ha (lagoon)
: PBDS: 23.7 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 m³
: PBDS: 0.83 million m³
(total volume between 2002 and 2005 including covering soil)
- Landfill Site Area : KMDS: 30 ha (lagoon)
: PBDS: 23.7 ha
(Pulan Burong included)

Table 13-1 shows a stage plan for implementation of the Master Plan including immediate improvement plans and interim measure.

13.2 Financial Plan

(1) Investment Required

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.

Table 13-2 Phased Investment Schedule

(M\$ million)

	<u>Interim Period</u>	<u>PHASE I</u>	<u>PHASE II</u>	<u>PHASE III</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 above investment costs exclude the cost of investment directly made by contractors.

(2) Inflation is assumed as follows: Emolument rates of the Council's employees will increase by 2.5% annually, while all the other costs will increase by 1.5%.

(2) Annual Expense and Revenues

Annual expenses comprises of annual operation/maintenance costs and annually allocated depreciation expenses as well as interest to be paid on loans.

Annual revenues comprise of two types of fee; commercial waste collection and tipping fees. Both fees are assumed to be collected from the recipients of services.

Table 13-3 and 13-4 show annual expenses and revenues for the solid waste management respectively.

Table 13-3 Estimated Annual SWM Expenses

	(M\$ million)				
	<u>1987</u>	<u>1992</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
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 assumed as follows: Emolument rates of the Council's employees will increase by 2.5% annually, while all the other costs will increase by 1.5%.

Table 13-4 Resources of Revenues

	(M\$ million)			
	<u>1992</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>
Assessment	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: Annual inflation of 1.5% is assumed.

(3) Major Assumption Made in Financial Plan

- 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, although haulage distance would be longer when disposal sites are provided at Kuala Muda and Pulau Burong.
- b. MPSP will also achieve a significant cost reduction of street/drain cleansing services by lowering the service frequency and reducing the number of laborers involved.
- c. MPSP will receive revenue from both commercial waste collection fee and tipping fees in the future.
- d. MPSP's revenue and budget allocation to SWM will be as shown in Table 13-5:

Table 13-5 Revenue and Budget Allocation to SWM

	(M\$ million)					
	<u>1987</u>	<u>1992</u>	<u>1995</u>	<u>2000</u>	<u>2005</u>	<u>ANNUAL INCREASE RATE</u>
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.

(4) Financial Projection

Fig. 13-1 shows financial projection for the MPSP Master Plan. The figure indicates the possibility that the sum of annual fee revenue and appropriation to SWM exceeds the annual expense (inclusive of annual depreciation) in 2001 with a decline of the total debt thereafter, even if the level of sanitary landfill would be level 4 in Phase III. The total debt in 2005 will still be M\$34.6 million.

An annual increase in the budgetary allocation of 7.1% is required to make the total debt zero by 2005. In addition Repayments for the sewage project will continue to be a heavy burden to MPSP.

In view of the above-described situation, the financial assistance by the Federal Government is essential for the realization of the Master Plan, i.e. the Federal loans for the construction of the level 3 sanitary landfill in the beginning of Phase 1, and loans and grants for the construction of the level 4 sanitary landfill in the beginning of Phase 3. It is proposed that the amount of the Federal grants be enough to cover 50% of the construction cost.

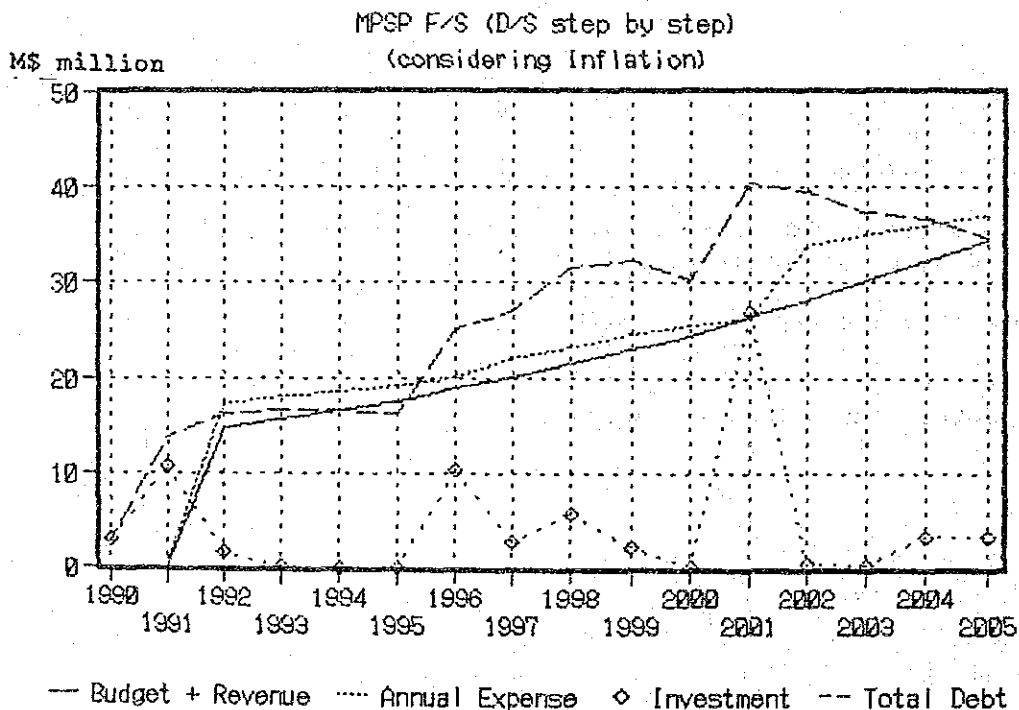


Fig. 13-1 Cash Flow in MPSP

14. Further Study Needs

The following 11 items need to be studied in the future.

- (1) Development of station collection system
- (2) Evaluation and improvement of dust shoot system and study on appropriate storage and discharge
- (3) Technical development of and data accumulation on level 3 disposal site
- (4) Consolidation of harmful solid waste treatment and disposal system
- (5) Environmental impact study on seepage water
- (6) Recovery of useful resources and minimization of discharge volume
- (7) Disposal site monitoring
- (8) Study on solid waste collection work and preparation of safety and sanitary work standards
- (9) Solid waste management cost analysis
- (10) Study on public hygiene at non collection areas and squatter areas
- (11) Study on appropriate incineration plants

II. First Phase Project Plan for MPPP

II. First Phase Project Plan for MPPP

1. Components of the First Phase Project

(1) Selection of the Level of Final Disposal

As referred to in the Master Plan, the introduction of sanitary landfill will require a large investment relative to the financial scale of the Council.

Disposal systems can be classified into the following four levels.

- a. Level 1 Controlled tipping
- b. Level 2 Sanitary landfill with a bund and daily soil covering
- c. Level 3 Sanitary landfill with leachate circulation and monitoring system
- d. Level 4 Sanitary landfill with leachate treatment and monitoring system

In view of the soil investigation data on the proposed disposal site, the estimated investment costs for the Phase 1 are as follows:

Level 3: M\$ 6.2 million

Level 4: M\$13.8 million*

* This amount does not include costs for bottom liner because it is not necessary in view of very low permeability of the bottom soil.

As can be seen from the above, Level 3 disposal system costs less than one half of Level 4.

In view of the facts that the implementation of a project which requires substantial investment against limited financial resources may destroy the financial basis of the municipality and that the balanced development of the infrastructures including sewage system, solid waste management system and

flood control, etc. is essential for the environmental conservation, it has been decided that the disposal facilities to be constructed in Phase I will be of Level 3, and that these will be improved to Level 4 in Phase II onwards. This decision is also supported by the preliminary environmental impact assessment results which show the impact of Level 3 sanitary landfill on the surrounding environment is minimal.

If a sanitary landfill would be introduced without measures for the improvement of collection and cleansing works proposed in this First Phase Project Plan, it will be necessary to increase the budgetary allocation by at least 4% annually. That is why the improvement of collection and cleansing works plays an important role in Phase I arrangements.

(2) Content of the First Phase Project

The objectives of Phase I are the achievement of a pleasant living environment and contribution to the socioeconomic development of the city by improving the living environment, which will be achieved in turn by improving the service level, expanding the service area and implementing sanitary landfill at disposal sites far from urban areas.

Fig. 1-1 shows the concrete contents of each component of the First Phase Project.

o Collection Improvement

- 3 times/week door-to-door collection (urban areas)
- Establishment of bulky waste collection system
- Introduction of 10 m³ compactors

o Construction of Pantai Acheh Disposal Site

- Development area : 25 ha
- Landfill volume : 1,540,000m³
- Daily disposal amount: 539 tons
- Operation period : 6 years

o Contracting-Out

- Maintaining 87% contracting-out ratio (in terms of waste amount)
- Review of collection zones (1 zone: 30 t/day)
- Advice on introduction of 10 m³ compactors

o Disposal Method

- Target level : Level 3
- Landfill method : Cell method

o Cleansing Improvements

- Introduction of team work and weekly cleansing (Residential areas)
- Mechanization of the sweeping of main roads
- Introduction of grass cutters

Fig. 1-1 Phase I Project of MPPP

(3) Design Conditions of Phase I Project

a. Target Year

Target year is 1995, due to the limited disposal capacity of the present site, the disposal operation will be commenced at the new landfill site in 1992.

b. Target Area

While the entire MPPP area is the target area, collection will be limited to the Priority Operational Areas.

c. Design Population

The estimated population in 1995 is 615,700. Since the design population for waste collection is 584,300, the collection rate will be 95% in 1995.

d. Solid Waste Amount

- Solid waste amount to be collected : 469 t/day
- Solid waste amount to be disposed of: 539 t/day
- Street length to be swept : 735 Km

e. Solid Waste Composition (refer to Part I Table 6-3)

f. Location of Disposal Site

The waste disposal will be conducted at Pantai Acheh disposal site. Until the commencement of the new site, the present disposal site will continue to be used up to 1992 by raising the disposal height.

2. Preliminary Design

2.1 Collection Improvement

(1) Collection System in 1995

The collection system to be achieved by 1995 is shown in Table 2-1.

Table 2-1 Collection System to be Achieved by 1995

a. Collection Rate	95% in terms of population
b. Collection Frequency and Discharge Points	<ul style="list-style-type: none">- Commercial Areas : Daily, door-to-door- Residential Areas : 3 times/week, door-to-door- Housing Complexes : Daily, dust chute with bulk bin- Housing Complexes : 3 times/week, station without bulk bin- Kampongs : 3 times/week, station
c. Waste Discharge Method	: Plastic Bags
d. Collection Amount	- 470 t/day
e. Collection System	<ul style="list-style-type: none">- Ordinary Waste Collection- Bulky Waste Collection- Large Amount Collection
f. Collection Vehicle	<ul style="list-style-type: none">- Ordinary Waste : Compactor- Bulky Waste : Dump truck- Large Amount Waste: Compactor and arm roll
g. Share of Private Companies	- 87% in terms of waste amount collected

(2) Project Plan

a. Promotion of Plastic Bag Use

The use of plastic bags for the discharge of domestic and commercial wastes will be promoted together with the introduction of a 3 times/week collection system.

b. 3 Times/Week Collection

The present daily door-to-door collection service will be continued in commercial areas and shopping streets in the Project Area, and an efficient 3 times/week collection service will be introduced in all the residential areas by 1995 with the cooperation of residents. This 3 times/week collection service will be provided first in places where its introduction appears easy and will then be extended to all other areas.

Collection from housing complexes with bulk bin will be conducted daily as part of the large amount collection service. Plastic bags will be used and station collection will be conducted 3 times/week for housing complexes where bulk bins are not provided.

c. Bulky Waste Collection

Bulky waste collections will be regularly conducted to maintain environmental sanitation with a collection frequency of once a month in 1995. The initial introduction of bulky waste collection will be conducted together with that of the 3 times/week collection.

d. Abolition of Double Handling System

The double handling system which is used in some areas will be replaced by the single handling system together with the introduction of the 3 times/week collection system and the discharge using system plastic bags.

e. Introduction of Compactor Vehicles

Compactors will be used for collection in the future, with a target of 2 trips a day on average. Use of compactors with a loading capacity of 10 m^3 is recommended instead of side loaders. Use of vehicles larger than 10 m^3 is not recommended in view of the road conditions. The conversion to this new type of vehicle will take place by 1992 in accordance with the commencement of operations at the Pantai Acheh disposal site.

f. Contract Out

At present, 87% of the solid waste is collected by MPPP's contractors. This ratio is to be maintained.

In view of efficient operation of collection vehicles (10 m^3) inclusive of stand-by vehicles, collection zones for contractors should be so arranged that the collection amount will be 30 t/day or more in respective zone.

g. Collection Equipment and Manpower for the Council's Operation

58 ton per day of waste will be collected using 11 compactors and 2 tipper trucks in 1995. Number of required manpower will be 94 persons.

2.2 Cleansing Improvements

(1) Target System in 1995

The cleansing system to be achieved by 1995 is shown in Table 2-2.

Table 2-2 Cleansing System and Work-load

	(km)		
	PRESENT 1987	1992	1995
a. Road Sweeping			
- Daily	554	328	128
- Weekly (Manual)	-	208	483
- Weekly (Mechanized)	-	124	124
Total	554	660	735
b. Drain Cleansing			
- Daily	1,108	656	256
- Weekly	-	664	1,214
c. Grass Cutting (Monthly)	1,108	1,320	1,470
d. Beach Cleaning (Daily)	30	30	30

(2) Project Plan

a. Introduction of Once-a Week Cleansing System in Residential Areas

Once-a-week cleansing system will be introduced in residential areas together with the introduction of the 3 times/week collection system. In view of the fact that cleansing work is currently conducted by 1,150 workers, once-a-week cleansing system will be gradually implemented to avoid a drastic cut in manpower.

b. Mechanization of Cleansing Work

Mechanical sweeping of main roads currently conducted in MPPP will be continued in the same manner. While grass cutting is currently conducted manually together with drain cleansing, the mechanized cutting by special workers will be introduced to improve work efficiency.

c. Introduction of Team Work

Team work system for street sweeping and drain cleansing will be introduced in residential areas. Streets in markets and commercial areas will, however, be swept daily.

d. Equipment and Manpower for Cleansing Work

The main equipment for cleansing work will be mechanical sweepers, trucks and grass cutting machines, and the required number of equipment in 1995 is as follows:

- 1) Mechanical sweepers : 1 unit + 1 unit (reserve)
- 2) Trucks : 8 units (1 unit for each district)
- 3) Grass cutting machines : 74 units (1 unit for each worker)

The required manpower is as shown in Table 2-3.

Table 2-3 Required Manpower in 1955

WORK ITEMS	(persons)	
	TOTAL LENGTH	NO. OF WORKERS
a. Worker		
- Street Sweeping		
. Daily	128 Km	147
. Weekly	483 Km	81
. Mechanized	124 Km	6
- Drain Cleansing (Weekly)	1,470 Km	245
- Grass Cutting	1,470 Km	74
- Beach Cleansing	30 Km	41
- Reserve	-	119
b. Mandors	-	71
Total	-	784

2.3 Final Disposal

(1) Planning Conditions

Final disposal in MPPP during Phase I is to be done at the PADS. Planning conditions of the PADS are summarized below:

ITEM	PADS	REMARKS
i. Service Area	Whole area of MPPP	
ii. Waste to be Disposed	Municipal waste such as domestic waste, commercial waste, street sweeping, drain and beach cleansing and, non-toxic industrial accepted by the council, such as construction demolition waste.	
iii. Cumulative Disposal Amount	950,000 tons	From Jan. 1992 to Dec. 1996
iv. Daily Disposal Amount	560 t/day	in 1996
v. Unit Weight of Waste	$r = 0.8 \text{ t/m}^3$	
vi. Cumulative Landfill Volume	1,188,000 m ³	From Jan. 1992 to Dec. 1996
vii. Cumulative Landfill Volume with Covering Material	1,544,000 m ³	
viii. Amount of Covering Material	356,400 m ³	1,188,000 m ³ x 30%

(2) Project Plan

The outline of the project for the site development and operations for the PADS is as follows:

ITEMS	PADS	REMARKS
i. Landfill Method	: Sanitary landfill for level 3	
ii. Total Site Area	: 100 ha	
iii. Phase I		
- Landfill Area	: 25 ha	From Jan. 1992 to Dec. 1996
- Landfill Height	: 6.6 m	
iv. Facilities Outline		
- Main Facilities	: Enclosing structure, drain system and access	Reconstruction of the existing bridge in the Kampong Bukit Kechil
- Environmental Protection Facilities	: Buffer zone, litter control, gas removal, leachate collection, leachate circulation, leachate outlet & monitoring facilities	
- Building and Accessories	: Site office, weighbridge, and storage building	
v. Equipment	: Bulldozer, hydraulic excavator, water sprinkler truck and inspection vehicle.	
vi. Personnel	: 14 persons	

3. Project Cost

(1) Investment Cost

The total investment cost will be M\$8.8 million, including engineering fees, physical and price contingencies as shown in Table 3-1.

Table 3-1 Total Investment Cost
(M\$1,000 in 1987 price)

Collection	1,810
Cleansing	1,288
Disposal	5,081
Sub-Total	8,179
Engineering Fees	179
Physical Contingencies	358
Sub-Total	537
Total	8,716

(2) Annual Expenses

The annual expenses in 1995 will be M\$18.6 million as shown in Table 3-2.

Table 3-2 Annual Expenses in 1995

(M\$1,000 in 1987 price)

	DEPRECIATION	MAINTENANCE	FUEL, ETC.	PERSONNEL	TOTAL
Collection	233	217	218	730	1,398
Cleansing	200	-	248	4,953	5,401
Disposal	781	174	643	153	1,751
Contractors	-	-	9,003	-	9,003
Administration	-	-	-	1,074	1,074
Total	1,214	391	10,112	6,910	18,627

4. Organization, Privatization and Fee Collection

4.1 Proposed Scheme for the USD Responsible for SWM

(1) Organizational Scheme

An organizational scheme is proposed for the new Urban Service Department of MPPP. (Refer to Part I, Fig. 10-1). The organizational scheme of the USD proposed is one that can be implemented immediately by deploying the existing cleansing personnel.

(2) Manpower Scheme

Personnel requirements projected for 1995, according to section and position, are shown in the Table 4-1. In total 1,056 persons will be required which is about two third of the present manpower size. Almost all personnel can be deployed from Health Dept. and Engineering Dept.

MPPP will have many redundant laborers in the future when it fully introduces 3 times/week collection and once-a-week cleansing system in residential area. Those redundant laborers need to be deployed for other kinds of services such as landscaping work, which is important in view of creating more beautiful city which deserve being called "Pearl of Orient".

Table 4-1 Proposed Number of Personnel According to Section and Position (1995)

NAME OF SECTION	PHI & ENG	TECH & Jr. CLE	OVER- SEER & Jr. TECH & CLE	DRIVER & OPE	MANDOR	LABORER	TOTAL
1. Cleansing Service	4*	-	36	24	71	783	918
- Collection				14	-	80	94
- Cleansing				10	71	703	784
2. Contract Monitoring	2	-	3	-	-	-	5
3. Campaign & Enforcement	2	-	8	-	-	-	10
4. Disposal Site Planning & Management	1	2	3	4	-	4	14
5. Night Soil Management	1	-	6	-	5	84	96
6. Research and Development	2	-	-	-	-	-	2
7. Administration	-	1	-	-	-	10	11
Total	12	3	56	28	76	881	1,056

* A director is included in this category.

Abbreviations:

PHI : Public health inspector
 ENG : Engineer
 TECH : Technician
 Jr. CLE: Junior Clerk
 OPE : Operator

(3) Organizational Scheme for the Cleansing Service Section

The organizational scheme as shown in Fig. 4-1 is proposed for the cleansing section of the USD.

It is proposed that both PHIs and Overseers would act as middle management who would generate more managerial and planning inputs rather than occupying themselves with daily routine.

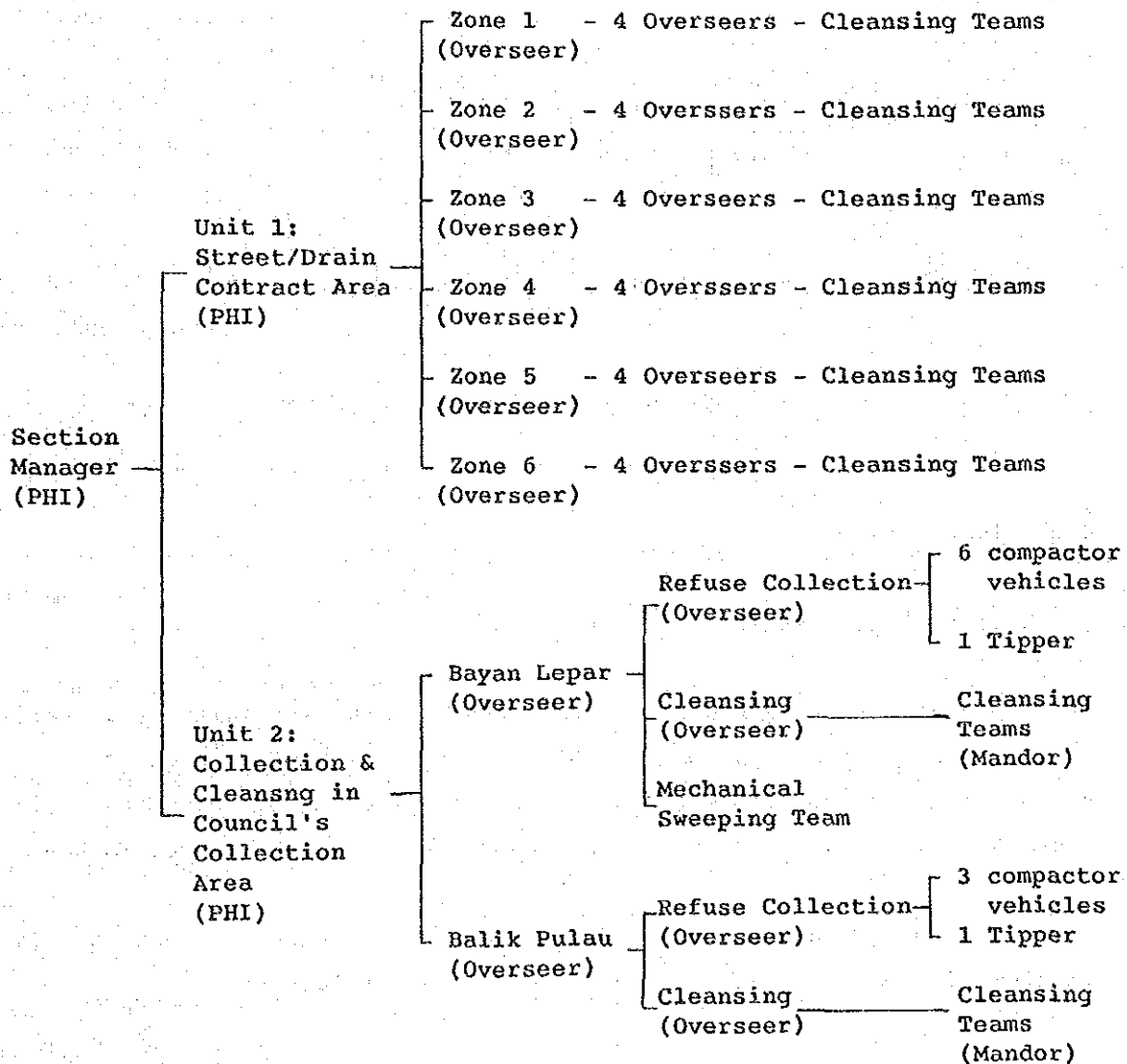


Fig. 4-1 Organization Scheme for Cleansing Section of USD

(4) Disposal Section

The organizational scheme for disposal section is proposed as shown in Fig. 4-2.

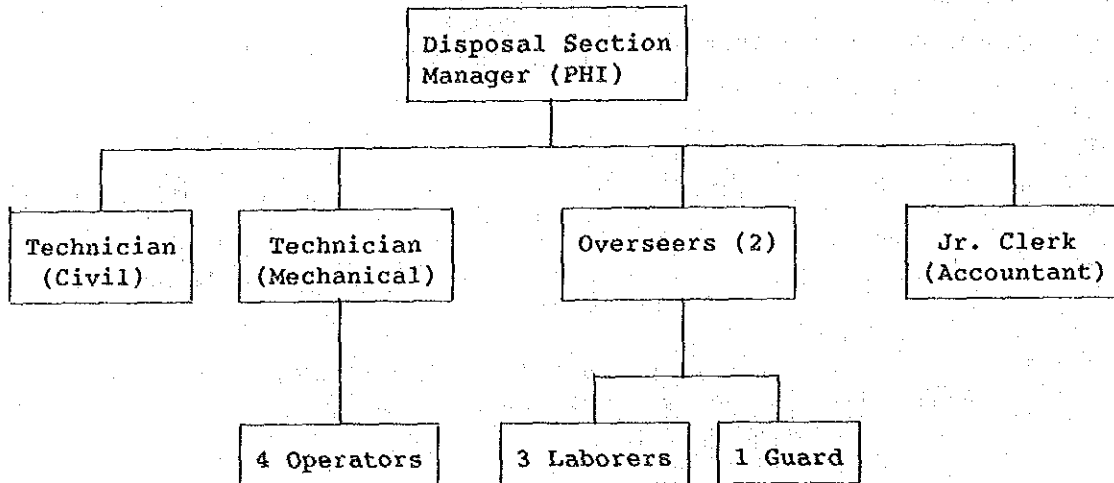


Fig. 4-2 Organizational Scheme for Disposal Section

4.2 Privatization

(1) Rate of Privatization

It is proposed that MPPP will maintain the present rate (87%) of privatization of waste collection services in 1995. To keep the same rate of the privatization means that waste amount to be collected by contractors will increase year by year as the generation amount itself increases in the future.

It is also proposed that street/drain cleansing service will not be privatized in view of the fact that MPPP has large number of laborers.

(2) Contract Area

It is proposed that MPPP will keep privatizing the same areas as present ones, i.e. northeast part of the island for domestic waste collection, and the entire area of the island for large amount waste collection service.

4.3 Fee Collection

(1) Fee Collection System

MPPP has already introduced two kinds of fee since some years ago: commercial waste collection fees and tipping fees charged on waste directly brought into the Council's disposal site by private firms.

These fee collection system should be further strengthened during the first phase project period so that the fee revenue be increasing.

Currently, some commercial waste collection fee is collected by means of the surcharge on the water bill. Such system should be further promoted.

As a means of collecting the disposal tipping fee, a pre-paid ticket system may be advisable.

(2) Measures to Strengthen Fee Collection System

The following measures is proposed for strengthening the fee collection system.

- 1) Revision of regulations related to the fee collection.
- 2) Introduction of licensing system for users of the Council's disposal site
- 3) Introduction of severer penalties on illegal dumping.

5. Project Evaluation

5.1 Technical Evaluation

(1) Improvement of Collection and Cleansing Works

From technical view point there is no problem in the introduction of 3-times/week collection system, plastic bag for discharge and once-a-week cleansing system. These systems have been implemented smoothly as a MPPP's pilot project in Bayan Baru area and have been accepted by the residents, even though residents complained about these systems especially on the use of standard plastic bags at the initial stage.

Therefore, it is feasible to introduce these systems in all residential area of MPPP by 1995 as proposed.

The MPPP's pilot project in Bayan Baru shows that these systems have following benefits:

- a. Operation efficiency will be greatly improved, and environmental conditions in the area will not deteriorate through residents' cooperation.
- b. Collection and cleansing zones are divided into smaller zones under the reduced frequency service system. The services are provided in a smaller zone in each day. This has made it easy to control the daily operation. It has been also found that the work control is easier under the group working system introduced in the pilot project area.
- c. The usage of plastic bags greatly contributes to the increase of collection efficiency and to the upgrading of sanitary conditions.

Health Department of MPPP will have some redundant laborers through the expansion of area where these systems will be applied in the near future. Therefore, it is necessary to deploy these laborers to other public services.

(2) Introduction of compactor vehicle

It is proposed that compactor vehicles with 10 cu.m be used for domestic waste collection also in future instead of tipper vehicle. It will not cause any problem to MPPP because MPPP has been using the vehicles of this type and size already.

However, it is necessary to establish a strong preventive maintenance system.

(3) Construction of level 3 sanitary disposal site in Pantai Acheh

From technical view point, level 3 sanitary disposal site which has daily soil covering and leachate circulation system to improve leachate quality, does not have difficulty in construction and operation.

5.2 Preliminary Environmental Impact Assessment

A Preliminary Environmental Impact Assessment for the proposed solid waste disposal site was conducted by the University Sains Malaysia (USM), under the contract with the Ministry of Housing and Local Government, in accordance with the Environmental Quality Order 1987. Results of the Preliminary Environmental Assessment are summarized in Table 5-1.

Table 5-1 Preliminary Environmental Impact Assessment of the Solid Waste Disposal Site of Pantai Aceh

	Construction Phase	Operational Phase
Noise	In some cases the noise level may be higher than the WHO's standard of 55 dB(A), but no adverse effect in daily life is expected.	Generation of noise from landfill equipment will be attenuated by more than 10 dB(A) due to five-meter high bund.
Dust/ Odor	Adverse impact from dust would not be significant for houses to be developed in the north side of the site, because the predominant wind direction is NNE throughout the year.	The generation of dust can be controlled by water sprinkling. The daily cover can minimize the generation of odor.
Traffic Volume	No increase of traffic volume is expected.	Only 270 traffic volume per day for haulage of waste will be added to the ordinary volume of 2,400 in 1995. Therefore, adverse impact due to concentration of carbon monoxide (CO) is very low.
Leachate	Nil	In case the level of landfill development and operation BOD and COD will be diluted to less than 3 ppm and 5 ppm at the points of 35 m away from discharging point. Therefore, almost no adverse effect on aquatic flora and fauna is expected.
Impacts on Plant and Animal Communi- ties	The most conspicuous loss of mangrove would be that of habitats of birds. Since a number of these birds feed in the mangrove mudflats, the retention of the mangrove fringe would enable some to survive as well as to protect shore.	If the leachate is diluted by sea water at the discharge point, as proposed by the project, the impact on the cockles and other marine life would be negligible.
Impacts on Human settle- ments	Adverse impact on human settlements would not be significant.	One major impact relates to the possible disruption to the state housing project, situated just north of the PADS. A buffer zone will help to isolate the landfill operation from residents in the future housing scheme.

5.3 Social Evaluation

(1) Collection and Cleansing Improvement in Residential Area

MPPP has implemented 3-times/week collection system and once-a-week cleansing system in Bayan Bara as a pilot project in order to see whether or not these systems would be acceptable to the citizens. Though the residents were not happy in the initial stage, they have accustomed to the new systems as the time passed. Eventually, the pilot project turned out to be successful.

MPPP is now confident that it can expand the new systems to all other residential areas.

(2) Introduction of Compactor

The introduction of compactors will contribute to the reduction in workload and the improvement of sanitary conditions of workers.

(3) Level 3 Landfill Operation

For the development of Level 3 landfill site at Pantai Acheh, the State Government has started the control over the development of the areas surrounding the site.

5.4 Economic and Financial Evaluation

(1) Economic Effects of Improvements of Collection and Cleansing Services

The proposed improvement measures will achieve a higher collection efficiency and will enable a considerable cost reduction as compared to the case where the present collection system were simply expanded. This means that the public services provided by the Council may be either improved or expanded by utilizing the Council's resources to be saved through the above SWM improvements.

(2) Economic Effects of Disposal Improvement

A major benefit resulting from the realization of the level 3 sanitary landfill with cell method is that the living environment and public hygiene standard would be greatly upgraded as compared to the case where the existing disposal systems continue.

(3) Economic Evaluation

Table 5-2 shows the cumulative SWM costs till 2005 estimated for the following two cases:

Case 1: Waste disposal system will be improved as proposed in the Master Plan. No improvements, however, will be made regarding waste collection/haulage and street/drain cleansing services.

Case 2: Improvements will be made not only for waste disposal system but also for collection/Haulage and street/drain cleansing services as proposed in the Master Plan. The improvements of collection/haulage and street/drain cleansing services include the reduction in the frequency of those services.

Table 5-2 Comparison of the Cumulative SWM Costs between the Two Cases

(M\$ million at 1987 price)	
Case 1	: 367.8 (a)
Case 2	: 272.5 (b)
Difference	: 95.3 (c)
Ratio of (b) to (a)	: 74%
Ratio of (c) to (a)	: 26%

The above table shows that the Case 2 which includes the improvements of collection/haulage and street/drain cleansing will bring about a considerable saving which would amount to M\$95.3 million over the Master Plan period till 2005.

Therefore, the Case 2 which is recommended in the Master Plan, has proved to be feasible.

(4) Financial Evaluation

The results of the financial evaluation of collection, cleansing and disposal improvement are given below assuming that the amount of budgetary allocation for solid waste management will remain at the same as that in 1988 (M\$21.3 million), and also assuming that commercial waste collection fees and tipping fees for disposal will increase substantially.

The solid waste management cost of MPPP was estimated to be some M\$18.7 million in 1987 and the fee revenue has been very low. In comparison, revenue from the proposed fee collection system will amount to M\$1.4 million in 1995 and M\$3.9 million in 2005.

With the implementation of collection, cleansing and disposal site improvement, the total operation cost of solid waste management is expected to total M\$20.2 million in 1995 and M\$24.1 million in 2005. If the budgetary allocation for solid waste management in the municipal budget is maintained at the present level and the fees are collected as proposed, the total remaining debt will be zero by 1995 with an internal reserve of M\$14.1 million, enabling contribution to the next phase investment.

Given the above financial evaluation results, the Project is considered financially feasible.

6. Implementation Plan

6.1 Project Implementation Body and Schedule

(1) Project Implementation Body

Solid waste management is currently conducted by the Health Department and Engineering Department which are responsible for collection/cleansing and disposal respectively. For the successful project implementation, however, the Urban Service Department should be established. In view of the fact that the financial assistance of the Federal Government is planned for the Project, the Ministry of Housing and Local Government will arrange the necessary funds and will supervise the implementation of the Project.

(2) Implementation Schedule

a. Implementation Conditions

The implementation conditions for the Phase I Improvement Project are as follows:

- Design Target Year : 1995
- Service Commencement Year : 1992
- Subject Area : entire MPPP

b. Preparatory Period

The following must be conducted in the preparatory period of some 18 months from the completion of the Feasibility Study to the commencement of the construction work:

- Acquisition of investment funds and preparation of repayment plan
- Confirmation of facility construction site
- Preparation of detailed design and specifications for facilities as well as equipment/material.
- Selection of contractor (tender, evaluation and contract)

c. Construction Schedule

The Project is mainly divided into equipment procurement work and facility construction of which periods are proposed as follows:

- Equipment/material procurement : 6 months after completion of contract
- Disposal site construction : 12 months after commencement of the construction

6.2 Financial Plan

Based on the results of the financial evaluation, the financial plan for the implementation of this project will be set as follows:

(1) Required Fund

The investment and annual expenditure shown in Table 6-1 have been estimated based upon Tables 3-1 and 3-2 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 expenditure 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%.

Table 6-1 Investment Cost and Annual Expenditure for MPPP

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
(\$ million)																		
1. Investment cost																		
- Vehicle	0.0	0.5	0.8	0.6	0.0	0.0	0.0	2.7					2.4					6.9
- Cleansing	0.0	0.0	0.9	0.4	0.0	0.1	0.1	1.6					0.8					3.9
- Sanitary D/S	0.3	0.2	6.0	0.0	0.0	0.0	0.0	20.3					0.7					27.5
	(0.3)																	
- Total	0.3	0.7	7.7	1.1	0.0	0.1	0.1	24.6					3.8					38.3
	(0.3)																	
2. Annual Expenditure																		
- Administration	1.1	1.1	1.1	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.6	20.1
- Collection	1.9	1.8	1.7	1.7	1.6	1.5	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9	22.6
- Street/Drain	8.3	7.6	6.9	7.1	6.8	6.6	6.3	6.5	6.7	6.9	7.1	7.3	7.5	7.8	8.1	8.4	8.7	101.8
- Contract-out	6.8	7.4	8.0	9.4	9.6	9.9	10.1	10.6	11.2	11.7	12.2	12.7	13.2	13.7	14.2	14.7	15.2	168.3
- Disposal	0.6	0.6	0.6	1.0	1.0	1.1	1.1	1.1	1.7	1.8	1.8	1.9	1.9	2.0	2.0	2.1	2.2	22.9
- Interest	0.0	0.0	0.1	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	5.8
Sub-total	18.7	18.5	18.5	21.1	20.9	20.9	20.8	21.5	23.0	23.7	24.5	25.3	26.1	27.0	27.9	28.8	29.8	341.4
- Repayment			0.0	0.0	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	5.7
Total	18.5	21.1	21.1	21.1	21.4	21.3	22.1	23.5	24.2	25.0	25.8	26.6	27.4	28.3	29.2	30.1	30.1	347.1

(2) Financial Resource

Financial resources for the investment are to be prepared through Federal Government loans and the MPPP's own development fund. Federal Government loans will be a combination of long term and mid term loans as shown in Table 6-2.

Table 6-2 Financial Resources for the Investment

	(M\$ million)						
	1990	1991	1992	1993	1994	1995	Total
Long Term Loans	0.2	6.0	-	-	-	-	6.2
Middle Term Loans	0.4	0.7	0.6	-	-	-	1.7
MPPP Funds	0.0	1.0	0.5	-	0.1	0.1	1.7
Total	0.6	7.7	1.1	-	0.1	0.1	9.6

Loan conditions are assumed as shown in Table 6-3.

Table 6-3 Loan Conditions

	REPAYMENT SCHEDULE	NOMINAL INTEREST RATE
Long Term Loans	Repayment over 20 years with a 3 year grace period	7%
Middle Term Loans	Repayment over 10 years with a 2 year grace period	9%
Short Term Loans	Repayment in the following year	13.5%

The annual operation cost for the SWM is to be born by a portion of the assessment (property tax), fees for commercial waste collection and for landfill service as shown in Table 6-4.

Table 6-4 Resources of Revenue

	(M\$ million)				
	1992	1993	1994	1995	Total
Assessment	22.9	23.3	23.6	24.0	93.8
Fee Collection					
- Commercial Fee	1.2	1.3	1.3	1.4	5.2
- Tipping Fee	0.2	0.2	0.2	0.2	0.7
Total	24.3	24.7	25.1	25.5	99.7

Note: All the amounts shown in Table 6-4 are greater than the corresponding figures shown in the previous sections as a result of the reflection of an inflation which is assumed at 1.5% per year.

The SWM budget to be allocated from general budget of the MPPP is estimated to increase by 1.5% per annum which is same as of the projected inflation rate.

Commercial and tipping fees are estimated to be collected at the rates of M\$36.1 per ton and M\$7.4 per ton respectively in 1992. Those rates will increase to M\$58.4/t for commercial waste and M\$12.0/t for tipping fee at 1996, and M\$83.8/t for commercial waste and M\$17.3/t for tipping fee at 2001.

(3) Balance of Expenditure and Revenue

Basically the balance in Phase I will keep the black figures, except in 1991 when the initial investment for the construction of disposal site is required.

The complete repayment of the total debt for Phase I investment will be possibly materialized in 1994.

(4) Proposal for Financial Plan

The Money flow of the project is shown in Table 6-5.

It is projected that the financial plan is comparatively easy, if the appropriation to SWM from the Council's general budget would increase by 1.5% per annum from the base year of 1988 (M\$21.3 million) up to 2005, and if the efficient waste collection and cleansing work in addition to the fee collection were smoothly introduced as proposed. The importance of introduction of those new systems, therefore, cannot be overemphasized.

Table 6-5 Money Flow of the Project

	(MPPP)		F/S		D/S step by step												
	unit: M\$ thousand (1M\$=¥50) (considering inflation & personnel increase)																
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Revenue																	
- SWM Budget			22,940	23,281	23,643	23,984	24,346	24,729	25,091	25,475	25,853	26,242	26,625	27,030	27,434	27,839	354,517
- Commercial Fee			1,223	1,268	1,315	1,364	2,281	2,359	2,443	2,526	2,615	3,884	4,021	4,162	4,309	4,462	38,232
- Tipping Fee			170	176	183	190	318	329	341	354	366	546	566	588	610	633	5,368
- Electrical Sale			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal (A)	0	0	24,333	24,725	25,141	25,538	26,944	27,418	27,875	28,356	28,840	30,671	31,212	31,779	32,353	32,933	398,118
Expense																	
- Depreciation			1,333	1,366	1,399	1,434	1,483	2,609	2,697	2,787	2,880	2,972	3,067	3,165	3,265	3,369	33,825
- Personnel			9,314	9,040	8,741	8,416	8,650	9,001	9,252	9,512	9,780	10,095	10,421	10,765	11,113	11,472	135,578
- Maintenance			421	427	434	440	459	667	588	610	632	651	669	689	708	728	8,025
- Fuel & Other			1,241	1,244	1,247	1,249	1,292	1,710	1,761	1,815	1,870	1,926	1,984	2,045	2,108	2,172	23,663
- Interest 1		53	536	588	579	539	499	459	418	378	338	298	266	241	215	190	5,597
- Interest 2		6	151	0	0	0	0	72	0	0	0	0	0	0	0	0	229
- Contract 1			9,405	9,649	9,893	10,137	10,644	11,151	11,658	12,165	12,672	13,178	13,685	14,102	14,699	15,206	68,335
- Contract 2																	
Subtotal (B)		60	22,402	22,314	22,294	22,216	23,033	25,568	26,374	27,267	28,172	29,120	30,092	3,396	32,108	33,137	375,253
Balance (A-B)		-60	1,930	2,410	2,847	3,322	3,911	1,850	1,501	1,090	663	1,551	1,120	383	244	-234	22,864
Investment																	
- Fund	636	7,700	1,071	0	78	88	18,507	783	3,905	1,280	95	111	0	326	1,092	1,804	38,018
- Budget	47	1,014	489	0	78	88	18,507	783	3,905	1,280	95	111	0	326	1,092	1,804	30,112
- Grant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Contractor																	
- Loan																	
Foreign	215	5,960	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,176
Local 1																	
Local 2	424	726	582	0	0	0	0	0	0	0	0	0	0	0	0	0	1,731
Repayment		0	0	103	527	527	527	527	527	527	527	436	363	363	363	363	5,679
Remain of Loan	636	7,325	7,907	7,803	7,277	5,750	6,223	5,696	5,170	4,643	4,116	3,680	3,317	2,954	2,591	2,227	
Money Demand	47	1,074	-2,775	-3,673	-3,642	-4,141	13,640	-3,150	234	-2,070	-2,926	-3,976	-3,824	-2,665	-2,054	-999	
Short Term Loan	47	1,074	-2,775	-3,673	-3,642	-4,141	-13,640	-3,150	234	-2,070	-2,926	-3,976	-3,824	-2,660	-2,054	-999	-20,899
Accumulated	47	1,121	-1,654	-5,327	-8,969	-13,110	530	-2,620	-2,335	-4,455	-7,381	-1,357	-15,181	-17,845	-19,900	-20,399	
Total of Debt	686	8,446	6,253	2,477	-1,692	-6,360	6,753	3,077	2,784	188	-3,265	-7,677	-11,864	-14,892	-17,309	-18,671	

III. First Phase Project Plan for MPSP

III. First Phase Project Plan for MPSP

1. Components of the First Phase Project

(1) Selection of the Level of Final Disposal

The introduction of sanitary landfill will require a large investment relative to the financial scale of the Council.

Disposal systems can be classified into the following four levels.

- a. Level 1 Controlled tipping
- b. Level 2 Sanitary landfill with a bund and daily soil covering
- c. Level 3 Sanitary landfill with leachate circulation
 and monitoring
- d. Level 4 Sanitary landfill with leachate treatment
 and monitoring

In view of the topography and geology of the proposed disposal sites, the estimated project costs for Level 3 and 4 during Phase I are estimated as follows.

Level 3: M\$8.1 million

Level 4: M\$23.5 million*

* This amount does not include costs for bottom liner because it is not necessary in view of very low permeability of the bottom soil.

As can be seen from the above, Level 3 disposal system costs less than one half of Level 4 disposal system.

In view of the facts that the implementation of a project which requires substantial investment against limited financial resources may destroy the financial basis of the Council and that the balanced development of the infrastructures including sewage system, solid waste management system and flood control, etc.) is essential for the environment conservation, it has

been decided that the disposal facilities to be constructed in Phase I will be of Level 3, and that these will be improved to Level 4 in Phase III onwards. This decision is also supported by the environmental impact assessment results which show the impact of Level 3 sanitary landfill on the surrounding environment is minimal.

(2) Content of the First Phase Project

The objectives of Phase I are the achievement of a pleasant living environment and contribution to the socioeconomic development of the city by improving the living environment, which will be achieved in turn by improving the service level, expanding the service area and implementing sanitary landfill at disposal sites far from urban areas.

Fig. 1-1 shows the concrete contents of each component of the First Phase Project Plan.

o Collection Improvement

- 3 times/week door-to-door collection (urban areas)
- 3 times/week station collection (suburban areas)
- Establishment of bulky waste collection system
- Introduction of 10 m³ compactors

o Expansion of Contracting-Out

- Achievement of 50% private contracting-out ratio (in terms of waste amount)
- Combined contract for collection and cleansing
- Review of collection zones (1 zone: 30 t/day)
- Advice on introduction of 10 m³ compactors

o Cleansing Improvements

- Introduction of team work and weekly cleaning (Residential areas)
- Mechanization of main road sweeping
- Introduction of grass cutters

o Construction of Kuara Muda Disposal Site

- Development area : 17.9 ha
- Landfill volume : 560,000 m³
- Daily disposal amount: 199 tons
- Operation period : 6 years

o Disposal Method

- Target level : Level 3
- Landfill method : Cell method

o Construction of Pulau Burong Disposal Site

- Development area : 16.7 ha
- Landfill volume : 660,000 m³
- Daily disposal amount: 238 tons
- Operation period : 6 years

Fig. 1-1 Phase I Project of MPSP

(3) Design conditions of Phase I Project

a. Target Year

Target year is 1995. The disposal operation will be transferred to the new sites in 1992 due to the limited disposal capacity of the present sites.

b. Target Area

While the entire MPSP is the target area, collection will be limited to the Priority Operational Areas.

c. Design Population

The design population in 1995 is 627,100. Since the design population for waste collection is 485,100, the collection rate will be 77% in 1995.

d. Solid Waste Amount

- Solid waste amount to be collected : 342 t/day
- Solid waste amount to be disposed of: 437 t/day
- Street length to be swept : 1292 km

e. Solid Waste Composition (refer to Part I Table 6-3)

f. Location of Disposal Sites

The waste disposal will be conducted at Kuala Muda and Pulau Burong disposal sites. Until the commencement of the new sites, the present disposal site will continue to be used up to 1992 by raising the disposal height.

2. Preliminary Design

2.1 Collection Improvement

(1) Collection System in 1995

The collection system to be achieved by 1995 is shown in Table 2-1

Table 2-1 Collection System to be Achieved by 1995

a. Collection Rate	- 77% in terms of population
b. Collection Frequency and Discharge Points	- Commercial Areas : Daily, door-to-door - Residential Areas : 3 times/week, door-to-door - Housing Complexes : Daily, dust chute with container : 3 times/week, station
c. Waste Discharge Method	: Plastic bags
d. Collection Volume	- 342 t/day
e. Collection System	- Ordinary Waste Collection - Bulky Waste Collection - Large Amount Collection
f. Collection Vehicle	- Ordinary Waste : Compactor - Bulky Waste : Dump truck - Large Amount Waste: Compactor and arm roll
g. Share of Private Contracting-Out	- 50% in terms of Waste Amount Collected

(2) Project Plan

a. Promotion of Plastic Bag Use

The use of plastic bags for the discharge of domestic and commercial wastes will be promoted together with the introduction of a 3 times/week collection system.

b. 3 Times/Week Collection

The present daily door-to-door Collection service will be continued in commercial areas and shopping streets in the Project Area, and an efficient 3 times/week collection service will be introduced in all the residential areas by 1995 with the cooperation of residents.

This 3 times/week collection service will be provided first in places where its introduction appears easy and will then be extended to all other areas.

Collection from housing complexes with container will be conducted daily as part of the large amount collection service. Plastic bags will be used and station collection will be conducted 3 times/week for housing complexes where bulk bins are not provided.

c. Bulky Waste Collection

Bulky waste collection will be regularly conducted to maintain environmental hygiene with a collection frequency of once a month in 1995. The initial introduction of bulky waste collection will be conducted together with that of the 3 times/week collection.

d. Large Amount Collection

The large amount collection system will be initially introduced in the North and Central Districts where urbanization is in rapid progress. The subjects of this daily collection service will include large businesses (hotels, stores and offices) and housing complexes and a list of the subject premises must be prepared.

e. Abolition of Double Handling System

The double handling system which is used in some areas will be replaced by the single handling system together with the introduction of the 3 times/week collection system and the discharge using system plastic bags.

f. Introduction of Compactor Vehicles

Compactors will be used for collection in the future with a target of 2 trips a day on average. Use of compactors with a loading capacity of 10 m³ is recommended instead of side loaders. Use of vehicles larger than 10 m³ is not recommended in view of the road conditions. The conversion to this new type of vehicle will take place in 1992 in accordance with the commencement of operations at the new disposal sites.

g. Contract Out

i. Ratio of Contract Out

It is planned to increase the contract-out ratio to some 50% in terms of waste amount by 1995.

The daily collection volume by MPSP's contractors will be 157 tons and 191 tons in 1992 and 1995 respectively. Road and drain cleansing will also be contracted-out to the private sector.

ii. Contract Zone

In view of efficient operation of collection vehicles (10 m³) inclusive of stand-by vehicles, collection zones for contractors should be so arranged that the collection amount will be 30 t/day or more in respective zone.

h. Collection Equipment and Manpower for the Council's Operation

31 compactors, 3 dump trucks and 238 workers will be required to collect solid waste in 1995.

2.2 Cleansing Improvement

(1) Cleansing System in 1995

The cleansing system to be achieved by 1995 is shown in Table 2-2.

Table 2-2 Cleansing System and Work-load

	PRESENT 1987	1992	1995 (Km)
a. Road Sweeping			
- Main Roads			
. Daily	215	-	-
. Weekly (Mechanized)	-	215	215
- Commercial Areas (Daily)	107	118	123
- Residential Areas (Weekly)			
. Daily	275	-	-
. Weekly	-	735	418
- Other Areas (Monthly)	536	536	536
Total	1,133	1,242	1,292
b. Drain Cleaning			
. Daily	1,194	-	-
. Weekly	-	1,416	1,512
c. Grass Cutting (Monthly)	1,194	1,416	1,512
d. Beach CleanSing (Daily)	10	20	20

(2) Project Plan

a. Introduction of Once-a-Week Cleansing System in Residential Areas

Once-a-week cleansing system will be introduced in residential areas together with the introduction of the 3 times/week collection system. In view of the fact that cleansing work is currently conducted by about 550 workers, once-a-week cleansing system will be gradually implemented in to avoid a drastic cut in manpower.

b. Mechanization of Cleansing Work

The weekly mechanized sweeping of main roads is planned in view of the extensive land area of MPSP. While grass cutting is currently conducted manually together with drain cleansing, the mechanized cutting by special workers will be introduced to improve work efficiency.

c. Introduction of Team Work

Team work system for street sweeping and drain cleansing will be introduced in residential areas. Streets in markets and commercial areas will, however, be swept daily.

d. Equipment and Manpower for Cleansing Work

The main equipment for cleansing work will be mechanical sweepers, trucks and grass cutting machines, and the required number of equipment in 1995 is as follows:

- | | |
|---------------------------|---------------------------------------|
| 1) Mechanical sweepers | : 2 units : 1 unit (reserve) |
| 2) Trucks | : 6 units (2 units for each district) |
| 3) Grass cutting machines | : 48 units (1 unit for each worker) |

The required manpower is shown in Table 2-3.

Table 2-3 Required Manpower

WORK ITEMS	TOTAL LENGTH	(persons)		
		COUNCIL WORKERS	CONTRACTORS	TOTAL
a. Worker				
- Street Sweeping				
. Daily	123 km	71	71	142
. Weekly	418 km	34	35	69
. Monthly	536 km	22	0	22
. Mechanized	215 km	8	0	8
- Drain Cleansing (Weekly)	1,512 km	158	90	248
- Grass Cutting	1,512 km	48	27	75
- Beach Cleansing	20 km	27	0	27
- Reserve		20	0	20
b. Mandor		39	23	62
Total		429	246	673

2.3 Final Disposal

(1) Planning Conditions

Final disposal in MPSP during Phase I is to be done at the KMDS and PBDS. Planning conditions for the KMDS and PBDS are summarized below:

ITEMS	KMDS	PBDS	REMARKS
i. Service Area	Northern district	Central & southern district	
ii. Waste to be Disposed	Municipal wastes such as domestic waste, commercial waste, street sweeping, drain and beach cleansing waste, and non-toxic industrial waste, accepted by the council, such as construction and demolition waste.		
iii. Cumulative Disposal Amount	345,000 tons	409,000 tons	From Jan. 1992 to Dec. 1996
iv. Daily Disposal Amount	210 t/day	250 t/day	in 1996
v. Unit Weight of Waste	$r = 0.8 \text{ t/m}^3$		
vi. Cumulative Landfill Volume	431,000m ³	511,000m ³	From Jan. 1992 to Dec. 1996
vii. Cumulative Landfill Volume with Covering Material	560,000m ³	664,000m ³	
viii. Amount of Covering Material	129,000m ³	153,000m ³	30% of waste to be disposed.

(2) Project Plan

The outline of the project for the site development and operations for the KMDS and PBDS is as following:

ITEMS	KMDS	PBDS	REMARKS
i. Landfill Method	: Sanitary landfill for level 3		
ii. Total Site Area	: Inland - 17.9 ha	: Inland -	
	: Lagoon - 60.0 ha	: Lagoon - 28.4 ha (Byram Forest Reserve)	
iii. Phase I			
- Landfill Area	: 9.2 ha	: 10.9 ha	From Jan. 1992
- Landfill Height	: 6.1 m	: 6.1 m	to Dec. 1996
iv. Facilities Outline			
- Main Facilities	: Enclosing structure, drain system and access		Existing road to the PBDS will be paved with asphalt
- Environmental Protection Facilities	: Buffer zone, litter, control, gas removal, leachate collection, leachate circulation leachate outlet & monitoring facilities		Buffer zone for the PBDS is not required.
- Building and Accessories	: Site office, weigh-bridge, and storage building		
v. Equipment	: Bulldozer, hydraulic excavator, water sprinkler truck and inspection vehicle.		
vi. Personnel	: 10 persons : 10 persons		

3. Project Cost

(1) Investment Cost

The total investment cost will be M\$14.7 million, including engineering fees, physical and price contingencies as shown in Table 3-1.

Table 3-1 Total Investment Cost
(M\$1,000 in 1987 price)

Collection	5,340
Cleaning	1,420
Disposal	6,990
Sub-Total	13,750
Engineering Fee	236
Physical Contingency	472
Price Contingency	217
Sub Total	925
Total	14,675

(2) Annual Expenses

The annual expenses in 1995 will be M\$15.2 million as shown Table 3-2.

Table 3-2 Annual Expenses in 1995
(M\$1,000 in 1987 price)

	DEPRECIATION	MAINTENANCE	FUEL, ETC.	PERSONNEL	TOTAL
Collection	629	587	540	1,581	3,339
Cleansing	187	0	277	2,769	3,236
Disposal	1,087	253	647	209	2,196
Contractors	-	-	5,462	-	5,462
Administration	-	-	-	962	962
Total	1,906	840	6,928	5,521	15,195

4. Organization, Privatization and Fee Collection

4.1 Proposed Scheme for USD Responsible for SWM

(1) Organizational Scheme

An organization scheme is proposed for the new Urban Service Department of MPSP as shown in Part I Fig. 10-2. The organizational scheme of the USD proposed is the one that can be implemented immediately by deploying the existing cleansing personnel.

(2) Manpower Scheme

Personnel requirements estimated for 1995, according to section and position, are shown in the Table 4-1. In total 869 persons will be required which is about 80% of the present manpower size.

MPSP will have many redundant laborers in the future when it fully introduces 3 times/week collection and once-a-week cleansing system in residential area. Those redundant laborers need to be deployed for other kinds of services such as landscaping work, which is important in view of creating more beautiful city.

Table 4-1 Proposed Number of Personnel According to Section and Position (1995)

NAME OF SECTION	PHI & ENG	TECH & Jr. CLE	OVER- SEER & Jr. TECH & CLE	DRIVER & OPE	MANDOR	LABORER	TOTAL
1. Cleansing Service	4*	-	24	43	39	624	734
2. Contract Monitoring	1	-	5	-	-	-	6
3. Campaign & Enforcement	1	-	4	-	-	-	5
4. Disposal Site Planning & Management	2	2	4	6	-	6	20
5. Research and Development	1	-	-	-	-	-	1
6. Anti-Mosquito	1	-	4	-	6	70	81
7. Administration	-	1	-	-	-	21	22
Total	10	3	41	49	45	721	869

* A director is included in this category.

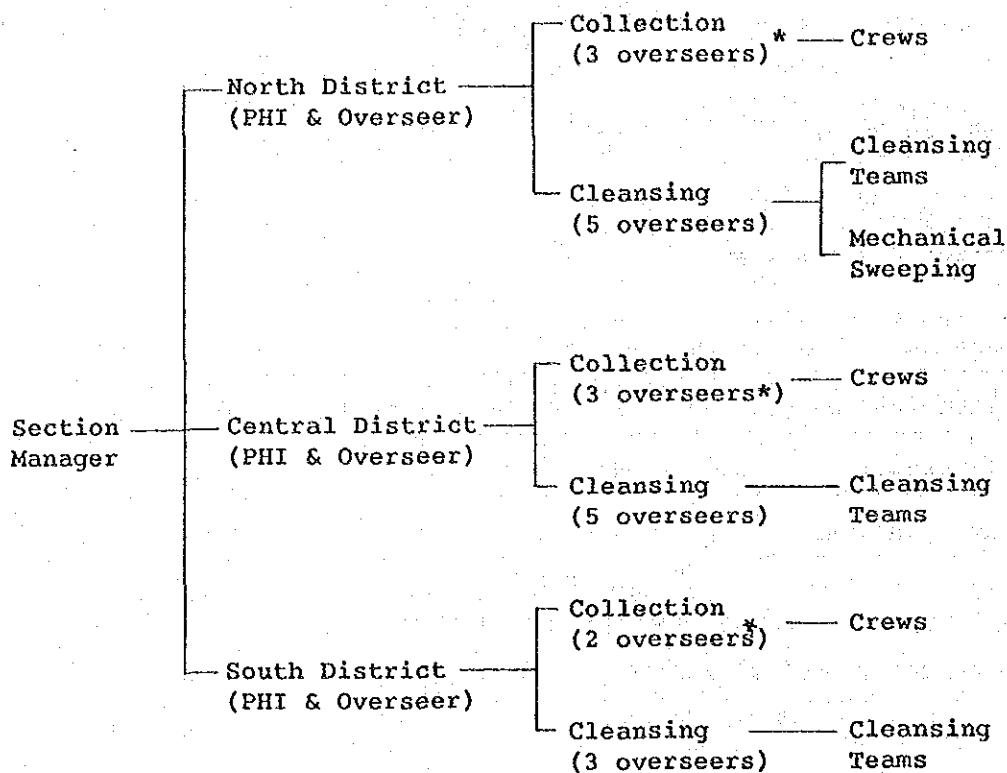
Abbreviations:

PHI : Public health inspector
 ENG : Engineer
 TECH : Technician
 Jr. CLE: Junior Clerk
 OPE : Operator

(3) Organizational Scheme for the Cleansing Service Section

The organizational scheme as shown in Fig. 4-1 is proposed for the cleansing section of the USD.

It is proposed that both PHIs and Overseers would act as middle management who would generate more managerial and planning inputs rather than occupying themselves with daily routine.



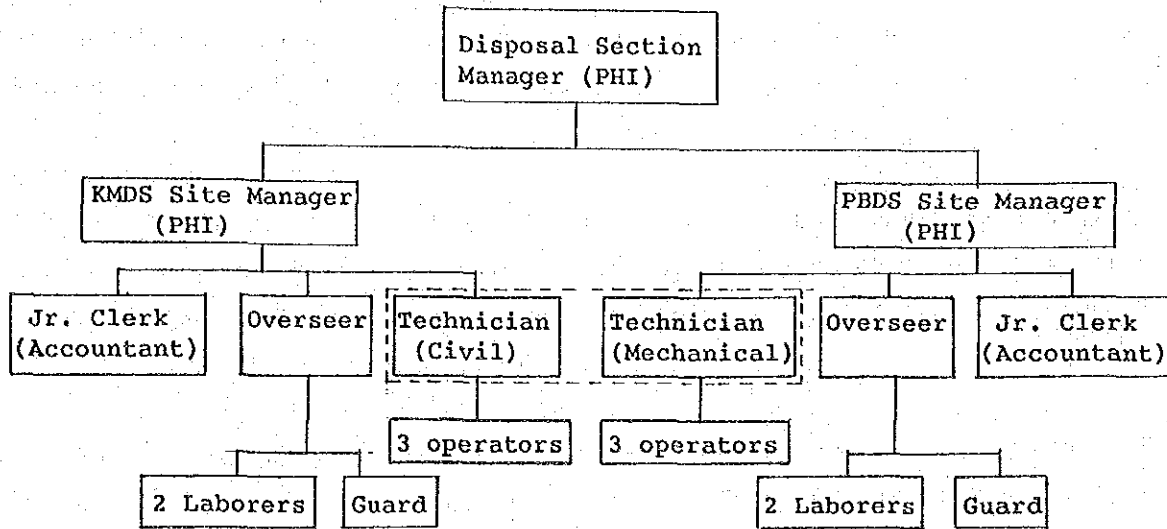
Note 1: North District managers (PHI) will assume the responsibility of the Section Manager.

2: One of the overseers marked with "*" will be responsible for the vehicle control.

Fig. 4-1 Organization Scheme for Cleansing Section in MPSP

(4) Disposal Section

The organization of disposal section is proposed as shown in Fig. 4-2.



- Note: 1. One of the site managers will assume the responsibility of the Disposal Section Manager.
2. Two technicians will look after both sites, though each technician has a principal site where he stations.

Fig. 4-2 Organizational Scheme for Disposal Section

4.2 Privatization

(1) Rate of Privatization

It is proposed that MPSP will expand its privatization in view of the increasing demand for waste collection and cleansing services, which would arise from the increasing waste amount and necessity for expanding the service coverage.

It is proposed that MPSP in 1995, will privatize 50% of domestic waste collection and 100% of the large amount waste collection services, which would lead to an overall privatization rate of 56% in terms of waste collection amount.

Similarly, it is proposed that MPSP will increase the privatization of street/drain cleansing to 50% approximately in 1995 in terms of served population. Like the present system, a contractor should be responsible for both waste collection and street/drain cleansing services in its contract area.

(2) Contract Area

It is proposed that the contract area be urban area, while MPSP itself will provide services mainly in rural area.

4.3 Fee Collection

(1) Fee Collection System

It is proposed that MPSP introduce two kinds of fees: commercial waste collection fees and tipping fees to be charged on waste directly brought into the Council's disposal site by private firms.

It is also proposed that MPSP increase revenue from those fees by increasing both fee rates and number of the fee payers.

As a means of collecting the commercial waste collection fees, it is advisable that such fees be included in water bills, as practiced by MPPP.

As a means of collecting the disposal tipping fees, a pre-paid ticket system may be advisable.

(2) Measures to Strengthen Fee Collection System

The following measures is proposed for strengthening the fee collection system.

- 1) Revision of regulations related to the fees.
- 2) Introduction of licensing system for users of the Council's disposal site
- 3) Introduction of severer penalties on illegal dumping.

5. Project Evaluation

5.1 Technical Evaluation

(1) Improvement of Collection and Cleansing Works

From technical view point there is no problem in the introduction of 3-times/week collection system, plastic bag usage for discharge and once-a-week cleansing system. These systems have been implemented smoothly as a MPPP's pilot project in Bayan Baru area and have been accepted by the residents, even though residents complained about these systems especially on the use of standard plastic bags at the initial stage.

It is considered that the introduction of those systems would be feasible in all residential area of MPSP by 1995 as proposed.

The MPPP's pilot project in Bayan Baru shows that these systems have following benefits:

- a. Operation efficiency will be greatly improved, and environmental conditions in the area will not deteriorate through residents' cooperation.
- b. Collection and cleansing zones are divided into smaller zones under the reduced frequency service system. The services are provided in a smaller zone in each day. This has made it easy to control the daily operation. It has been also found that the work control is easier under the group working system introduced in the pilot project area.
- c. The usage of plastic bags greatly contributes to the increase of collection efficiency and to the upgrading of sanitary conditions.

Health Department of MPSP will have some redundant laborers through the expansion of area where these systems will be applied in the near future. Therefore, it is necessary to deploy these laborers to other public services.

(2) Introduction of compactor vehicle

It is proposed that compactor vehicles with 10 cu.m be used for domestic waste collection also in future instead of tipper vehicle. It will not cause any problem to MPSP because MPSP has been using the vehicles of this type and size already.

However, it is necessary to establish a strong preventive maintenance system.

(3) Construction of level 3 sanitary disposal sites in Kuala Muda and Pulau Burong

From technical view point, level 3 sanitary disposal site which has daily soil covering and leachate circulation system to improve leachate quality, does not have difficulty in construction and operation.

5.2 Preliminary Environmental Impact Assessment

A Preliminary Environmental Impact Assessment for the proposed solid waste disposal site was conducted by the University Sains Malaysia (USM), under the contract with the Ministry of Housing and Local Government, in accordance with the Environmental Quality Order 1987. Results of the Preliminary Environmental Assessment are summarized in Tables 5-1 and 5-2.

Table 5-1 Preliminary Environmental Impact Assessment of
the Solid Waste Disposal Site of Kuala Muda

	Construction Phase	Operational Phase
Noise	In some cases the noise level may be higher than the WHO's standard of 55 dB(A), but no adverse effect in daily life is expected.	Generation of noise from landfill equipment will be attenuated by more than 10 dB(A) due to five-meter high bund.
Dust/ Odor	Adverse impact from dust would not be significant for the residential area, because a five-meter high bund will be constructed with a 50m wide green belt.	The generation of dust can be controlled by water sprinkling. The daily cover can minimize the generation of odor.
Traffic Volume	No increase of traffic volume is expected.	Only 100 traffic volume per day for haulage of waste will be added to the ordinary volume of 1,900 in 1995. Therefore, adverse impact due to concentration of carbon monoxide (CO) is very low.
Leachate	Nil	In case the level of landfill development and operation is level 3, BOD and COD will be diluted to less than 3 ppm and 4 ppm at the points of 30 m away from discharging point. Therefore, almost no adverse effect on aquatic flora and fauna is expected.
Impacts on Plant and Animal Communi- ties	No adverse impacts are assumed, because there is no removal of vegetation involved.	By discharging the leachate directly into the sea and not into the river, the impact on aquaculture would not be significant. If the leachate is diluted by sea water at the discharge point, as proposed by the project, the impact on the marine lives would be negligible.
Impacts on Human settle- ments	Adverse impact on human settlements would not be significant.	First major impact relates to the proposed PERDA housing scheme. A buffer zone and a bund will mitigate the offensive problems on the surrounding residents. Second major impact is the adverse effect by haulage vehicles on the human settlement along the route. Rerouting the trucks from the proposed Penaga road to the Permatang Sintok road will reduce the adverse impacts.

Table 5-2 Preliminary Environmental Impact Assessment of the Solid Waste Disposal Site of Pulau Burong

	Construction Phase	Operational Phase
Noise	No adverse effects of noise are assumed, because there are no houses around the proposed site.	No adverse effects of noise are assumed, because there are no houses around the proposed site.
Dust/ Odor	No adverse effects of dust are assumed, because there are no houses around the proposed site.	No adverse effects of dust and odor are assumed, because there are no houses around the proposed site.
Traffic Volume	No increase of traffic volume is expected.	Only 120 traffic volume per day for haulage of waste will be added to the ordinary volume of 1,000 in 1995. Therefore, adverse impact due to concentration of carbon monoxide (CO) is very low.
Leachate	Nil	In case the level of landfill development and operation is level 3, BOD and COD will be diluted to less than 3 ppm and 4 ppm at the points of 30 m away from discharging point. Therefore, almost no adverse effect on aquatic flora and fauna is expected.
Impacts on Plant and Animal Communi- ties	The main biological effect would be the loss of habitats for the birds and mammals. The retention of the mangrove fringe would mitigate the adverse effects.	Though there is a lot of cockle farming in the mudflats, these would not be affected much by the leachate because of dilution.
Impacts on Human settle- ments	There is virtually no impact anticipated.	The main problem is the trucking of waste through changkat (especially with narrow streets). It mitigates the adverse effects that haulage vehicles driver keep going slowly and that the returning route be the route passing Nibon Tebal.

5.3 Social Evaluation

(1) Collection and Cleansing Improvement in Residential Area

As for the introduction of 3 times/week collection system combined with plastic bag and once a week cleansing system, it is indispensable to obtain the resident's cooperation due to decline the service level.

It is reasonably expected that those new systems may be socially acceptable in MPSP area in view of the successful implement of the pilot project in Bayan Baru.

(2) Introduction of Compactor

The introduction of compactors will contribute to the reduction in workload and the improvement of sanitary conditions of workers.

(3) Level 3 Landfill Operation

An agreement is made between the parties concerned regarding the use of Kuala Muda and Pulau Burong area as the sites for waste disposal. The State Government has started the control over the development of the areas surrounding these sites.

Furthermore, the existing dump site in question will possibly be closed upon the commencement of landfill operation at KMDS and PBDS.

5.4 Economic and Financial Evaluation

(1) Economic Effects of Improvements of Collection and Cleansing Services

The proposed improvement measures will achieve a higher collection efficiency and will enable a considerable cost reduction as compared to the case where the present collection system were simply expanded.

It is proposed that MPSP expand its service coverage in terms of area and population by utilizing the resources to be saved through the above SWM improvements. Such expansion of the service coverage is considered to be a benefit resulting from the implementation of the new systems.

(2) Economic Effects of Disposal Improvement

A major benefit resulting from the realization of the level 3 sanitary landfill with cell method is that the living environment and public hygiene standard would be greatly upgraded as compared to the case where the existing disposal systems continue.

(3) Economic Evaluation

Table 5-3 shows the cumulative SWM costs till 2005 estimated for the following two cases:

Case 1: Waste disposal system will be improved as proposed in the Master Plan. No improvements, however, will be made regarding waste collection/haulage and street/drain cleansing services.

Case 2: Improvements will be made not only for waste disposal system but also for collection/Haulage and street/drain cleansing services as proposed in the Master Plan. The improvements of collection/haulage and street/drain cleansing services include the reduction in the frequency of those services.

Table 5-3 Comparison of the Cumulative SWM Costs between the Two Cases

(M\$ million at 1987 price)

Case 1	:	255.7 (a)
Case 2	:	239.2 (b)
Difference	:	16.5 (c)
Ratio of (b) to (a)	:	93%
Ratio of (c) to (a)	:	6%

The above table shows that the Case 2 which includes the improvements of collection/haulage and street/drain cleansing will bring about a considerable saving which would amount to M\$16.5 million over the Master Plan period till 2005.

Therefore, the Case 2 which is recommended in the Master Plan, has proved to be feasible.

(4) Financial Evaluation

The results of the financial evaluation of collection, cleansing and disposal improvement are given below assuming that the appropriation to SWM budget will increase by 4.8% in real term annually and fees for commercial waste collection and tipping fee for disposal will increase substantially.

The present solid waste management cost of MPSP is estimated to be some M\$9.9 million.

If MPSP introduced both the commercial waste collection fees and tipping fees as proposed in the Master Plan, the fee revenue will be M\$1.1 million in 1995 and M\$3.5 million in 2005.

With the implementation of collection, cleansing and disposal site improvement, the annual expenses of solid waste management is expected to total M\$16.2 million in 1995 and M\$24.9 million in 2005. If solid waste management budget increases by 4.8% in real term annually and the fees are collected as proposed, the total debt will decrease to M\$18.1 million in 2005, and will possibly be repaid completely in several years after 2005.

Given the above financial evaluation results, the Project is considered financially feasible.

6. Implementation Plan

6.1 Project Implementation Body and Schedule

(1) Project Implementation Body

Solid waste management is currently conducted by the Health Department. For the successful project implementation, however, the Urban Service Department should be established. In view of the fact that the financial assistance of the Federal Government is planned for the Project, the Ministry of Housing and Local Government will arrange the necessary funds and will supervise the implementation of the Project.

(2) Implementation Schedule

a. Implementation Conditions

The implementation conditions for the Phase I Improvement Project are as follows:

- Design Target Year : 1995
- Service Commencement Year : 1992
- Subject Area : entire MPSP

b. Preparatory Period

The following must be conducted in the preparatory period of some 18 months from the completion of the Feasibility Study to the commencement of the construction work:

- Acquisition of investment funds and preparation of repayment plan
- Confirmation of facility construction sites
- Preparation of detailed design and specifications for facilities and equipment
- Selection of contractor (tender, evaluation and contract)

c. Construction Schedule

The Project is mainly divided into equipment procurement work and facility construction of which periods are proposed as follows:

- Equipment/material procurement : 6 months after completion of contract
- Disposal site construction : 12 months after commencement of the construction

6.2 Financial Plan

Based on the results of the financial evaluation, the financial plan for the implementation of this project will be set as follows:

(1) Required Fund

The investment and annual expenditure shown in Table 6-1 have been estimated based upon Tables 3-1 and 3-2, and using the following assumptions:

- a. An additional budget amounting to 15% of the original construction cost may be required for engineering service and allowance for contingency.
- b. Annual expenditure 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%.

Table 6-1 Investment Cost and Annual Expenditure for MFSP

(M\$ million)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total	
1. Investment cost																			
- Vehicle	0.0	2.7	1.7	1.1	0.2	0.0	0.0	6.6					6.1					18.4	
- Cleansing	0.0	0.0	0.8	0.6	0.0	0.1	0.1	1.9					1.5					4.9	
- Sanitary D/S (0.1)	0.1	0.3	8.2	0.0	0.0	0.0	0.0	12.8					26.8					48.2	
- Total (0.1)	0.1	3.0	10.7	1.7	0.2	0.1	0.1	21.4					34.4					71.5	
2. Annual Expenditure																			
- Administration	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5	18.0	
- Collection	4.0	4.0	4.0	3.2	3.2	3.2	3.2	3.3	3.3	3.4	3.5	3.5	3.6	3.7	3.7	3.8	3.9	48.4	
- Street/Drain	3.5	3.5	3.5	3.3	3.4	3.5	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.9	5.1	5.3	5.5	60.0	
- Contract-out	2.1	2.5	3.1	5.4	5.6	5.9	6.2	6.6	7.0	7.4	7.8	8.2	8.7	9.2	9.7	10.1	10.6	108.4	
- Disposal	0.3	0.3	0.3	1.2	1.2	1.2	1.3	1.3	0.9	0.9	0.9	1.0	1.0	2.7	2.8	2.9	2.9	22.1	
- Interest	0.0	0.0	0.3	1.1	1.4	1.4	1.5	1.4	2.5	2.8	3.3	3.3	3.1	4.3	4.1	3.7	3.6	37.8	
Sub-total	10.9	11.3	12.5	15.2	15.9	16.4	16.9	17.6	18.9	19.8	21.1	21.9	22.4	26.1	26.8	27.3	28.1	294.7	
- Repayment	0.0	0.0	0.0	0.0	0.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.5	0.5	0.5	0.5	8.5	
Total	10.9	11.3	12.5	15.2	16.1	17.2	17.7	18.4	19.7	20.7	21.9	22.7	23.0	26.6	27.3	27.8	28.6	303.2	

(2) Financial Resource

Financial resources for the investment are to be prepared through Federal Government loans and the MPSP's own development fund. Federal Government loans will be a combination of long term and mid term loans as shown in Table 6-2.

Table 6-2 Financial Resources for the Investment

	(M\$ million)						
	1990	1991	1992	1993	1994	1995	Total
Long Term Loans	0.3	8.2	-	-	-	-	8.5
Middle Term Loans	2.3	1.5	1.0	-	-	-	4.8
MPSP Funds	0.4	1.0	0.7	0.2	0.1	0.1	2.4
Total	3.0	10.7	1.7	0.2	0.1	0.1	15.7

Loan conditions are assumed as shown in Table 6-3.

Table 6-3 Loan Conditions

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

The manual operation cost for the SWM is to be born by a portion of the assessment (property tax), fees for commercial waste collection and for landfill service, as shown in Table 6-4.

Table 6-4 Resources of Revenue

	(M\$ million)				
	1992	1993	1994	1995	TOTAL
Assessment	13.4	14.3	15.2	16.2	59.1
Fee Collection					
- Commercial Fee	0.8	0.8	0.8	0.9	3.3
- Tipping Fee	0.5	0.5	0.5	0.5	2.1
Total	14.7	15.6	16.6	17.6	64.5

Note: All the amounts shown in Table 6-4 are greater than the corresponding figures shown in the previous sections as a result of the reflection of an inflation which is assumed at 1.5% per year.

The SWM budget to be allocated from general budget of the MPSP is estimated to increase 6.37% in nominal term annually with 1987 SWM budget as a base year considering annual increase rate 4.8% in real term and 1.5% inflation.

The commercial waste collection fees and tipping fees are estimated to be collected at the rates of M\$65.8/t and M\$15.3/t respectively in 1995. Those rates will rise M\$70.9/t and M\$18.9/t in 1996, and M\$79.5/t and M\$21.0/t in 2001.

(3) Balance of Expenditure and Revenue

Basically the balance in Phase I will show a deficit, though it is expected that the balance will turn to the black in 2001.

In Phase III, the balance will show a deficit due to an increase in the operation cost of the level 4 sanitary landfill in 2002. However, it is expected that the deficit will decrease rapidly from M\$4.8 million at 2002 to M\$1.5 million at 2005.

(4) Proposal for Financial Plan

Money flow of the project is shown in Table 6-5.

In view of the tight financial conditions arising in the future, the importance of the fee collection and the proposed service efficiency improvements cannot be overemphasized.

The construction of the level 4 sanitary landfill in Phase III will require much more fund than the level 3 landfill does. Judging from the future financial situation of MPSP, a grant from the Federal Government will be indispensable for MPSP to construct the level 4 sanitary landfill. The amount of the grant needs to be at least 50% (M\$13.4 million) of the construction cost.

Table 6-5 Money Flow of the Project

D/S step by step (Level 4 in 2001)
MPSP (M\$ thousand) (considering inflation & personnel increase)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Revenue																	
- SWM Budget			13,430	14,283	15,203	16,161	17,193	18,302	19,462	20,708	22,028	23,428	24,910	26,503	28,190	29,980	289,781
- Commercial Fee			768	799	830	864	1,051	1,183	1,333	1,501	1,690	2,132	2,402	2,706	3,048	3,434	23,741
- Tipping Fee			499	511	523	534	687	715	743	774	805	928	962	998	1,036	1,075	10,788
- Electrical Sale																	
Subtotal (A)	0	0	14,697	15,593	16,556	17,559	18,931	20,199	21,538	22,982	24,522	26,487	28,274	30,208	32,275	34,489	324,310
Expense																	
- Depreciation			2,076	2,120	2,167	2,218	2,336	2,940	3,052	3,168	3,288	3,407	7,030	7,303	7,586	7,879	56,569
- Personnel			6,158	6,345	6,534	6,725	6,914	7,103	7,299	7,502	7,712	7,922	8,209	8,440	8,672	8,911	104,446
- Maintenance			963	957	952	946	978	874	906	940	973	1,008	1,278	1,318	1,358	1,400	14,851
- Fuel & Other			1,554	1,584	1,617	1,650	1,705	1,409	1,462	1,518	1,576	1,676	3,165	3,294	3,427	3,563	29,199
- Interest 1		223	931	1,022	1,004	941	878	814	751	688	625	562	515	481	446	411	10,292
- Interest 2		49	203	346	428	518	547	1,734	2,019	2,593	2,723	2,531	3,736	3,601	3,296	3,166	27,491
- Contract Out			3,812	3,992.7	4,174.0	4,355	4,698.7	5,042.1	5,385.6	5,729.0	6,072	6,462.1	6,851.8	7,241.6	7,631.3	8,021	79,470
- Tipping Fee																	
Subtotal (B)		272	17,281	18,023	18,602	19,147	19,926	21,862	22,896	24,234	25,140	25,823	33,123	34,100	34,922	35,940	351,291
Balance (A-B)		-272	-2,585	-2,429	-2,047	-1,588	-995	-1,663	-1,359	-1,252	-618	665	-4,849	-3,893	-2,647	-1,451	-26,981
Investment																	
- Fund	2,951	10,688	1,697	175	53	56	10,421	2,844	5,661	2,189	255	26,906	563	371	3,359	3,241	71,431
- Budget	408	1,012	680	175	53	56	10,421	2,844	5,661	2,189	255	13,486	563	371	3,359	3,241	44,774
- Grant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Loan	0	0	0	0	0	0	0	0	0	0	0	13,420	0	0	0	0	13,420
. Local 1	284	8,167	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,451
. Local 2	2,259	1,509	1,018	0	0	0	0	0	0	0	0	0	0	0	0	0	4,786
Repayment		0	0	205	813	813	813	813	813	813	813	624	497	497	497	497	8,508
Remain of Lo	2,543	12,219	13,237	13,031	12,218	11,406	10,593	9,780	8,967	8,154	7,341	6,717	6,220	5,722	5,225	4,728	
Money Demand	408	1,284	1,188	690	746	239	9,893	2,380	4,781	1,085	-1,602	10,039	-1,122	-2,543	-1,083	-2,690	
Short Term L	408	1,284	1,188	690	746	239	9,893	2,380	4,781	1,085	-1,602	10,039	1,122	2,543	-1,083	-2,690	23,694
Accumulated	408	1,692	2,881	3,570	4,316	4,556	14,448	16,829	21,610	22,695	21,093	31,133	30,011	27,468	26,384	23,694	
Total of Deb	2,951	13,911	16,117	16,602	16,535	15,961	25,041	26,608	30,577	30,849	28,434	37,849	36,230	33,190	31,610	28,423	

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