

6.7 Organization and Institution

(1) Features of the Proposed Organization

The organization proposed has the following features:-

- a. 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.
- b. It has seven sections as shown below.
 - 1) Council Service Section
 - 2) Monitoring Contract Service Section*
 - 3) Campaign & Enforcement Section*
 - 4) Disposal Site Management & Planning Section*
 - 5) Research & Development Section*
 - 6) Anti-Mosquito Section
 - 7) Administrative Section

The four sections marked with asterisk will perform new functions.

- c. The remaining functions of the Health Department include the following.

- Licensing for food handlers and other traders including petty traders
- Clinics for preventive inoculation of food handling licence holders

d. The allocation of PHI's and departmental heads for the new department and the Health Department is proposed as follows:

Table 3.7-3

Proposed Allocation of Personnel for MPSP's USD & Health Dept.

	<u>PHI's (B9)</u>	<u>Sr. PHI's</u>		<u>Chief</u>	<u>DIRECTOR</u>
		<u>(B4)</u>	<u>(B3)</u>	<u>PHI (B1)</u>	
1) USD (SWM & NSW)	6	2	1	0	1
2) Health Department					
- Licensing	6	1	0	1	1
- Clinics	0	0	0		
Total	12 (12)	3 (4)	1 (0)	1 (1)	2 (1)

Note: Figures in the parentheses indicate the existing number of personnel.

In the proposed scheme, one Sr.PHI of B3-scale will act as a cleansing superintendent. (One B3 post has been created in MPSP some time ago. This post however has not been filled since then.)

Personnel such as overseers, drivers, mandors and laborers who have been involved in the cleansing services will be transferred to the new department.

e. The recruitment of a director will require immediate increase in the emolument amounting approximately \$3,600/month, which may be equivalent to the emolument for 5 - 7 laborers.

There may however be a strong case where such increase will soon be offset by the reduction of emolument related to workers without lowering the cleansing service level as the council's cleansing manpower size shrinks as a result of natural retirement under the council's existing policies for non-recruitment of new personnel as well as expansion of the contracting-out of the cleansing services. It can be expected that overall cost-effectiveness of the cleansing services will be improved as a result of expansion of the contracting-out, in view of the relatively higher cost-effectiveness of the contractors over the council's own services.

(3) Functions of Each Section

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

a. 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, each PHI will be responsible for one of the three districts: North, Central and South.

Roles of Overseers and PHI's should be such that Overseers handle most of the day-to-day problems, and PHI's use their time to generate more managerial and planning inputs for the improvement of the existing systems with less expenditure. Among others, the PHI's should be responsible for making sure that conditions of communal bins and collection vehicles are checked by overseers and reported to the PHI's.

b. Contract Monitoring Section

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

This section will be managed by one Sr. PHI. He should have monthly meetings with the contractors.

Five Overseers will be responsible for the daily close monitoring of the contract service. Each of them will be responsible for the supervision of one or two contractors.

c. Campaign and Enforcement Section

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

From experience gained in Kuantan, Petaling Jaya, and some other municipalities, it was found that campaign was never successful without enforcement. This fact cannot be overemphasized. Sr. PHI of this section are expected to come up with a detailed implementation plan for campaign and enforcement.

It is advisable for MPSP to concentrate its campaign and enforcement on one zone at a time. In the cases of Kuantan and Petaling Jaya, they spend about a month in one zone before moving on to the next zone.

d. 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 qualification in the future.

e. 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

- 1) Analysis of information obtained at the weigh-bridge

Whether or not the weigh-bridge will prove to be useful depends greatly on how effectively the user will utilize the information to be obtained at the weigh-bridge. The weigh-bridge will enable the users not only to keep the daily operation record but also to measure the efficiency of waste collection and haulage in various ways.

To measure the efficiency of the cleansing services is the first step toward the identification of problems and improvement on the services.

After the introduction of weigh-bridge to some other municipal councils in Malaysia, it would be useful and advisable for those municipal councils to make cross-municipal comparisons to know the relative efficiency of respective councils.

2) Developing or searching for new tools and equipment

The effectiveness of the cleansing services depends much on the appropriateness of the equipment used. The person in charge of this section must be keen in finding appropriate technology through studying equipment catalogues and observing other councils or making research of his own.

3) Analysis of current practice

The PHI of R & D section is expected also to review the current practice analytically, and come up with improvement plans in collaboration with PHI's of Cleansing Section.

f. 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.

A PHI will be responsible for the management of this section.

g. Administrative Section

In the proposed scheme, all the existing personnel (One Chief Clerk and 21 other personnel including clerks, typists and other office boys) 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.

(4) Role of Personnel

Roles of personnel have been discussed in detail in the Progress Report III Section 5.5.5. 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 practiced.

Overseers are expected to handle most of day-to-day problems and routine (roll-calling and reporting, etc.). Overseers should be encouraged to make suggestions which may lead to improvement on operational efficiency.

PHI's, on the other hand, are expected to concentrate on non-routine matters such as:-

- Identification of fundamental problems
- Working out implementation plans for system improvement and introduction of new system such as usage of plastic bags and less frequent collection
- Training of overseers
- Data-base management
- Monitoring contractors' performance

Cleansing Superintendent is expected to perform the following duties:-

- Measurement of productivity and cost-control
- Inter-council communication to exchange experience and know-how
- Overall management

Departmental Head is expected to perform the following responsibilities:-

- Disciplinary control and work-morale support
- Sound personnel management
- Provision of training
- Inter-departmental communication
- Introduction of sanitary landfilling
- overall management

Council Administrators are expected to:

- Understand the important of the application of systematic thinking and planning to the solid waste management
- Support and give as much authority (controlling power) as possible to the service executing departments
- Maintain quick and effective disciplinary control, and work-morale support
- Minimize political involvement in the execution of council's services

7. Financial Evaluation

There are three steps to select an appropriate alternative from financial viewpoint.

- a. to select an appropriate system (further study on examination of alternatives)
- b. to set the level of sanitary landfill (preliminary financial evaluation)
- c. sensitivity analysis (financial evaluation in F/S study)

In each step, some major assumption are changed as summarized in Table 7.1-1 and 7.2-1. The assumption mentioned below are common in each step and financial evaluation for MPPP and MPSP.

1. All expenses and costs including emolument are estimated at the current price of 1987.
2. All the future costs and expenses will remain at the same level in real term (not in nominal term)

3. Emolument

<u>POST</u>	<u>SCALE</u>	<u>RATE</u>
- PHI's and other supervising personnel	B	\$21,700/year
- Technician & Clerks	C	\$15,400/year
- Overseers, Junior Technicians & Junior Clerks	Upper D	\$11,300/year
- Drivers & Machine Operators	Middle D	\$ 8,300/year
- Mandor & Laborers	Lower D	\$ 6,500/year

The above rates include salaries, EPF, allowances and overtime borne by the Council. It is assumed that the Council employees work eight (8) hours a day, 256 days a year. It is assumed that a 30% increase will be applied to overtime work in excess of the above working hours and days.

4. Fuel and Electricity Costs

- Fuel (Light oil x 120%*) \$ 0.468/liter
- Electricity (for industrial use,
6,600 V or less) \$ 0.21/Kwh
- Water (for business use, less than
60,000 liter) \$ 0.52/m³
- Toll at Penang Bridge (for large
vehicle) \$15.00/trip

Note: Cost of lubricant, which is more expensive than light oil, is included in the fuel cost.

5. Equipment Maintenance Costs

- Vehicle and Heavy Equipment : 8% of Purchase cost
- Machines including civil works : 1.5% of Construction cost

6. Depreciation Period

Depreciation period will be as follows:-

	<u>DURATION</u>	<u>SALVAGE VALUE</u>
- Container	3 years	0%
- Vehicle & Heavy Equipment	7 years	10%
- Machinery inclusive of Barge	18 years	0%
- Civil and Building Works	30 years	0%

The duration of the structures and facilities in the disposal sites are assumed to be equivalent to the disposal period as those are useful only through the disposal period.

7.1 Financial Evaluation for MPPP

7.1.1 Alternatives examined in Master Plan study

In the step to select an appropriate system, two alternatives are examined basically.

- a. Alternative 1 : direct sanitary landfill of all solid waste at the Pantai Aceh Disposal Site
- b. Alternative 1-A : incineration of all solid waste at Free Trade Zone and sanitary landfill of residual waste (ash) at the Pantai Aceh Disposal Site

Two additional alternatives are examined to consider the possibilities to introduce incineration to MPPP.

- b2. 80% of the original incineration cost
- b3. 60% of the original incineration cost

The result is shown in Table 7.1-1.

Detailed information on the possibility of introduction of incineration is written in 6.5.5 of this report.

Table 7.1-1 Repayment of Debts according to Alternative and Assumption

<u>ALTERNATIVE</u>	<u>ASSUMPTION REGARDING MPPP'S BUDGET ALLOCATION TO SWM</u>	<u>ASSUMPTION REGARDING INVESTMENT COST FOR INCINERATOR</u>	<u>PROJECTED YEAR BY WHICH REPAYMENT IS COMPLETED</u>
Alternative 1	0.1% increase/year	N.A.	2002
Alternative 1-A	0.1% increase/year	100% of the original cost	Debt will increase
Alternative 1-A	0.1% increase/year	80% of the original cost	Debt will increase
Alternative 1-A	0.1% increase/year	60% of the original cost	The remaining debt in 2005 will be about \$100 million
Alternative 1-A	4.5% increase/year	80% of the original cost	2004

Note

- 1) The original investment cost of the incineration plant is \$157.4 million, of which \$156.3 is assumed to be invested in Phase 1.
- 2) Major assumptions used for arriving at the above results are shown in the Section 2.4.

7.1.2 Alternatives examined in Preliminary Financial Evaluation

In the step to set the level of sanitary landfill, there are two alternatives basically.

a1- level 3 in Phase 1 and level 4 in Phase 2

a2- level 4 in Phase 1 and level 4 in Phase 2

The investment schedule is assumed shown in Table 7.1-2.

The trend of cost is assumed shown in Table 7.1-3.

The results of the above two cases are shown in Table 7.1-4.

Although there is little difference between the two cases in the total cost for the period from 1992 to 2005, and although it is desirable to start at Level 4 as it is superior to Level 3 in environmental sanitation, present financial circumstances cannot support a project requiring heavy initial investment. For this reason, the project must start from Level 3.

If a final disposal site is arranged without consideration for the improvement of collection and cleaning works, it will be necessary to increase the budgetary allocation by at least 4% annually. That is why the improvement of collection and cleaning works plays an important role in Phase 1 arrangements.

Table 7.1-2 Investment Schedule

Invest Plan	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
D/S																	
Alt-1							13053										29844
Construct Vehicle	840	15951				631											2340
renew		1709					1709							631			2340
Total	840	17660	0	0	0	13684	0	1709	0	0	0	0	0	631	0	0	34524
step by step																	
Construct Vehicle	219	4372				21264											25855
renew		1780				560								560			2340
Total	219	6152	0	0	0	21824	0	1780	0	0	0	0	0	560	0	0	30565

570

Table 7.1-3 Trend of Cost

Trend of Cost	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Alt-1															
Depreciation	1531	1588	1647	1708	1771	1834	1901	1970	2041	2115	2193	2273	2356	2442	27370
Personnel	147	153	158	164	170	177	183	190	196	204	211	219	227	235	2634
Mainte	161	167	173	180	186	193	200	207	215	223	231	239	248	257	2880
Fuel & etc	701	728	755	783	811	841	871	903	935	969	1005	1042	1080	1119	12542
Total	2540	2636	2733	2835	2939	3045	3155	3269	3388	3511	3640	3773	3911	4053	45426
step by step															
Depreciation	1309	1377	1450	1527	1590	1554	1618	1685	1755	1821	1885	1955	2028	2101	38880
Personnel	193	193	193	193	193	208	208	208	208	208	256	256	256	256	3029
Mainte	112	112	112	112	112	134	134	134	134	134	322	322	322	322	2518
Fuel & etc	283	299	315	333	347	368	383	400	417	433	456	474	492	511	9910
Total	1897	1981	2070	2165	2242	2264	2343	2426	2514	2596	2680	2769	2859	2953	54337

Table 7.1-4 Results of Financial Evaluation (MPPP)

M\$ million

Alternatives	Total Investment Cost	Total Expense	Total Revenue	Assumption regarding MPPP's budget alloc.	Total Debt in 2005	Projected year by when repayment is completed	Other Comments
Existing	68.6	439.4	450.4	4.0% per annum increase from 1987	-8.9	2005	Fee Tariff(\$/ton) 1992 2005 Commercial 31.1 62.2 Tipping 7.2 14.4 gradually increase
Alt-1	78.1	293.2	301.9	0.2% per annum increase from 1987	-0.3	2005	ditto
ditto	78.1	293.6	298.9	0.1% increase	3.2		ditto
Step by step	74.2	287.4	298.9	0.1% per annum increase from 1987	-8.6	1994 2002	ditto

7.1.3 Sensitivity Analysis in Feasibility Study

There are many differences on major assumptions between M/P evaluation and F/S evaluation.

The differences are summarized in Table 7.1-5.

The investment schedule of F/S evaluation is assumed shown in Table 7.1-6.

The trend of cost of F/S evaluation is assumed shown in Table 7.1-7.

Sensitivity analysis are examined from three points as below:

1. Investment Costs
2. Fee Collection
3. Personnel cost

The results are shown in Table 7.1-8, 7.1-9, 7.1-10 and 7.1-11.

Table 7.1-5 Difference of Major Assumptions adopted to
Financial Evaluation for MPPP

	M/P Evaluation		F/S Evaluation
	Select alternative	Set disposal	Sensitivity analysis
Target year of reduction of collection and cleansing costs	beginning of 1992	same as left	end of 1995
Level of Sanitary Landfill	Level 4	Level 3 vs. Level 4 in Phase 1	Level 3 in Phase 1 Level 4 in Phase 2
Fee Collection	gradually increase of tariff	same as left	three steps
Budget Allocation	0.1% per annum increase from 1987	same as left	same level of 1988
Invest costs by Contractors	included in total investment cost	same as left	excluded from total investment cost
Investment costs for Cleansing	not considered	same as left	considered
Foreign Loan	considered	same as left	not considered
Loan Conditions of Long-term Domestic Loan	grace period 5 years	same as left	grace period 3 years

Table 7.1-6 Investment Plan (MPPP)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Collection	450	760	600	0			0	150	150	150	0	0	0	0	600	910	3770
Vehicle renew							0	450	760	600	0	0	0	0	150	150	2110
D/S	179	3578				13593											17350
Construct Vehicle renew	1503					560											2053
C/W							1503	0	0	0	0	0	0	560	0	0	2063
Vehicle	820	820	320		10	4		64	78		14	12		72	86	320	1460
Grass cut	60	60	74					0	820	320	0	0	0	0	0	0	474
renew								0									1140
renew2	0	0	0	0	60	74	0	10	4	0	64	78	0	14	12	0	316
Total	629	6721	994	0	70	78	14153	674	3315	1070	78	90	0	646	848	1380	30746

Table 7.1-7 Trends of Cost

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Collection	233	233	233	233	245	256	268	279	291	299	306	314	321	329
Depreciation	1034	933	831	730	728	726	723	721	719	717	715	712	710	708
Personnel	217	217	217	217	228	239	249	260	271	278	285	293	300	307
Mainte	249	239	228	218	225	231	238	244	251	255	260	264	269	273
Fuel & etc	720	740	760	781	802	1640	1690	1742	1796	1851	1909	1968	2030	2094
D/S	153	153	153	153	153	235	235	235	235	235	235	235	235	235
Depreciation	174	174	174	174	174	250	250	250	250	250	250	250	250	250
Personnel	605	617	630	643	657	992	1006	1021	1036	1052	1069	1086	1104	1122
C/W	197	198	199	200	200	201	202	203	204	204	205	206	207	208
Depreciation	5974	5634	5293	4953	4975	4997	5020	5042	5064	5119	5173	5228	5282	5337
Personnel	299	282	265	248	249	250	251	252	253	256	259	261	264	267
Fuel & etc	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074	1074
S/S	10929	10493	10058	9624	9709	11091	11206	11324	11444	11591	11740	11892	12046	12204
Personnel	1150	1171	1192	1214	1247	2098	2160	2224	2290	2354	2420	2488	2559	2631
Total	8235	7793	7352	6910	6930	7032	7052	7072	7092	7144	7197	7249	7302	7354
Depreciation	391	391	391	391	402	489	499	510	521	528	535	543	550	557
Personnel	1153	1138	1123	1109	1130	1473	1495	1517	1540	1564	1587	1611	1636	1662
Mainte														
Fuel & etc														

Table 7.1-8 Comparison between Master Plan Evaluation and Feasibility Study valuation

M\$ million

Alternatives	Total Investment Cost	Total Expense	Total Revenue	Assumption regarding MPPP's budget alloc.	Total Debt in 2005	Projected year by when repayment is completed	Other Comments
M/P	74.2 (37.1 *)	286.2	331.8	no increase from 1989	-42.8	1993	Fee Tariff(\$/ton) 1992 2005 Commercial 31.1 62.2 Tipping 7.2 14.4 gradually increase
F/S	30.7 *	299.7	333.1	ditto	-29.9	1994 1997	Fee Tariff(\$/ton) step1 step2 step3 Commercial 32.1 48.1 64.1 Tipping 6.6 9.9 13.2

Note: Investment cost in a parenthesis of M/P and that of F/S is excluding the contractors' investment.

Table 7.1-9 Comparison of Alternatives (Investment cost)

Alternatives	Total Investment Cost	Total Expense	Total Balance	Assumption regarding MSP's budget alloc.	Total Debt in 2005	Projected Year by which repayment is completed	Other Comments
Base case	30.7	299.7	33.4	no increase from 1989	-29.9	1997	Fee Tariff (\$/ton) step 1 step 2 step 3 Commercial 32.1 48.1 64.1 Tipping 6.6 9.9 13.2
20% increase	36.9	307.3	25.8	ditto	-21.5	1999	ditto
10% increase	33.8	303.5	29.6	ditto	-25.7	1997	ditto
10% discount	27.7	295.9	37.3	ditto	-34.1	1993	ditto
20% discount	24.6	292.0	41.1	ditto	-38.2	1993	ditto

Table 7.1-10 Comparison of Alternatives (Fee Collection)

Alternatives	Total Investment Cost	Total Expense	Total Balance	Assumption regarding MPSP's budget alloc.	Total Debt in 2005	Projected Year by which repayment is completed	Other Comments
Base case	30.7	299.7	33.4	no increase from 1989	-29.9	1997	Fee Tariff (\$/ton) step 1 step 2 step 3 Commercial 32.1 48.1 64.1 Tipping 6.6 9.9 13.2
no Fee	ditto.	302.7	-4.5	ditto	8.0		0.0 0.0 0.0
M/P base	ditto.	299.7	32.1	ditto	-28.6	1997	Commercial 31.1 46.7 62.2 Tipping 7.2 10.8 14.4

Table 7.1-11 Comparison of Alternatives (Personnel Cost)

MS million

Alternatives	Total Investment Cost	Total Expense	Total Balance	Assumption regarding MPPP's budget alloc.	Total Debt in 2005	Projected year by when repayment is completed	Other Comments
Base case (no increase)	30.7	299.7	33.4	no increase from 1989	-29.9	1997	Fee Tariff(\$/ton) step1 step2 step3 Commercial 32.1 48.1 64.1 Tipping 6.6 9.9 13.2
1% per annum increase	30.7	312.0	21.1	ditto	-17.5	1998	ditto
2% per annum increase	30.7	326.0	7.1	ditto	-3.6	2001	ditto

7.2 Financial Evaluation for MPSP

7.2.1 Alternatives examined in Master Plan study

In the step to select an appropriate system, two alternatives are examined basically.

- a. Alternative 1 : direct sanitary landfill at the Kuala Muda and Pulau Burong Disposal sites, generated solid waste is divided and hauled to these two sites on the basis of optimal haulage efficiency.
- b. Alternative 1-B : only the Pulau Burong Disposal Site; generated solid waste in part of the North District or an equivalent amount is disposed of by sanitary landfill after reloading at transfer station.

On the second alternatives, three alternatives are examined to consider the possibilities to introduce transfer station to MPSP.

- b1. without transfer station
- b2. with one small transfer station (170 ton/day)
- b3. with one large transfer station (420 ton/day)

The conclusions obtained through the financial evaluation of the alternatives are presented below.

- (1) In terms of debt repayment, Alternative 1 (with two disposal sites) is found feasible, while Alternative 1-B (B1, B2 and B3 - all of them have one disposal site) are unfeasible.
- (2) It has been found from the comparison of the total costs (total investment costs plus total operation/maintenance plus interest to be paid) arising in the entire master plan period till 2005, that Alternative 1 requires lower costs than any of Alternative 1-B's in the

long run. Although Alternative 1 is more costly than Alternative 1-B1 in terms of MPSP's investment costs alone (\$66.9 million and \$63.0 million respectively), the former requires a lower annual operation cost of waste haulage as compared to Alternative 1-B1 because the average haulage distance is shorter in case of Alternative 1. The difference in the annual haulage operation costs is large enough to recover the difference (\$3.9 million) in the investment costs in a few years.

- (3) Having a transfer station as in Alternatives 1-B2 and 1-B3 is not feasible financially as the benefit (reduction of the haulage operation/maintenance costs) resulting from transfer station is not large enough to cover the investment costs even in the long term.
- (4) In case Alternative 1 is adopted, MPSP will complete the repayment of all the debts a few years after 2005 as shown in Fig. 7.2-1.
- (5) In case Alternative 1-B1 is adopted, the debt will start decreasing very slowly only after 2003. In 2005 the outstanding debt will be as much as \$50 million. See Fig. 7.2-2.
- (6) Alternatives 1-B2 and 1-B3 are unfeasible as the debt will increase in the future as shown in Fig. 7.2-3 and 7.2-4.
- (7) As has been stated in the above Item (4), MPSP will not complete the repayment of the debt by 2005 even in case Alternative 1 is adopted. There are two ways to enable MPSP to reduce the borrowing, and repay the debts before 2005.

First : To obtain a grant from the Federal Government.

Second: To introduce phased improvements on disposal system, i.e. step by step improvements. (A complete sanitary landfill will be introduced in Phase 3.)

The subsequent four figures 7.2-5 - 7.2-8 show the cases where the above arrangements were made.

- (8) Fig. 7.2-5 shows the case where MPSP obtain a grant covering 50% of investment costs required for the construction of sanitary landfill. In this case, the maximum debt will be \$17 million, and MPSP will be able to repay all the debt by 2001.
- (9) Fig. 7.2-6 shows the case where the obtainable grant is enough to cover 50% of investment costs for Phase 1 construction of sanitary landfill. In this case, MPSP will repay the debt by 2005.
- (10) Fig. 7.2-7 shows the case where phased improvements on disposal system is introduced without any grant. A complete sanitary landfill will be constructed in Phase 3. In this case, MPSP will have the maximum debt of about \$15 million in the beginning of Phase 1. MPSP will not need loans for Phase 2 construction. Phase 3 investment, though its total amount is \$28 million, can be made with only \$7 million loan. The remaining part of the investment costs required in Phase 3 will be financed by the Council's saving. The source of the Council's saving is the difference between the annual expense and annual budget allocation to SWM which is assumed to increase by 4.5% per year, while the increase in the annual expense is expected to be about 2.6% during Phases 1 and 2. In the above case, MPSP will repay all the debt by 2003. If a grant is not available, this case (phased improvements on disposal system) would pose the least financial burden to MPSP.

Note: In this study, the construction cost of sanitary landfill in phase 2 is estimated smaller than the preliminary evaluation and assumed to be allocated from the capital budget out of budget allocation to SWM increasing 4.57 per year.

(11) Fig. 7.2-8 shows the case where 1) phased improvements (as in Fig. 7.2-7) are introduced, and 2) MPSP obtains a grant covering 50% of the total investment costs required for construction of the disposal system. This case is the most preferable from financial view point. The maximum debt will be \$12 million in Phase 1 which will be repaid completely by 1997. Phase 3 investments need less than two-million-dollar loan, which can be repaid in the next year. Most of the investment costs required for Phase 3 can be funded by the Council's own saving, which can be made as explained in the above section.

(12) Fig. 7.2-9 examines the case where a private company obtains a loan with 10% annual interest, and constructs an incineration plant with the capacity enough to accept all the waste to be collected in 2005. The examination indicates that such private company need to charge \$43/ton of tipping fee in order to repay all the debt by 2005. Fig. 7.2-9 shows that MPSP will have to continue to borrow money to pay such tipping fee if the Council's annual allocation to SWM increases by 4.5% per year. Accordingly, MPSP's debt will increase infinitely. Obviously, this plan would not be feasible to MPSP unless MPSP obtains a constant grant from the Federal Government.

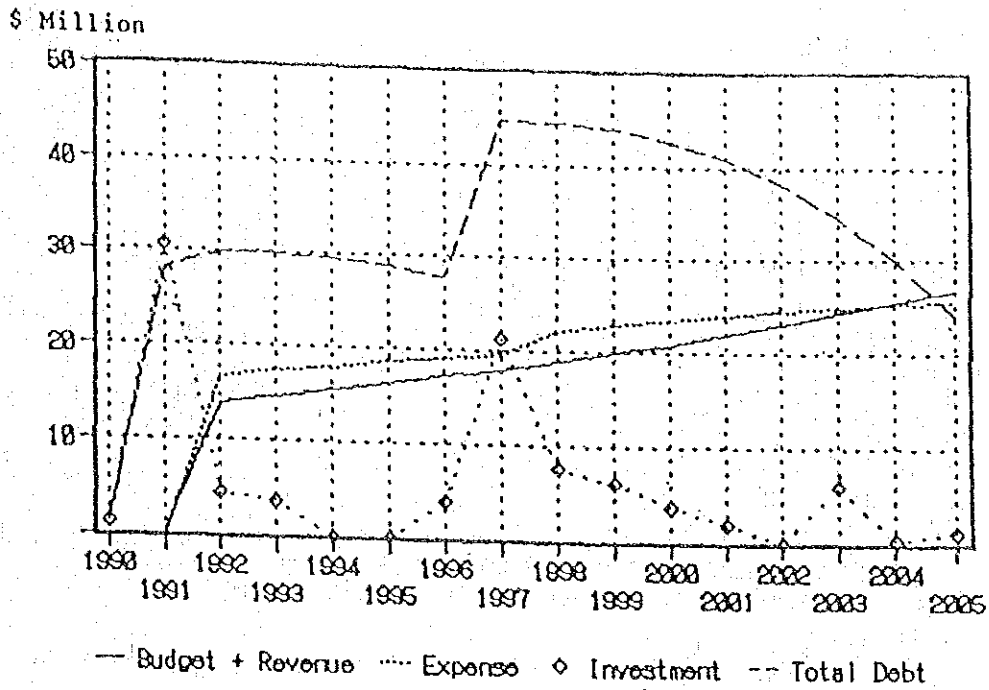


Fig. 7.2-1 Alternative 1: Debt, Annual Investment, Expense and Allocation

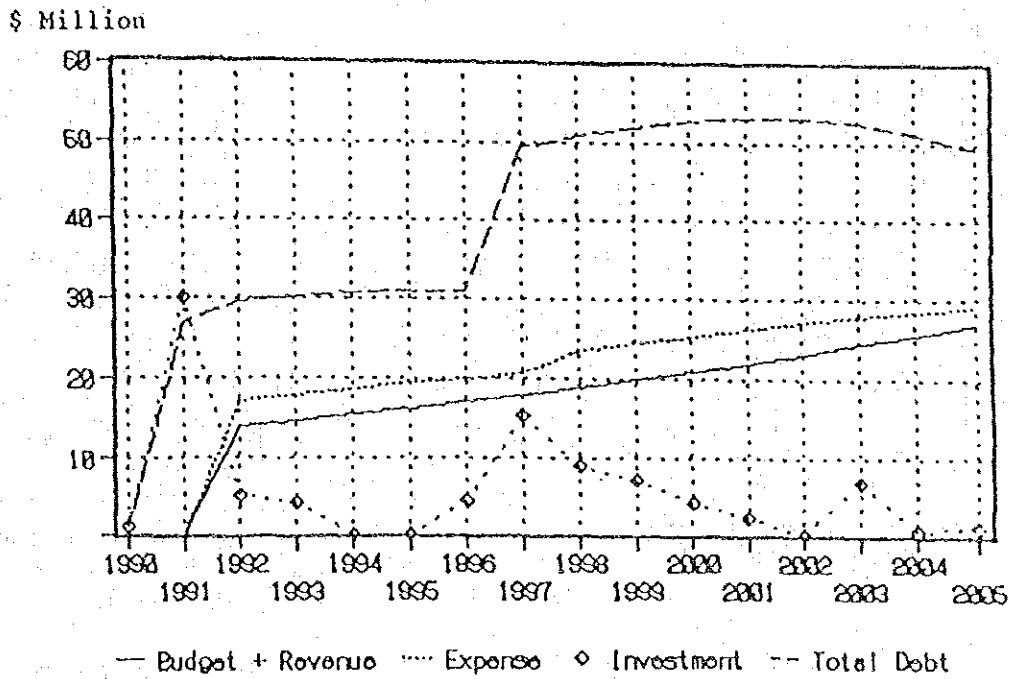


Fig. 7.2-2 Alternative 1-B1: Debt, Annual Investment, Expense and Allocation

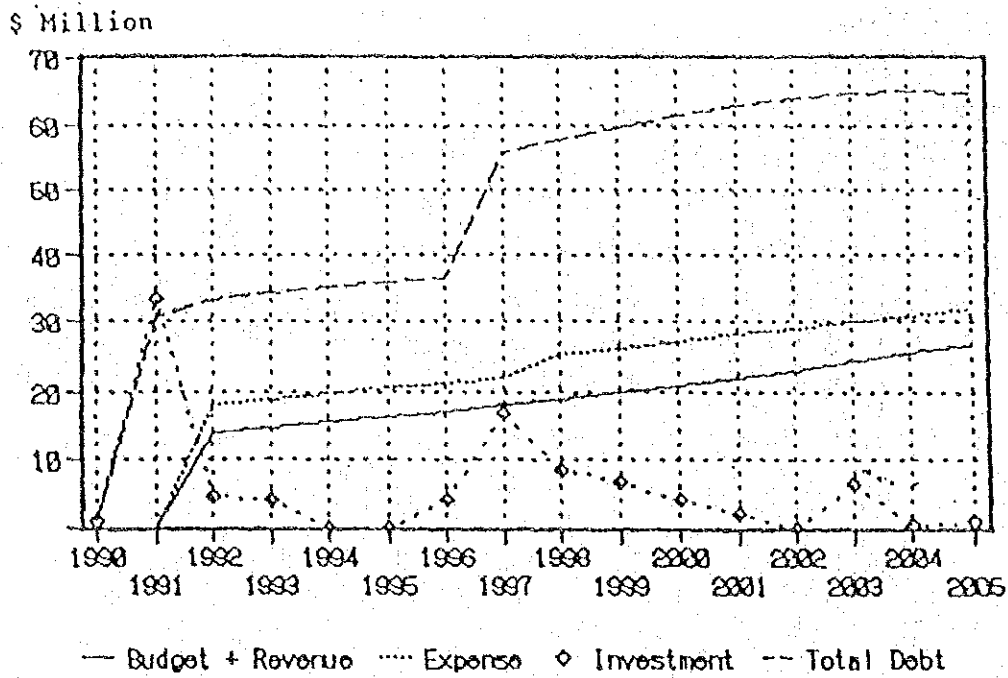


Fig. 7.2-3 Alternative 1-B2: Debt, Annual Investment, Expense and Allocation

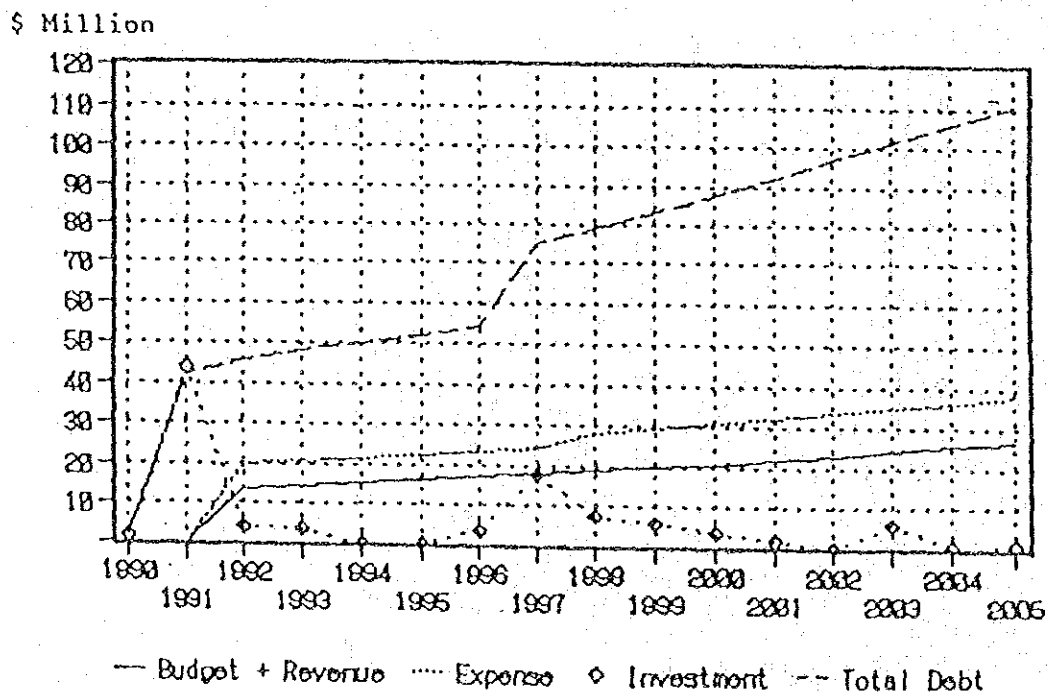


Fig. 7.2-4 Alternative 1-B3: Debt, Annual Investment, Expense and Allocation

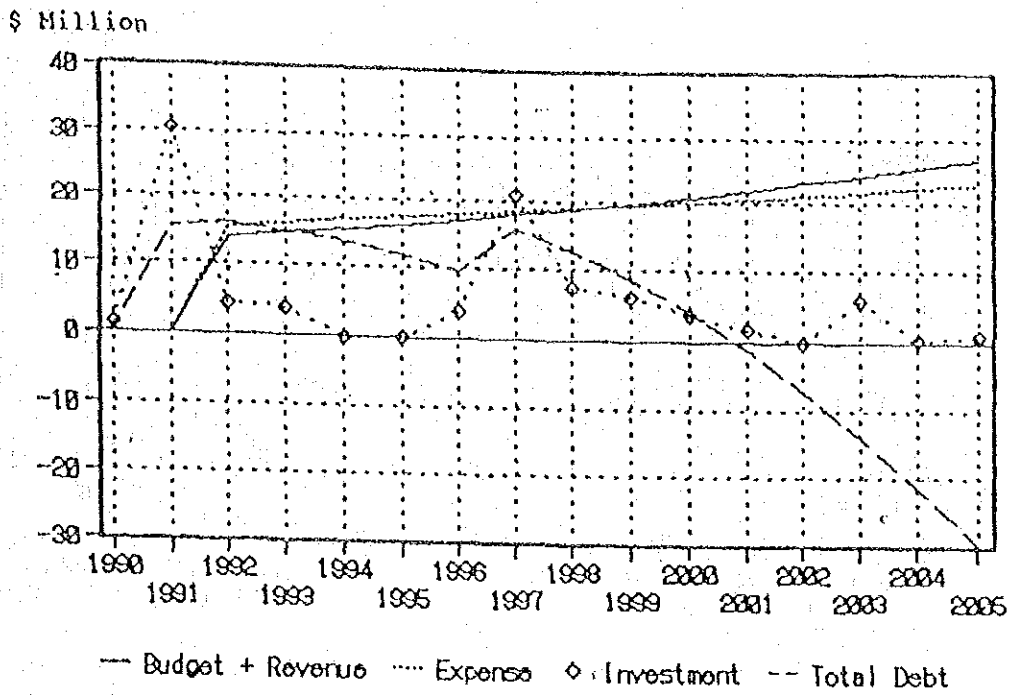


Fig. 7.2-5 Alternative 1 with Grant Covering 50% of Disposal System Construction Costs: Debt, Annual Investment, Expense and Allocation.

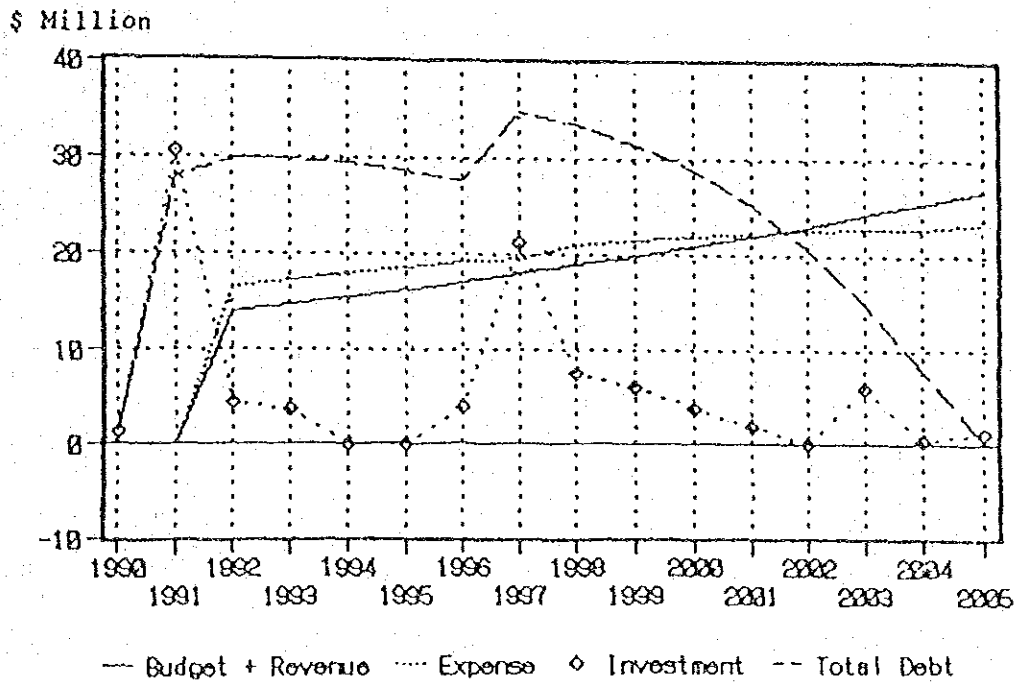


Fig. 7.2-6 Alternative 1 with Grant Covering 50% of Disposal System Construction Costs Arising in Phases 1 & 2: Debt, Annual Investment, Expense and Allocation

\$ Million

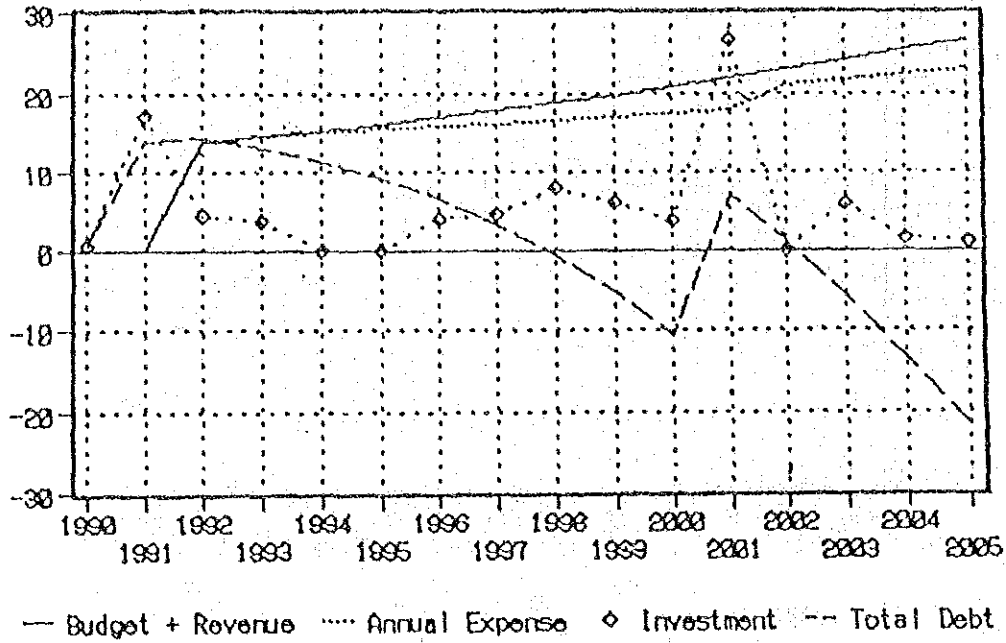


Fig. 7.2-7 Alternative 1 with Phased Improvements on Disposal System: Debt, Annual Investment, Expense and Allocation

\$ Million

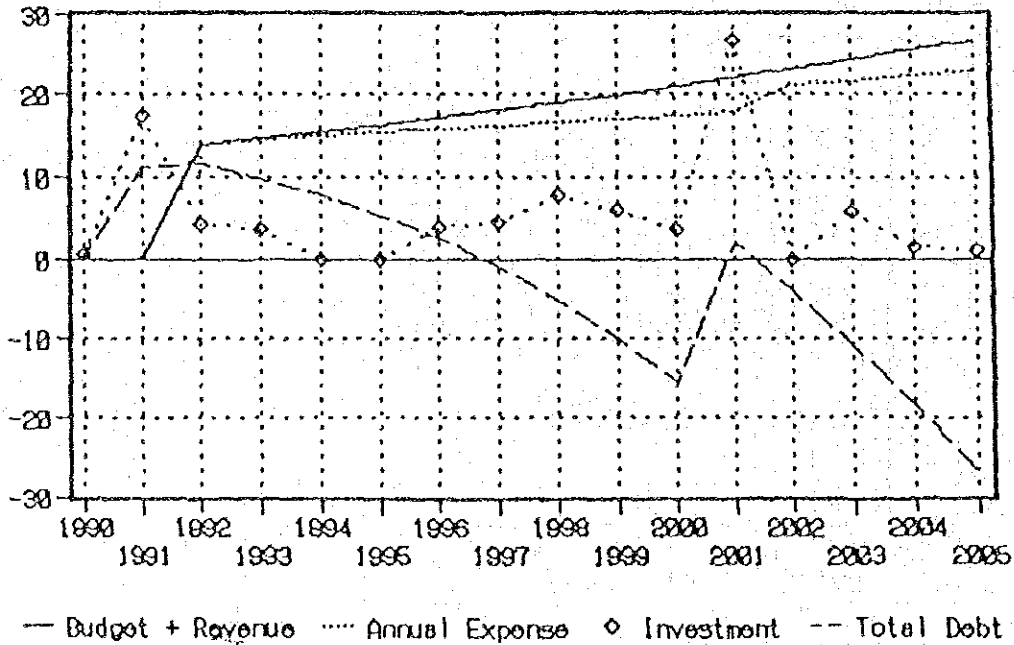


Fig. 7.2-8 Alternative 1 with Phased Improvement on Disposal System and Grant Covering 50% of Disposal System Construction Costs: Debt, Annual Investment, Expense and Allocation

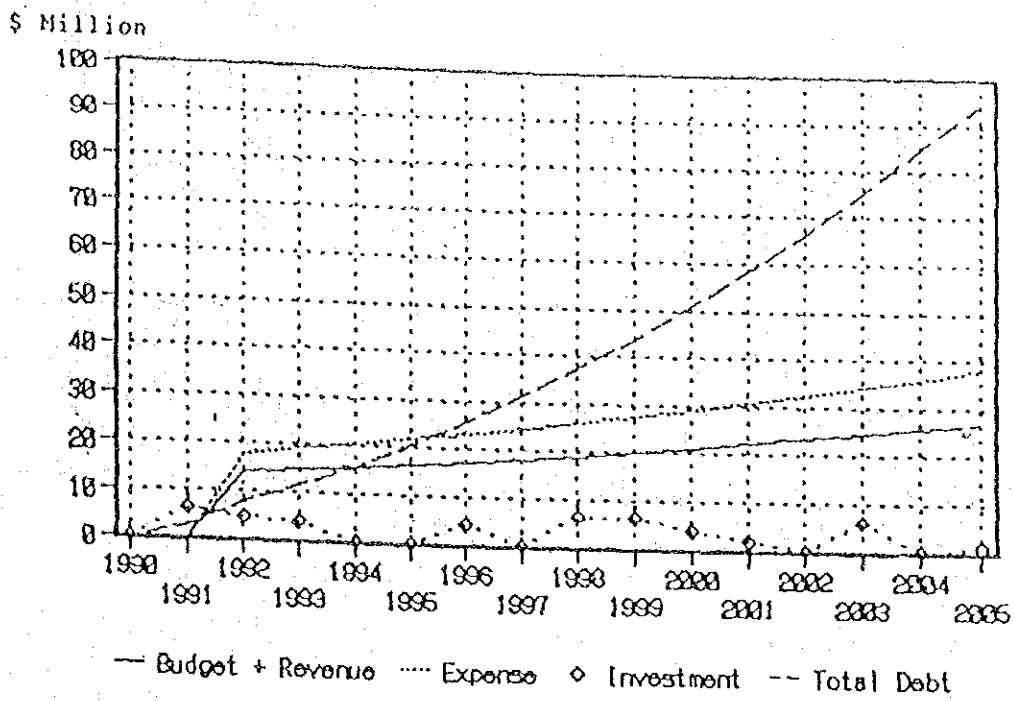


Fig. 7.2-9 Case Where a Contractor Constructs Incinerator, and Collects Tipping Fee from MPSP: MPSP's Debt, Annual Expense and Allocation.

7.2.2 Alternatives examined in Preliminary Financial Evaluation

In the step to set the level of sanitary landfill, there are three alternatives basically.

- a1. level 3 in Phase 1 and Phase 2 and level 4 in Phase 3
- a2. level 3 In Phase 1 and level 4 in Phase 2 and Phase 3
- a3. level 4 in Phase 1, Phase 2 and Phase 3

The investment schedule is assumed shown in Table 7.2-1.

The trend of cost is assumed shown in Table 7.2-2.

The results of the above three cases are shown in Table 7.2-3.

A rapid rise in the solid waste management cost appears inevitable, particularly in MPSP, due to the introduction of costly sanitary landfill, the long distance to the new disposal sites and the required improvement of the collection rate, in addition to the required expansion of the work scale to meet a population increase.

Based on the severe financial conditions described above and also on the results of the preliminary environmental impact evaluation conducted by the Malaysian side, it has been decided that an effluent drainage facility (Level 3 arrangement) will be initially introduced with the condition that regular monitoring of the impact of effluent on the surrounding public water basin will be conducted and the understanding that an effluent treatment facility (Level 4 arrangement) will be introduced in the case of serious damage to the environment being predicted.

Fig. 7.2-10 shows the case where an effluent treatment facility (level 4 arrangement) will be introduced in Phase 2. In the above case, MPSP will repay all the debt by 2004, if it is possible to secure financial resources for sanitary landfill in 1996.

Table 7.2-1 Investment Schedule

Invest Plan	D/S	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Alt. 1																		
Construct Vehicle renew		1213	23044					20789										45046
			1040					360										1400
Total		1213	24084	0	0	0	0	21149	1040	1040	0	0	0	0	0	360	0	1400
																		47846
Step by step (level 3 in phase 1)																		
Construct Vehicle renew		323	6469				22975						3003					32770
Total		323	8069	0	0	0	22975	0	1600	1600	0	0	3563	0	0	0	0	36530
Step by step (level 4 in phase 3)																		
Construct Vehicle renew		311	6225				7404						22083					36023
Total		311	7825	0	0	0	7404	0	1600	1600	0	0	560	0	0	0	0	2160
																		1600
																		39783

Table 7.2-2 Trend of Cost

Trend of Cost	D/S													
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Alt-1														
Depreciation	1903	2021	2146	2279	2387	2501	2618	2743	2872	2995	3124	3258	3398	3543
Personnel	165	176	187	198	208	217	228	238	250	260	272	283	295	308
Mainte	179	191	202	215	225	236	247	259	271	282	294	307	320	334
Fuel & etc	731	776	825	876	917	961	1006	1054	1103	1151	1200	1251	1305	1361
Total	2980	3164	3360	3568	3737	3914	4099	4293	4496	4689	4890	5099	5318	5546
Step by step (level 3 in phase 1)														
Depreciation	1230	1294	1361	1433	1491	2843	2968	3099	3236	3365	3135	3257	3385	3518
Personnel	193	193	193	193	193	208	208	208	208	208	256	256	256	256
Mainte	112	112	112	112	112	260	260	260	260	260	322	322	322	322
Fuel & etc	288	304	320	338	352	1482	1497	1514	1531	1547	1562	1580	1598	1617
Total	1823	1902	1986	2076	2148	4793	4933	5080	5234	5380	5275	5415	5561	5713
Step by step (level 4 in phase 3)														
Depreciation	1309	1377	1450	1527	1590	1554	1618	1685	1755	1821	5456	5678	5910	6151
Personnel	193	193	193	193	193	208	208	208	208	208	256	256	256	256
Mainte	112	112	112	112	112	134	134	134	134	134	322	322	322	322
Fuel & etc	283	299	315	333	347	368	383	400	417	433	1556	1574	1592	1611
Total	1897	1981	2070	2165	2242	2264	2343	2426	2514	2596	7590	7829	8079	8340

Table 7.2-3 Results of Financial Evaluation (MPSP)

M\$ million

Alternatives	Total Investment Cost	Total Expense	Total Revenue	Assumption regarding MPPP's budget alloc.	Total Debt in 2005	Projected year by when repayment is completed	Other Comments
Existing	81.2	301.9	294.9	5.5% per annum increase -from 1987	-8.5	2004	Fee Tariff(\$/ton) 1992, 2005 Commercial 33.5 67.0 Tipping 10.5 21.0 gradually increase
ditto	81.2	309.9	280.1	5.0% increase	15.7		ditto
Alt-1	91.5	291.8	294.9	5.5% increase	-4.4	2005	ditto
ditto	91.5	313.7	26.0	4.5% increase	46.4		ditto
Step by step Phase 2	80.2	279.0	280.1	5.0% increase	-14.0	2004	ditto
ditto	80.2	287.8	266.0	4.5% increase	8.8		ditto
Step by step Phase 3	83.4	269.1	266.0	4.5% increase	-3.4	2000 2004	ditto

Note: "Existing" refers to an alternative which employs the existing collection/haulage system and the sanitary landfill system of Step by step (Phase 3)

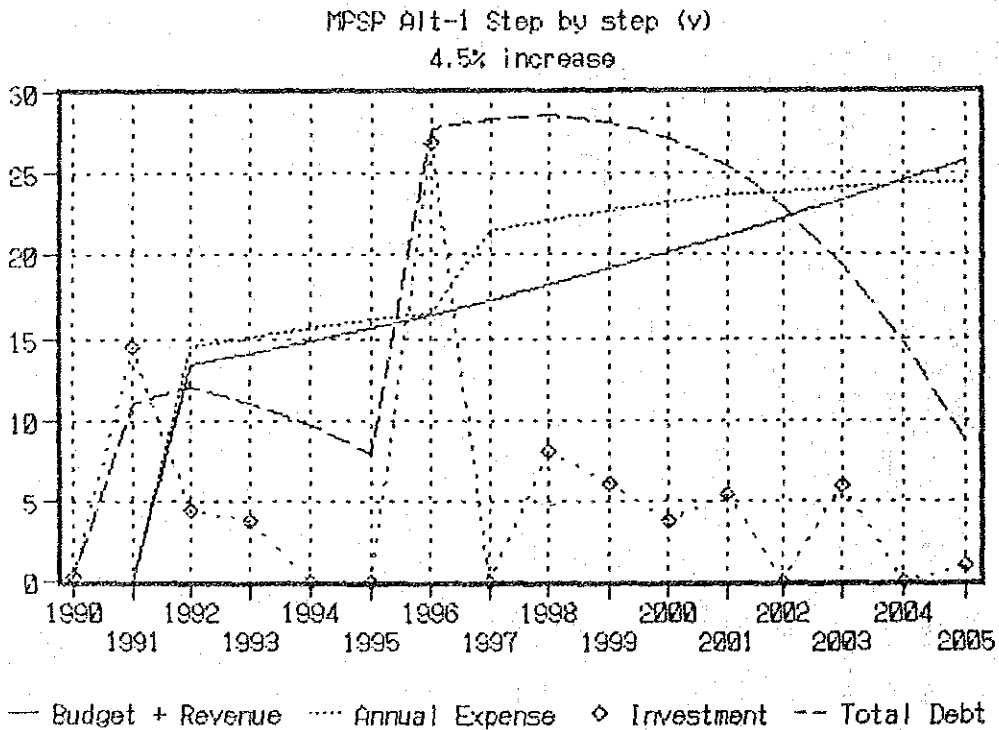
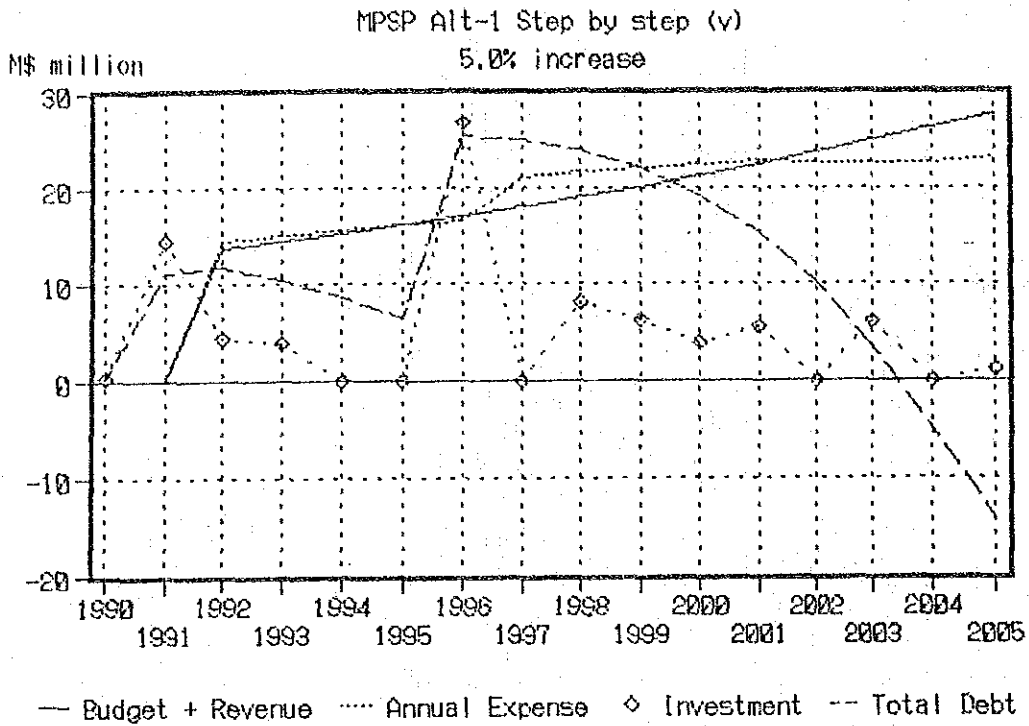


Fig. 7.2-10 Cash Flow for the Case of Level 4 Introduced in 1996

7.2.3 Sensitivity Analysis in Feasibility Study

There are many differences on major assumptions between M/P evaluation and F/S evaluation. The constraints on financial and personnel management cause the gloomy financial plan of MPSP.

The differences are summarized in Table 7.2-4.

The investment schedule of F/S evaluation is assumed shown in Table 7.2-5.

The trend of cost of F/S evaluation is assumed shown in Table 7.2-6.

Fig. 7.2-11 shows the feasibility of Phase 1 project form the viewpoint of financial evaluation, though there are many problems to overcome to reach the master plan goals.

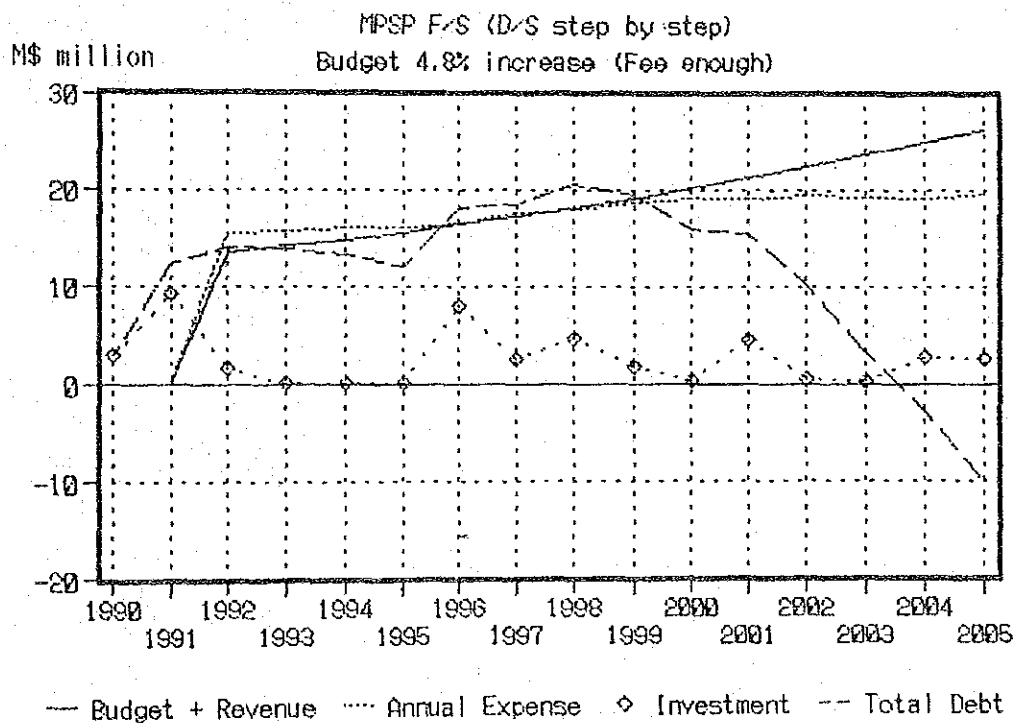


Fig. 7.2-11 Cash Flow when the Level of Phase 3 Remains at Level 3

Table 7.2-4 Difference of Major Assumptions adopted to
Financial Evaluation for MPSP

	M/P Evaluation		F/S Evaluation
	Select alternative	Set disposal	Sensitivity analysis
Target year of reduction of collection and cleansing costs	beginning of 1992	same as left	end of 1995
Level of Sanitary Landfill	Level 4	Level 3 vs. Level 4 in Phase 1	Level 3 in Phase 1 & 2 Level 4 in Phase 3
Fee Collection	gradually increase of tariff	same as left	three steps
Budget Allocation	0.1% per annum increase from 1987	same as left	same level of 1988
	another budg. for purchase vehicles & etc. is considered	same as left	purchase cost is recovered in MPSP fund
Invest costs by Contractors	included in total investment cost	same as left	excluded from total investment cost
Investment costs for Cleansing	not considered	same as left	considered
Foreign Loan	considered	same as left	not considered
Loan Conditions of Long-term Domestic Loan	grace period 5 years	same as left	grace period 3 years
Subsidy for sanitary landfill of level 4	50% for one alternative	not considered	50% in Phase 3 for one alternatives

Table 7.2-5 Investment Plan (MPSP)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005 Total
Collection	2400	1530	1050	150				2400	150	300			450		2550	1580
Vehicle renew	150			150					1560	1050	160		0	0	0	150
D/S	236	1716				7719						18457				31123
Construct		2274						0	2274	0	0	0	0	0	0	2834
Vehicle renew			480													2274
C/W		750	46		2	4	240	48	48		2	6		50	52	2220
Vehicle			46					0	750	480	0	0	0	240	0	304
Grass cutter								0	0	0	0	0	0	0	0	1470
renew								2	4	0	48	48	0	2	6	202
renew		0	0	0	46	46	0	2	0	0			0	2	0	202
Total	2786	9266	1576	160	48	50	7959	2450	1806	1830	210	19071	450	292	2608	2480
																56142

Table 7.2-6 Trends of Cost

	S/D step by step																
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005			
MPSP																	
Collection	687	667	648	629	646	663	681	698	716	733	750	768	785	802			
Depreciation	1628	1612	1597	1581	1558	1534	1511	1488	1465	1441	1418	1395	1371	1348			
Personnel	641	623	605	587	603	619	635	652	668	684	700	716	733	749			
Mainte	581	568	555	542	550	558	566	574	582	590	597	605	613	621			
Fuel & etc																	
D/S	956	997	1040	1087	1124	1486	1542	1601	1663	1722	3932	4085	4245	4411			
Depreciation	209	209	209	209	209	208	208	208	208	208	256	256	256	256			
Personnel	253	253	253	253	253	134	134	134	134	134	322	322	322	322			
Mainte	597	613	629	647	661	372	387	404	421	437	1562	1580	1598	1617			
Fuel & etc																	
C/W																	
Depreciation	189	189	190	190	222	222	223	223	224	224	225	225	226	226			
Personnel	2646	2687	2728	2769	2807	2845	2882	2920	2958	2996	3033	3071	3108	3146			
Fuel & etc	265	269	273	277	281	284	288	292	296	334	372	411	449	488			
S/S																	
Personnel	962	962	962	962	962	962	962	962	962	962	962	962	962	962			
Total	9612	9618	9638	9732	9875	9887	10019	10155	10295	10464	14131	14396	14660	14849			
Depreciation	1831	1853	1878	1906	1992	2371	2445	2522	2602	2679	4907	5078	5256	5440			
Personnel	5445	5470	5496	5521	5536	5549	5564	5578	5593	5607	5669	5683	5698	5712			
Mainte	894	876	858	840	856	753	769	786	802	818	1022	1038	1055	1071			
Fuel & etc	1442	1449	1457	1465	1491	1214	1241	1269	1298	1361	2532	2596	2660	2726			

Sensibility analysis are examined from three points as below;

1. Investment Costs
2. Fee Collection
3. Personnel cost
4. Subsidy to investment cost for sanitary landfill at level 4

The results are shown in Table 7.2-7, 7.2-8, 7.2-9, 7.2-10 and 7.2-11.

These facts have an effect on the financial plan of MPSP very seriously, therefore it is important to make the effort to reduce the cost of collection and cleansing through efficiency improvement of these services.

Table 7.2-7 Comparison between Master Plan and Feasibility Study Evaluation

M\$ million

Alternatives	Total Investment Cost	Total Expense	Total Revenue	Assumption regarding MPP's budget alloc.	Total Debt in 2005	Projected year by when repayment is completed	Other Comments
M/P	83.4 (58.8 #)	269.1	266.0	4.5% per annum increase from 1987 & capital budg. -ave. 0.9/year	-3.4	2000 2004	Fee Tariff(\$/ton) 1992 2005 Commercial 33.5 67.0 Tipping 10.5 21.0 gradually increase
ditto	83.4 (58.8 #)	277.5	277.5	4.8% increase no capital budget	10.9		ditto
F/S	56.1 *	273.4	268.7	ditto	18.1		Fee Tariff(\$/ton) step1 step2 step3 Commercial 58.4 53.4 60.8 Tipping 13.6 15.6 16.1

Note: investment cost in a parenthesis of M/P and that of F/S is excluding the contractors' investment.

Table 7.2-8 Comparison of Alternatives (Investment Cost)

Alternatives	Total Investment Cost	Total Expense	Total Balance	Assumption regarding MPSP's budget alloc.	Total Debt in 2005	Projected Year by which repayment is completed	Other Comments
Base case	56.1	269.8	-1.1	4.8% increase	18.1		Fee Tariff (\$/ton) step 1, step 2, step 3 Commercial 58.4 58.4 60.8 Tipping 13.8 15.6 16.1
20% increase	67.4	298.4	-29.7	ditto	50.0		ditto
10% increase	61.8	284.1	-15.4	ditto	34.1		ditto
10% discount	50.5	255.6	13.2	ditto	2.1		ditto
20% discount	44.9	243.5	25.2	ditto	-11.7	2004	ditto

Table 7.2-9 Comparison of Alternatives (Fee Collection)

Alternatives	Total Investment Cost	Total Expense	Total Balance	Assumption regarding MPSP's budget alloc.	Total Debt in 2005	Projected Year by which repayment is completed	Other Comments
Base case	56.1	269.8	-1.1	4.8% increase	18.1		Fee Tariff (\$/ton) step 1 step 2 step 3 Commercial 58.4 58.4 60.8 Tipping 13.8 15.6 16.1
no Fee	dito.	296.4	-55.3	ditto	72.3		
step by step	dito.	277.9	-13.2	ditto	30.1		Commercial 30.4 45.6 60.8 Tipping 8.1 12.1 16.1
M/P base	dito.	265.1	9.2	ditto	7.7		Commercial 86.5 80.1 66.9 Tipping 13.4 17.1 20.9

Table 7.2-10 Comparison of Alternatives (Personnel Cost)

M\$ million

Alternatives	Total Investment Cost	Total Expense	Total Revenue	Assumption regarding MPPP's budget alloc.	Total Debt in 2005	Projected year by when repayment is completed	Other Comments
Base case (no increase)	56.1	273.4	268.7	4.8% increase no capital budget	18.1		Fee Tariff(\$/ton) step1 step2 step3 Commercial 58.4 53.4 60.8 Tipping 13.6 15.6 16.1
1% per annum increase	56.1	291.9	268.7	ditto	36.6		ditto
2% per annum increase	56.1	312.4	268.7	ditto	57.1		ditto

Table 7.2-11 Comparison of Alternatives (Subsidy for Phase 3)

M\$ million

Alternatives	Total Investment Cost	Total Expense	Total Revenue	Assumption regarding MPPP's budget alloc.	Total Debt in 2005	Projected year by when repayment is completed	Other Comments
Base case (no subsidy)	56.1	273.4	268.7	4.8% increase no capital budget	18.1		Fee Tariff(\$/ton) step1 58.4 step2 53.4 step3 60.8 Commercial 13.6 Tipping 15.6 16.1
25% subsidy	56.1	270.7	268.7	ditto	10.6		ditto
50% subsidy	56.1	268.0	268.7	ditto	3.1		ditto
75% subsidy	56.1	265.6	268.7	ditto	-4.0	2005	ditto
level 3 in phase 3	41.6	250.6	268.7	ditto	-10.1	2004	ditto

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