CHAPTER 8

FINANCE

CHAPTER 8 FINANCE

8.1. Fund Sources

Substantial funds are required to finance the sewerage project from the planning stage to the actual stage of implementation, which is beyond the financial means of the local authorities in Malaysia. It is, therefore, important to explore various potential sources of funds for financing the sewerage project.

There are several sources for financing the cost of the construction and operation/maintenance of the sewerage system including debt service. These sources represent three kinds of funds: (1) Loans and grants by the Federal and/or State Government and loans by the international lending agencies for the purpose of capital investment, (2) Revenues from individuals who will receive benefits from the sewerage services, and (3) Contribution from MPK to supplement expenditures required.

8.1.1. Sources for Capital Investment

The proposed amount of capital investment to meet construction cost for the Master Plan up to 2000 is approximately M$327 million with M$92 million for foreign currency portion and M$235 million for local currency portion at 1981 price level. The possible sources for this capital cost are as follows:

1) Long-Term Loans

Since Kelang Municipality cannot afford to finance this project at its own cost, loans constitute the most likely source for a substantial part of the capital investment.

Loans are available from the Federal Government and State Government, as well as multilateral and bilateral lending agencies and financial

institutions. These loans are generally long term with low interest, which are ideal features for supporting the viability of a sewerage project.

As for the foreign currency portion of the project, the World Bank (IBRD) and Asian Development Bank (ADB) are the usual multilateral sources while bilateral loans can be arranged with various foreign governments through the Federal Government. These sources cannot be used to provide a loan for the local currency portion. On the other hand, the Federal Government can furnish loans for both the local and foreign currency portions.

2) Grant

As mentioned above, the amount of cost for the sewerage works is far beyond the financial ability of the local government to undertake in the form of a self-supporting system, since the sewerage project generally entails a huge amount of initial construction cost with relatively less generated income. However although infrastructural facilities in the form of roads, electricity and water supply are funded through Government grants in Malaysia, sewerage facilities including sewer network and treatment works unfortunately are not necessarily placed under this category with the same priority, despite the fact that the local government should legally have responsibility for implementing a sewerage project. Judging from the huge amount of initial construction cost, if the Local Authority relies only on loans for the construction cost, the sewerage scheme might not be viable because of the heavy burden of debt servicing after commencement of loan repayment.

Although the large-scale grants for sewerage projects may not necessarily be required, Federal and/or State Government grant for land acquisition or some part of the construction cost should be considered as an alternative measure to help MPK reduce its financial burden of debt servicing of the loans.

It should be kept in mind that in most developed countries the central government provides grants for sewerage works to the executing agencies such as local governments. Recently, even in Malaysia, the Tech-

nical Unit of the Ministry of Housing and Local Government has been exploring the possibility of grants for sewerage systems to the local governments in order to promote greater efforts for implementation of sewerage projects. It is hoped that, in the near future, such a grant would be provided for the sake of financing a part of the capital investment for sewerage projects.

8.1.2. Sources for Operation and Maintenance Cost including Debt Service

Sufficient revenues should be raised for proper operation and maintenance, including debt service payments. The method for raising such revenues should be based on consideration of economics, financial strategy, development policy and political acceptability.

1) Sources Based on the Principle of Benefit-Received

The benefit-received principle is employed in the selection of revenue sources to meet the required cost of operation and maintenance, including debt service. There are two sources in a broader concept for meeting this principle.

a) Sewerage User's Charge

This is a charge imposed on the users of the sewerage system in proportion to the use they make of the sewerage system. Therefore, this charge normally takes the form of collecting the charge based on volume of wastewater discharge.

b) Property Tax for the Sewerage Service

This is a charge imposed on some or the whole community, both for users and non-users of the sewerage system, in accordance with the overall community benefits derived from the sewerage service. Therefore, this charge normally takes the form of an assessment on each property benefitting from the sewerage system.

2) Municipality Contribution and Other Financing Sources

a) Municipality Contribution

Due to the limitations in imposing sewerage user's charge, or for property surcharge tax for sewerage service, contribution from the general revenue of the Municipality might be necessary, in order to undertake the sewerage project.

However, judging from the size of MPK's general revenues, it is expected to have great difficulties in covering the huge deficit from the Sewerage Project. Therefore, the amount of such burden from MPK's general revenues may have to be minimized from the viability standpoint of the financial plan, partly because the sewerage system requires a cost recovery mechanism.

b) Special Charge for Industrial Wastewater

Industries sometimes generate wastewater which requires additional cost over those incurred in the treatment of normal domestic wastewater. A special charge could be imposed on such industries, according to established levels of BOD and SS concentrations. This special charging system would create an incentive for industries to equip themselves with pre-treatment facilities.

Although this practice is expected to present administrative difficulties because it requires trained personnel for including sampling, analysis and flow measurement, and time-consuming legalization procedures, it still is worth future consideration, depending on the development of industrial facilities.

8.1.3. Charging Principles

The charging methods for the above-mentioned sewerage user's charge and property surcharge tax for the sewerage service are examined on the basis of the following principles in detail.

i) Fairness and Efficiency

Fairness requires that the service charge be applied equally, corresponding to the amount of service received by each user. However, if the user can be encouraged to economize on the use of the sewerage service, the sliding scale of charges could be considered. Application of the sliding scale system of charges is also desirable from the viewpoint of a more efficient use of available resources.

ii) Simplicity of Administration

Consideration of the cost of administration requires the charging system for the sewerage service to be simple and easy to administer.

iii) Financial Adequacy

The charging system should adequately cover the cost of total wastewater disposal service, such as those of operation, maintenance, depreciation, and ultimately cover capital investment.

iv) Affordability of Payments

The level of charge must be acceptable to the extent that those benefitting from the sewerage system can pay the charge without difficulty. Therefore, it is desirable that the charging system be affordable.

v) Enforceability of Legal Action

Some users may be reluctant to pay or have no intention of paying the bill despite benefitting from the sewerage system. Therefore, means should be provided to enforce payment of the charge. If the bill is not paid, the service should be stopped until payment is made.

1) Sewerage User's Charging Method

There are several methods applicable for the charging system. The most common methods are outlined below:

a) Pedestal Charge

This method assumes that the waste volume is directly proportional to the number of water closet (WC) pedestal in the household. A flat rate is usually charged per pedestal unit. The collection of charges is administratively easy, but wastewater volume is not considered to be necessarily closely proportional to the number of pedestals.

b) Fixture-Unit Charge

This method assumes that the volume of waste discharge per household is directly proportional to the number of water fixtures, such as faucets, water heaters, air coolers, and flush toilet. As mentioned in pedestal charge, a flat rate is usually charged per fixture. However, households which have many fixtures do not necessarily consume a greater amount of water.

c) Per Capita Charge

The basic assumption of this method is that the volume of wastewater is proportionate to the number of occupants. A flat rate is usually charged for each occupant. This basic assumption is considered to be valid compared to the foregoing two methods; however, it has a significant disadvantage as there is no registration system to confirm the correct number of occupants for each dwelling at various times of the year.

d) Water Rate Surcharge

Based on the fact that after completion of the sewerage system most of the water consumed in each household or commercial enterprise will end up as wastewater discharged into the sewerage system, the sewerage charge is calculated by multiplying a fixed rate by the metered amount of water consumption. The advantage of this system is its administrative ease in collection of charges by making use of the same agency collecting the water bill. In addition, this method has another advantage in that the collection of sewerage charge is enforceable by cutting off the water supply in the event of non-payment.

The advantages and/or disadvantages of these alternative charging systems are summarized in the following Table 8.1.

Table 8.1. Comparison of Alternative Systems for Sewerage User's Charge

Charging System / Assessment Factor	Pedestal Charge	Fixture Unit Charge	Per Capita Charge	Water Rate Surcharge
Fairness and Efficiency	Poor	Poor	Fair	Good
Simplicity of Administration	Fair	Fair	Poor	Good
Financial Adequacy	Depends on the charging level			
Affordability of Payment	"	" "	"	"
Enforceability of Legal Action	Poor	Poor	Poor	Good

As a result of comparing these alternatives, the system of raising revenue from the direct users based on a percentage surcharge on the water bill is recommended. The other alternatives lack fairness, ease in collecting bills, and enforceability of legal action.

In Selangor State, the present tariff scale for sewerage is already set by Kuala Lumpur and its charge is collected by the Water Works Department on behalf of Sewerage and Drainage Department of K.L. Therefore, the recommended water surcharge system would require agreement between the Water Works Department of the State of Selangor and MPK on the setting of costs of operation, procedures for enforcement and accounting and payment methods for the commission fee. (An adequate commission fee to WWD by MPK would be required for the compensation of the collection cost. Currently, 1 percent of the total sewerage surcharge is paid by the Kuala Lumpur Sewerage and Drainage Department to WWD.)

The following consideration should be borne in mind to ensure and expedite adequate revenue for financing the proposed sewerage system.

A regulation or by-law for sewerage charge collection from the users should be enacted, in order to ensure adequate income for sewerage service, to apply to those residing in any premises within 30 m (100 ft) of available branch and lateral sewers, whether or not house connection has been made. Such arrangement for enforced payment is considered indispensable for efficient collection for the cost involved in sewerage activities through its influence on home owners to expedite house connections. However, as most property owners living in the Project Area have already installed septic tanks at considerable personal expense, they might feel reluctant to avail themselves of the sewerage services since the cost of replumbing and making house connection is likely to be expensive. One way of dealing with this problem might be to establish a revolving fund to assist property owners by providing loans to the property owner to help ease the cost involved.

2) Property Tax for Sewerage Service

Property tax surcharge on the assessment of property benefiting from the sewerage service is considered to be another source of revenue for the sewerage service. This is based on the fact that environmental improvement and property value will be increased by construction of the sewerage system and all members of the community will receive tangible and/or intangible benefits, such as improved living conditions. Therefore, it is considered justifiable that this charge be imposed on even those who are not directly using the sewerage facilities.

The Local Government Act, 1976 (sections 128, 130, and 131) empowers the local municipality to impose a maximum sewerage improvement tax of 5 percent per annum of the value of the property served or to be served by the sewerage system to cover the costs for construction and maintenance. This will be a large potential source of revenue for the sewerage activities.

The introduction of this tax raises the problem of how to impose this tax on the residents. Generally speaking, it is desirable for tax to be imposed according to the benefits accrued, including indirect benefits derived through improvement of environmental sanitation. However, since such benefits as environmental improvement and enhancement of property value cannot be quantified accurately, it is difficult to determine the optimal charging system from the equity viewpoint. In the following, the Alternative charging systems are examined. The charging system of the sewerage surcharge tax could take the following forms, depending on financial needs and ease of management:

(a) As a fixed percentage taxation on only the estimated value of property directly receiving the sewerage service.
(b) As a fixed percentage of the area-wide property tax on the entire Kelang area. Therefore, the sewerage tax can be levied on the annual value of the property served or to be served.
(c) As a different percentage of the area-wide property tax. In this case, property tax rate for the sewerage service differs according to the tax rate of each area shown in Table 8.2.

Charging system (a) might be readily accepted by those residents on whom the sewerage surcharge tax is imposed, if they are actually using and benefiting from the sewerage system. However, the revenue based on this charging system would not be an adequate source for financing the maintenance and operation costs, including debt servicing.

On the other hand, charging system (b) could be expected to raise larger revenue as is now practiced in Kuala Lumpur. However, in Kelang Municipality, the current property tax rate for the MPK's general

revenue varies considerably area-to-area within its territory. Therefore, the sewerage surcharge tax rate can more reasonably be determined considering the income redistribution; that is, the surcharge rate is determined by imposing proportionate rates to the currently applied property tax rate. For the above reasons, charging system (c) is proposed for the property tax surcharge.

The advantages and/or disadvantages of these alternatives are summarized in Table 8.2.

Table 8.2. Comparison of Alternative Charging Systems for Property Surcharge Tax

Assessment Factor	Charging System		
	(a)	(b)	(c)
Fairness and Efficiency	Good	Poor	Fair*
Simplicity of Administration	Fair	Good	Good
Financial Adequacy	Poor	Good	Fair
Affordability of Payment	Depends on the surcharge tax rate		
Enforceability of Legal Action	Good	Good	Good

Note: * Could be rated "Good" from long-term viewpoint.

8.2. Financial Projections

Various financial projections are prepared, based on consideration of the charging system presented above and other sources of financing the total capital and operation and maintenance costs of the entire proposed sewerage system. These projections are based on order-of-magnitude estimates of both capital and operation costs. Therefore, an allowance is made for bad debts, but none for charges in accounts receivable or accounts payable.

8.2.1. Funding Requirements for the Project

1) Construction Cost Estimate

As presented in Chapter 6, total cost required up to 2000 is approximately M$327 million, at 1981 price level, of which land acquisition cost is approximately M$20 million.

Cost estimates by phases are shown in Table 8.3. No allowance has been made for price escalation in these cost estimates. It is assumed that 70 percent of total cost is the local currency portion. In addition, all lands required for the proposed sewerage system up to the year 2000 are assumed to be purchased within the First Phase.

Table 8.3. Estimated Construction and Land Acquisition Costs

(Unit: M$1,000 at 1981 Price Level)

Phase	Source	Cost		
		Construction Cost	Land Acquisition Cost	Total
First (1990)	Foreign	11,279	-	11,279
	Local	26,318	20,447	46,765
	Total	37,597	20,447	58,044
Second (1991-1995)	Foreign	23,349	-	23,349
	Local	54,481	-	54,481
	Total	77,830		77,830
Third (1995-2000)	Foreign	57,221	-	57,221
	Local	133,514	-	133,514
	Total	190,735		190,735
Total	Foreign	91,849	-	91,849
	Local	214,313	20,447	234,760
	Total	306,162	20,447	326,609

Note: 1) The construction costs include design and construction supervision costs and contingency allowance.

2) It is assumed that the local currency portion is 70 percent of construction cost, and the remainder the foreign currency portion.

2) Operation and Maintenance Cost

Operation and maintenance cost by phases is estimated in Chapter 6. The following Table 8.4 summarizes the results of the estimation. It is assumed that the operation and maintenance cost from the year 2001 will continue to be the same up to 2005 after completion of the proposed sewerage system.

Table 8.4. Estimated Operation and Maintenance Costs

(Unit : M$1,000)

Phase	Operation and Maintenance Costs			
	Payroll	Electricity Supply and Repair	Adminis-tration	Total
First (-1990)	1,793	-	181	1,974
Second (1991-1995)	2,025	2,905	201	5,131
Third (1996-2000)	2,269	9,060	227	11,556
(2001-2005)	2,365	25,990	235	28,590

3) Loan Terms and Amortization of Principal and Interest

Since capital cost for sewerage construction will mostly be financed by long-term loans, possible sources considered appropriate for the Project are Federal Government loan and loans from multilateral lending agencies, such as the World Bank and Asian Development Bank. After examination of prevailing conditions of the above-mentioned loans, the following loan terms are considered realistic for use in financial projections in the Master Plan.

Source	Interest Rate (%)	Repayment Period (year)	Grace Period (year)
Federal Government	6	30	5
Multilateral Lending Agency	10	20	5

Calculations of the loan requirements and subsequent repayments are based on financial alternatives, which are explained in Section 8.2.3. These results are shown in Table 8.5.

8.2.2. Revenue Forecasts

Revenue forecasts are based on the sources discussed in Section 8.1.2: (1) Sewerage User's Charge, (2) Property Surcharge Tax for the Sewerage Service, (3) Municipality Contribution. As mentioned in Section 8.1.2, Municipality contribution is a source to make up any sewerage service deficit. Therefore, it is not forecasted in this section.

1) Revenue from Sewerage User's Charge

Revenue from the water bill surcharge recommended for the charging system is based on the average water consumption per person.

Table 8.6 shows the prevailing tariff scale for water supply and sewerage in Selangor State, although the sewerage tariff scale is applied only in Kuala Lumpur. The prevailing water surcharge rate levied on sewerage areas differs in unit price of M$0.09/$m^3$ (33 percent of the water bill) for residential use and M$0.22/$m^3$ (50 percent of the water bill) for commercial use.

Table 8.5. Amortization of Principal and Interest

(Unit: M$1,000)

Year	Alternative A-1			Alternative A-2			Alternative A-3			Alternative A-4			Alternative A-5		
	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal
1983															
1984															
1985	F: 11,279			F: 11,279			F: 11,279			F: 11,279			F: 11,279		
1986	L: 46,765			L: 26,318			L: 27,417			L: 17,743			L: 26,318		
1987	T: 58,044			T: 37,597			T: 38,696			T: 29,022			T: 37,597		
1988		3,934	788		2,707	530		2,773	544		2,193	421		2,707	530
1989		3,878	844		2,667	570		2,732	585		2,159	455		2,667	570
1990		3,820	902		2,625	612		2,689	628		2,124	490		2,625	612
Sub-Total		11,632	2,534		7,999	1,712		8,194	1,757		6,476	1,366		7,999	1,712
1991		3,756	966		2,578	659		2,642	675		2,085	529		2,578	659
1992	F: 23,349	3,688	1,034	F: 23,349	2,529	708	F: 23,349	2,591	726	F: 23,349	2,043	571	F: 23,349	2,529	708
1993	L: 54,481	3,614	1,108	L: 54,481	2,474	763	L: 28,538	2,536	781	L: 15,566	1,997	617	L: 28,538	2,474	763
1994	T: 77,830	3,535	1,187	T: 77,830	2,416	821	T: 51,887	2,476	841	T: 38,915	1,947	667	T: 51,887	2,416	821
1995		3,449	1,273		2,352	885		2,411	906		1,893	721		2,352	885
Sub-Total		18,042	5,568		12,349	3,836		12,656	3,929		9,965	3,105		12,349	3,836
1996		8,962	2,461		7,888	2,050		6,389	1,744		5,103	1,385		6,331	1,722
1997	F: 57,221	8,781	2,642	F: 57,221	7,732	2,206	F: 57,221	6,252	1,881	F: 57,221	4,987	1,501	F: 57,221	6,195	1,858
1998	L:133,514	8,585	2,838	L:133,514	7,563	2,375	L: 69,937	6,102	2,031	L: 38,147	4,860	1,628	L: 38,147	6,047	2,006
1999	T:190,735	8,375	3,048	T:190,735	7,380	2,558	T:127,158	5,940	2,193	T: 95,368	4,722	1,766	T: 95,368	5,886	2,167
2000		8,149	3,274		7,183	2,755		5,765	2,368		4,573	1,915		5,713	2,340
Sub-Total		42,852	14,263		37,746	11,944		30,448	10,217		24,245	8,195		30,172	10,093
2001		21,636	6,208		20,702	5,657		15,491	4,444		12,419	3,561		13,534	4,011
2002		21,171	6,673		20,269	6,090		15,131	4,804		12,112	3,868		13,199	4,346
2003		20,666	7,178		19,800	6,559		14,741	5,194		11,777	4,203		12,836	4,709
2004		20,122	7,722		19,293	7,066		14,315	5,620		11,412	4,568		12,440	5,105
2005		19,535	8,309		18,745	7,614		13,854	6,081		11,013	4,967		12,009	5,536
Sub-Total		103,130	36,090		98,809	32,986		73,532	26,143		58,733	21,167		64,018	23,707

Year	Alternative B-1			Alternative B-2			Alternative B-3			Alternative B-4			Alternative B-5		
	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal	Loan Requirement	Interest	Principal
1983															
1984															
1985	F: 0			F: 0			F: 0			F: 0			F: 0		
1986	L: 58,044			L: 37,597			L: 38,696			L: 29,022			L: 37,597		
1987	T: 58,044			T: 37,597			T: 38,696			T: 29,022			T: 37,597		
1988		3,483	734		2,256	475		2,322	489		1,741	367		2,256	475
1989		3,439	778		2,227	504		2,292	519		1,719	389		2,227	504
1990		3,392	825		2,197	534		2,261	550		1,696	412		2,197	534
Sub-Total		10,314	2,337		6,680	1,513		6,875	1,558		5,156	1,168		6,680	1,513
1991		3,342	875		2,165	566		2,228	583		1,671	437		2,165	566
1992	F: 0	3,290	927	F: 0	2,131	600	F: 0	2,193	618	F: 0	1,645	463	F: 0	2,131	600
1993	L: 77,830	3,234	983	L: 77,830	2,095	636	L: 51,887	2,156	655	L: 38,915	1,617	491	L: 51,887	2,095	636
1994	T: 77,830	3,175	1,042	T: 77,830	2,057	674	T: 51,887	2,117	694	T: 38,915	1,588	520	T: 51,887	2,057	674
1995		3,113	1,104		2,016	715		2,075	736		1,557	551		2,016	715
Sub-Total		16,154	4,931		10,464	3,191		10,769	3,286		8,078	2,462		10,464	3,191
1996		7,717	2,154		6,644	1,741		5,144	1,437		3,859	1,076		5,087	1,414
1997	F: 0	7,587	2,284	F: 0	6,539	1,846	F: 0	5,058	1,523	F: 0	3,793	1,142	F: 0	5,002	1,499
1998	L:190,735	7,450	2,421	L:190,735	6,428	1,957	L:127,157	4,967	1,614	L: 95,368	3,725	1,210	L: 95,368	4,912	1,589
1999	L:190,735	7,305	2,566	T:190,735	6,311	2,074	T:127,157	4,870	1,711	T: 95,368	3,653	1,282	T: 95,368	4,817	1,684
2000		7,151	2,720		6,187	2,198		4,767	1,814		3,576	1,359		4,716	1,785
Sub-Total		37,210	12,145		32,109	9,816		24,806	8,099		18,606	6,069		24,534	7,971
2001		18,432	5,296		17,498	4,744		12,287	3,532		9,216	2,647		10,330	3,099
2002		18,114	5,614		17,214	5,028		12,076	3,743		9,058	2,805		10,145	3,284
2003		17,777	5,951		16,912	5,330		11,851	3,968		8,889	2,974		9,947	3,482
2004		17,420	6,308		16,592	5,650		11,613	4,206		8,711	3,152		9,739	3,690
2005		17,042	6,686		16,253	5,989		11,360	4,459		8,523	3,340		9,517	3,912
Sub-Total		88,785	29,855		84,469	26,741		59,187	19,908		44,397	14,918		49,678	17,467

F: Foreign currency portion

L: Local currency portion

T: Total

Table 8.6. Tariff Scale for Water Supply & Sewerage in Selangor State

Type of Use	Water Supply			Water Supply & Sewerage		
	Code No.	Water Supply (M$/m^3)	Minimum Charge (M$)	Code No.	Water Supply (M$/m^3)	Minimum Charge (M$)
Residential	10	0.27	2.40	60	0.36	3.20
Government Houses	11	0.27	2.40	61	0.36	3.20
Club	12	0.27	2.40	62	0.36	3.20
School	13	0.27	2.40	63	0.36	3.20
Local Authority	14	0.27	2.40	64	0.36	3.20
Port, Trade	15	0.38	3.40	65	0.54	4.80
Commercial	16	0.44	4.00	66	0.66	6.00
Mosque, Church	17	0.14	1.20	67	0.23	2.00
Religious Establishment	18	0.11	1.00	68	0.20	1.80
Swimming Pool	19	0.27	2.40	69	0.36	3.20
Shipping	20	0.66	-	70	-	-
Low-Cost Residence	21	0.14	1.20	71	0.23	2.00

In this financial projection, water bill surcharge revenues are based on different tariff scales for residential and commercial use. Since these prevailing tariff scales are considered to be insufficient to cover the projected operation and maintenance cost, including debt servicing, a reasonable charging rate should be determined, taking into consideration the analysis of the various financial projections, discussed in the following Section 8.2.1.

The level of the sewerage charge should not exceed the amount the user is able to pay. However, it is difficult to estimate the level of ability to pay for a capital-intensive public utility such as sewerage. It is generally considered that the proper approach used to measure the ability-to-pay of the individual domestic user for planning a sanitary project including water supply and sewerage will be based on the assumption of the maximum rate of approximately 2 percent of their disposable income. This rate is considered reasonable in developing nations, including Malaysia, for sewerage charge.

According to the result of random sampling surveys conducted during the Study Period in connection with household income and residents' willingness-to-pay, as presented in Chapter 11, the average household income per month is M$1,051. Therefore, the maximum monthly water and sewerage charge within ability-to-pay would be approximately M$21. According to data available, the average bill for water consumption is about M$10.4, which means that the maximum sewerage charge may be around M$10.6; i.e., approximately 100 percent of the water bill. There should be a reasonable charging rate between the prevailing sewerage surcharge rate (33 percent) and the maximum sewerage surcharge rate (100 percent).

The following four sewerage surcharge rates are considered in order to examine the optimal rate.

(1) A water surcharge levied at 33 percent of the water bill for domestic use, and at 50 percent for commercial use.

(2) At 50 percent for domestic and at 70 percent for commercial use.

(3) At 70 percent for domestic and at 90 percent for commercial use.

(4) At 100 percent for domestic and 120 percent for commercial use.

Water bill surcharge revenues from households are calculated on the basis of the projected population, and those from commercial and industrial use are calculated on the basis of number of employees, as shown in Table 8.7, and assuming that the basic water charge will be raised 20 percent from 1996.

Table 8.8 shows the revenues expected from the domestic and commercial water bill surcharge.

Table 8.7. Estimated Water Consumption

Year	Water Consumption Categories and Quantity				
	Water Consumption per Person (m^3/person/year)	Estimated Served Population (person)	Estimated Employed Population (person)	Domestic Water Consumption (1,000 m^3)	Commercial Water Consumption (1,000 m^3)
1991	95	29,200	10,100	2,774	960
1992	96	30,000	10,700	2,880	1,027
1993	97	30,800	11,400	2,988	1,106
1994	99	31,600	12,100	3,128	1,198
1995	100	32,300	12,900	3,230	1,290
Sub-Total			57,200	15,000	5,581
1996	101	108,400	42,000	10,948	4,242
1997	102	109,900	43,800	11,210	4,468
1998	103	111,400	45,700	11,474	4,707
1999	105	112,800	47,800	11,844	5,019
2000	106	114,300	49,900	12,116	5,289
Sub-Total			229,200	57,592	23,725
2001	106	298,400	98,000	31,630	10,388
2002	106	298,400	98,000	31,630	10,388
2003	106	298,400	98,000	31,630	10,388
2004	106	298,400	98,000	31,630	10,388
2005	106	298,400	98,000	31,630	10,388
Sub-Total			490,000	158,150	51,940

Table 8.8. Revenue from Users of the Sewerage System

(Unit: M$1,000)

Period	Type of Users	Revenue	Surcharge Rate (%)			
			D* C*	D* C*	D* C*	D* C*
			33 (50)	50 (70)	70 (90)	100 (120)
1991-1995	Domestic	Charge(M$/$m^3$)	0.09	0.135	0.189	0.270
		Revenue	1,350	2,025	2,835	4,050
	Commercial	Charge(M$/$m^3$)	0.22	0.308	0.396	0.528
		Revenue	1,228	1,719	2,210	2,947
	Total	Revenue	2,578	3,744	5,045	6,997
1996-2000	Domestic	Charge(M$/$m^3$)	0.108	0.162	0.227	0.324
		Revenue	6,220	9,330	13,073	18,660
	Commercial	Charge(M$/$m^3$)	0.264	0.370	0.475	0.634
		Revenue	6,263	8,778	11,269	15,042
	Total	Revenue	12,483	18,108	24,342	33,702
2001-2005	Domestic	Charge(M$/$m^3$)	0.108	0.162	0.227	0.324
		Revenue	17,080	25,620	35,900	51,241
	Commercial	Charge(M$/$m^3$)	0.264	0.370	0.475	0.634
		Revenue	13,712	19,218	24,672	32,930
	Total	Revenue	30,792	44,838	60,572	84,171

Note: D* Domestic
C* Commercial

2) Revenue from Property Tax for the Sewerage Service

As pointed out in Section 8.1.3., it is recommended that the sewerage surcharge tax rate be levied in proportion with the prevailing property tax rate, which differs according to the area, as shown in Table 8.9. Revenues obtainable up to maximum 5 percent property tax for the sewerage service are presented in Table 8.10.

Table 8.9. Cases of Sewerage Surcharge Tax Rate

Area	Prevailing Tax Rate (%)	Case				
		Max. 5 (%)	Max. 4 (%)	Max. 3 (%)	Max. 2 (%)	Max. 1 (%)
Within Sectors 1-32 (Inside the town)	15	5	4	3	2	1
Zone 'A' (Telok Gadong Rd)	15					
Zone 'B' (Eng Ann Estate)	15					
Mukim (Outside the town area)	14					
Extension Area	11	3	2.5	2	1	0.5
Village (Pendamaran) (Pendamaran Jaya)	10					
Kapar Town	10					
Meru Town	10					
Malay Reservation in Meru Town	8	2	1.5	1	0.5	0
Existing Malay Reservation Area	7					

Table 8.10. Surcharge Tax Revenue

(Unit: M$1;000)

Year	Surcharge Tax Rate				
	Max. 5%	Max. 4%	Max. 3%	Max. 2%	Max. 1%
(For Reference) 1981	3,263	2,624	1,983	1,273	634
1988	4,591	3,692	2,790	1,791	892
1989	4,821	3,877	2,930	1,881	937
1990	5,062	4,071	3,076	1,975	984
Sub-Total	14,474	11,640	8,796	5,647	2,813
1991	5,315	4,274	3,230	2,074	1,033
1992	5,581	4,488	3,392	2,177	1,084
1993	5,860	4,712	3,561	2,286	1,139
1994	6,153	4,948	3,739	2,400	1,196
1995	6,461	5,195	3,926	2,520	1,255
Sub-Total	29,190	23,617	17,848	11,457	5,707
1996	6,784	5,455	4,123	2,646	1,318
1997	7,123	5,728	4,329	2,779	1,384
1998	7,479	6,014	4,545	2,918	1,453
1999	7,853	6,315	4,772	3,064	1,526
2000	8,245	6,631	5,011	3,217	1,602
Sub-Total	37,484	30,143	22,780	14,624	7,283
2001	8,245	6,631	5,011	3,217	1,602
2002	8,245	6,631	5,011	3,217	1,602
2003	8,245	6,631	5,011	3,217	1,602
2004	8,245	6,631	5,011	3,217	1,602
2005	8,245	6,631	5,011	3,217	1,602
Sub-Total	41,225	33,155	25,055	16,085	8,010

8.2.3. Alternative Financial Projections

1) Setting of Alternatives

Based on the above-mentioned conditions, the following alternatives are set up on how to cover the capital cost. These alternatives are categorized into the following two groups:

(A) Where the foreign currency portion of the construction cost is assumed to be financed by the foreign lending agencies and the local currency portion by the Federal Government.

(B) Where the entire construction cost is assumed to be financed by the Federal Government.

Each group is further divided into five alternatives, according to the grant conditions. (In Japan, such grants are common, although the amount of grant differs according to the size of the city, ranging from 30 to 50 percent.) These alternatives are summarized in Table 8.11.

(a) Alternative A-1 and B-1

No grant is provided either for construction cost or for land acquisition cost.

(b) Alternative A-2 and B-2

Grant is assumed to be provided only for land acquisition cost.

(c) Alternative A-3 and B-3

Federal and/or State Government is assumed to contribute a grant for one-third of the total construction cost including land acquistion cost.

(d) Alternative A-4 and B-4

The grant is increased from one-third to half of the total construction cost including land acquisition cost.

(e) Alternative A-5 and B-5

In this financial projections, the percentage of the grant for the total construction cost are different for each Phase:

First Phase (-1990)

Grant is given to the land acquisition cost in accordance with Alternative A-2.

Second Phase (1991 - 1995)

One-third of the required cost is financed by a grant in accordance with Alternative A-3.

Third Phase (1996 - 2000)

Half of the required cost is financed by a grant in accordance with Alternative A-4.

Under the ten alternative sets for the proposed sewerage system described above, further detailed revenue plans are developed with the following components in mind in order to find the most viable financing schedule within the limit of MPK's contribution.

Table 8.11. Alternative Financial Projections for Sewerage System

(Unit: M$1,000)

Alternative Financial Plan	Type and Source of Funds				
	Loan			Grant	(For each Phase, except where otherwise noted)
	Foreign Lending Agencies	Federal Government	Total	Federal or State Government	Remarks
A-1	91,849 (28.1%)	234,760 (71.9%)	326,609	0	(None)
A-2	91,849 (28.1%)	214,313 (65.6%)	306,162	20,447 (6.3%)	For land acquisition in 1st Phase (State Govt. grant)
A-3	91,849 (28.1%)	125,890 (38.5%)	217,739	108,870 (33.3%)	Including land acquisition in 1st Phase
A-4	91,849 (28.1%)	71,455 (21.9%)	163,304	163,305 (50.0%)	Including land acquisition in 1st Phase
A-5	91,849 (21.8%)	93,003 (28.5%)	184,852	141,758 (43.4%)	Differs for each phases as follows: 1st: (6.3%) for land acquisition (from State Govt. grant) 2nd: (33.3%) 3rd: (50.0%)
B-1	0	326,609 (100.0%)	326,609	0	(None)
B-2	0	306,162 (100.0%)	306,162	20,447 (6.3%)	For land acquisition in 1st Phase (State Govt. grant)
B-3	0	217,739 (66.7%)	217,739	108,870 (33.3%)	Including land acquisition in 1st Phase
B-4	0	163,304 (50.0%)	163,304	163,305 (50.0%)	Including land acquisition in 1st Phase
B-5	0	184,852 (56.6%)	184,852	141,758 (43.4%)	Differs for each phases as follows: 1st: (6.3%) for land acquisition (from State Govt. grant) 2nd: (33.3%) 3rd: (50.0%)

Note: 1. ( ) indicates the percentage proportion of the total consruction cost.
2. All alternatives propose acquisition of land required up to the Year 2000 in the 1st Phase.

2) Evaluation Criteria for Alternatives

The most viable financial plan is to be selected, taking into consideration the following criteria:

(a) The revenue should be projected at least to cover operation and maintenance expenses and debt service payments as a minimum requirement to ensure the viability of the sewerage project. Otherwise, the project operation would be suspended due to shortage of cash available for operation.

(b) The sewerage service is a form of public service and is not a profit-making operation. Since the executing agencies are not expected to make profits from its service, MPK are required to bear some amount of deficit from its service. It is reasonable to consider that MPK would be able to compensate a deficit of about M$1 million each year (about M$20 million up to 2005), judging from the size of MPK's general revenue (M$1 million corresponds to about 0.5 percent of current MPK's general revenue). In addition, as already mentioned above the reassessment which will be conducted every five years should form a potential source for such compensation.

(c) If MPK is able to produce large revenue, the sewerage surcharge rate and/or the sewerage tax rate should be lowered.

3) Examination of Alternatives

In order to find viable financial plans in each alternative mentioned above, financial statements are calculated, based on various sewerage surcharge rates and sewerage surcharge tax rates. The sewerage surcharge rate is calculated at 33, 50, 70 and 100 percent on the water bill, and the sewerage surcharge tax rate is calculated at 1, 2, 3, 4 and 5 percent of the annual property valve. Combinations of these various sewerage surcharge rates and sewerage surcharge tax rates result in 20 cases of calculation for each alternative.

Among these 20 cases calculated, feasible financial plans are selected according to the evaluation criteria described previously, especially from the viewpoint that MPK's contribution amounts to about M$20 million up to 2005 at most, as summarized in Table 8.12 (1) and 8.12 (2).

Based on the above-mentioned criteria; that is, the sewerage surcharge rate on water bill within 100 percent, the sewerage surcharge tax rate within 5 percent, and the amount of MPK's contribution within M$20 million up to 2005, feasible financial plans in each alternative can be selected. These are shown within the feasible area indicated in Fig. 8.1 (1) through Fig. 8.1 (10), which represent the relationship of (1) the sewerage surcharge rates on the water bill, (2) the sewerage surcharge tax rates and (3) the amount of MPK's contribution (cash accumulated) up to 2005, based on Table 8.16 (1) and 8.16 (2). In these figures, the vertical line represents MPK's contribution up to 2005, the horizontal line represents the sewerage surcharge tax rate, and the diagonal lines represent the different sewerage surcharge rates on the water bill. The space above the horizontal line represents surplus and that below the horizontal line represents deficit (that is, Kelang Municipality's contribution). The intersecting points of the horizontal and the diagonal lines represent zero contribution by MPK; that is, there are no profits from the proposed sewerage operation and there will be no need for any contribution. The further down to the right the diagonal line is moved, the less viable becomes the financial projection, since the sewerage surcharge tax rate increases.

This analysis indicates that as shown within the feasible area of Figures, each alternative has feasible financial plans which are satisfied with the above-mentioned criteria except Alternative A-1. These feasible financial plans are presented in Table 8.13.

Table 8.12. (1) Table of Cash Accumulated up to 2005

(Unit: M$1,000)

Alternative	Sewerage Surcharge Tax Rate (%)	Sewerage Surcharge Rate on Water Bill (%)			
		33	50	70	100
A-1	1	Δ213,123	Δ192,865	Δ170,941	Δ136,425
	2	Δ189,075	Δ168,865	Δ146,440	Δ112,428
	3	Δ162,407	Δ142,199	Δ119,775	Δ90,759
	4	Δ138,331	Δ118,119	Δ95,698	Δ58,684
	5	Δ114,503	Δ94,311	Δ63,780	Δ37,865
A-2	1	Δ186,414	Δ166,226	Δ144,304	Δ109,786
	2	Δ162,434	Δ129,968	Δ119,801	Δ85,789
	3	Δ135,768	Δ115,560	Δ93,135	Δ64,210
	4	Δ111,692	Δ91,480	Δ69,059	Δ35,221
	5	Δ87,874	Δ67,666	Δ45,241	Δ11,226
A-3	1	Δ145,848	Δ125,640	Δ103,715	Δ69,200
	2	Δ121,848	Δ101,640	Δ79,215	Δ45,203
	3	Δ95,182	Δ74,974	Δ52,549	Δ23,534
	4	Δ71,106	Δ61,960	Δ28,473	8,541
	5	Δ47,288	Δ27,080	Δ4,655	29,360
A-4	1	Δ112,215	Δ92,007	Δ70,082	Δ35,567
	2	Δ88,215	Δ68,007	Δ87,207	Δ11,570
	3	Δ61,545	Δ41,341	Δ18,916	10,009
	4	Δ37,473	Δ17,261	5,160	42,174
	5	Δ13,655	6,553	28,978	62,930
A-5	1	Δ132,852	Δ112,644	Δ90,719	Δ56,204
	2	Δ108,852	Δ88,644	Δ66,219	Δ32,207
	3	Δ82,186	Δ61,928	Δ39,553	Δ9,938
	4	Δ58,110	Δ37,898	Δ15,477	21,537
	5	Δ34,292	Δ14,084	8,341	42,356

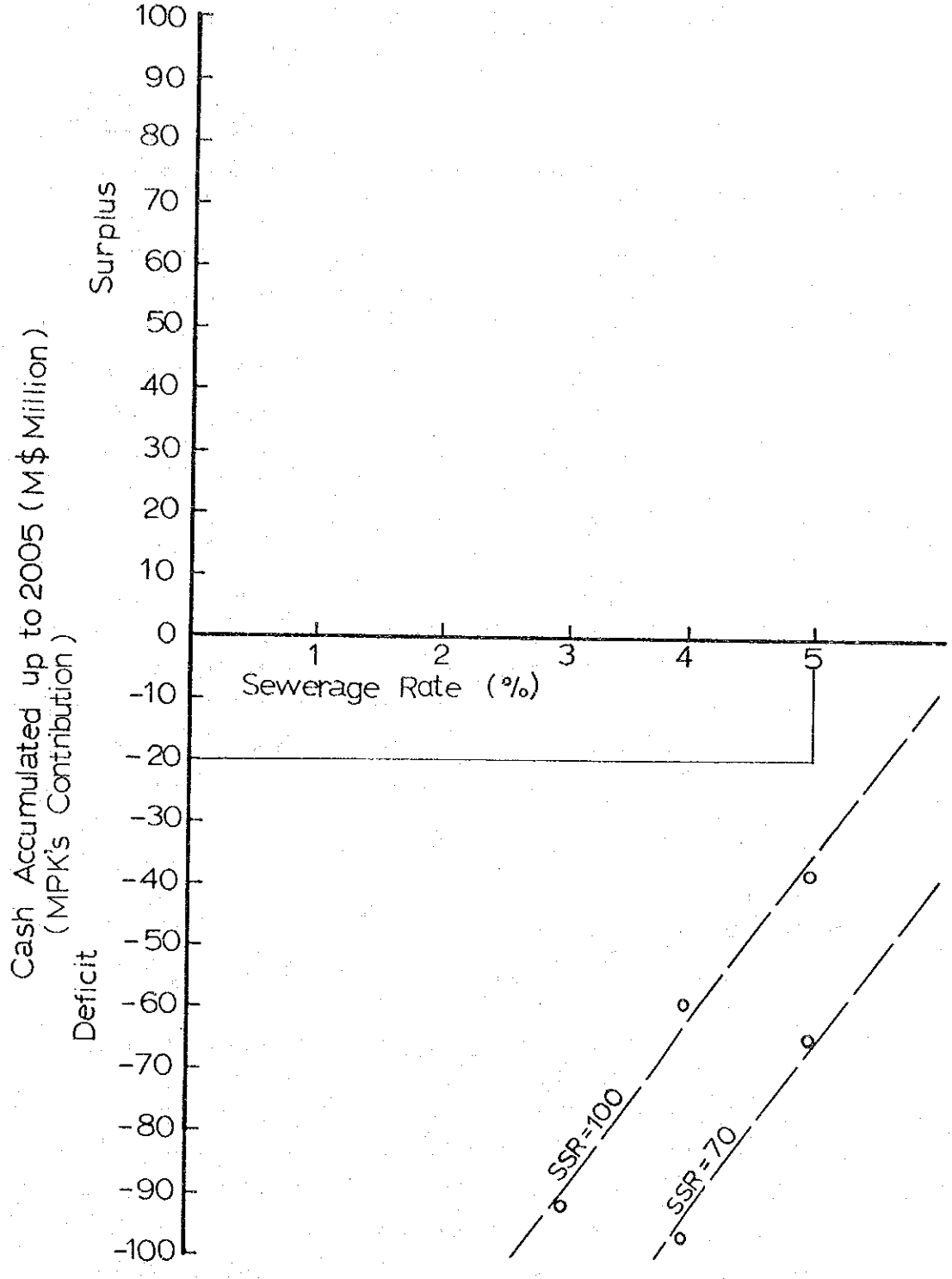
Table 8.12.(2)

(Unit: M$1,000)

Alternative	Sewerage Surcharge Tax Rate (%)	Sewerage Surcharge Rate on Water Bill (%)			
		33	50	70	100
B-1	1	Δ180,693	Δ160,485	Δ172,860	Δ104,045
	2	Δ156,693	Δ136,485	Δ114,060	Δ80,048
	3	Δ130,027	Δ109,819	Δ87,394	Δ58,379
	4	Δ105,951	Δ85,739	Δ63,318	Δ26,304
	5	Δ82,133	Δ61,925	Δ39,500	Δ5,485
B-2	1	Δ153,945	Δ133,737	Δ111,812	Δ77,297
	2	Δ129,945	Δ109,737	Δ87,312	Δ53,300
	3	Δ103,279	Δ83,071	Δ60,666	Δ31,631
	4	Δ79,203	Δ58,991	Δ36,570	444
	5	Δ55,385	Δ35,177	Δ12,752	21,263
B-3	1	Δ113,450	Δ93,242	Δ71,317	Δ36,804
	2	Δ89,510	Δ69,242	Δ46,817	Δ12,806
	3	Δ62,784	Δ42,576	Δ20,151	8,864
	4	Δ38,708	Δ18,496	3,925	40,939
	5	Δ14,890	5,318	27,743	61,758
B-4	1	Δ46,214	Δ26,006	Δ4,081	30,434
	2	Δ20,214	Δ2,006	20,419	54,431
	3	Δ4,452	24,662	47,085	116,100
	4	28,528	50,740	71,161	108,175
	5	52,346	72,554	94,979	128,994
B-5	1	Δ110,460	Δ80,252	Δ92,627	Δ23,812
	2	Δ76,460	Δ56,252	Δ33,827	185
	3	Δ49,794	Δ29,586	Δ7,161	21,854
	4	Δ25,718	Δ5,506	16,915	53,929
	5	Δ1,900	18,308	40,733	74,748

Fig.8.1.(1) Cash Accumulated (MPK's Contribution) by Cases

Alternative A－1



SSR : Sewerage Surcharge Rate (%)

⬚ Feasible Area

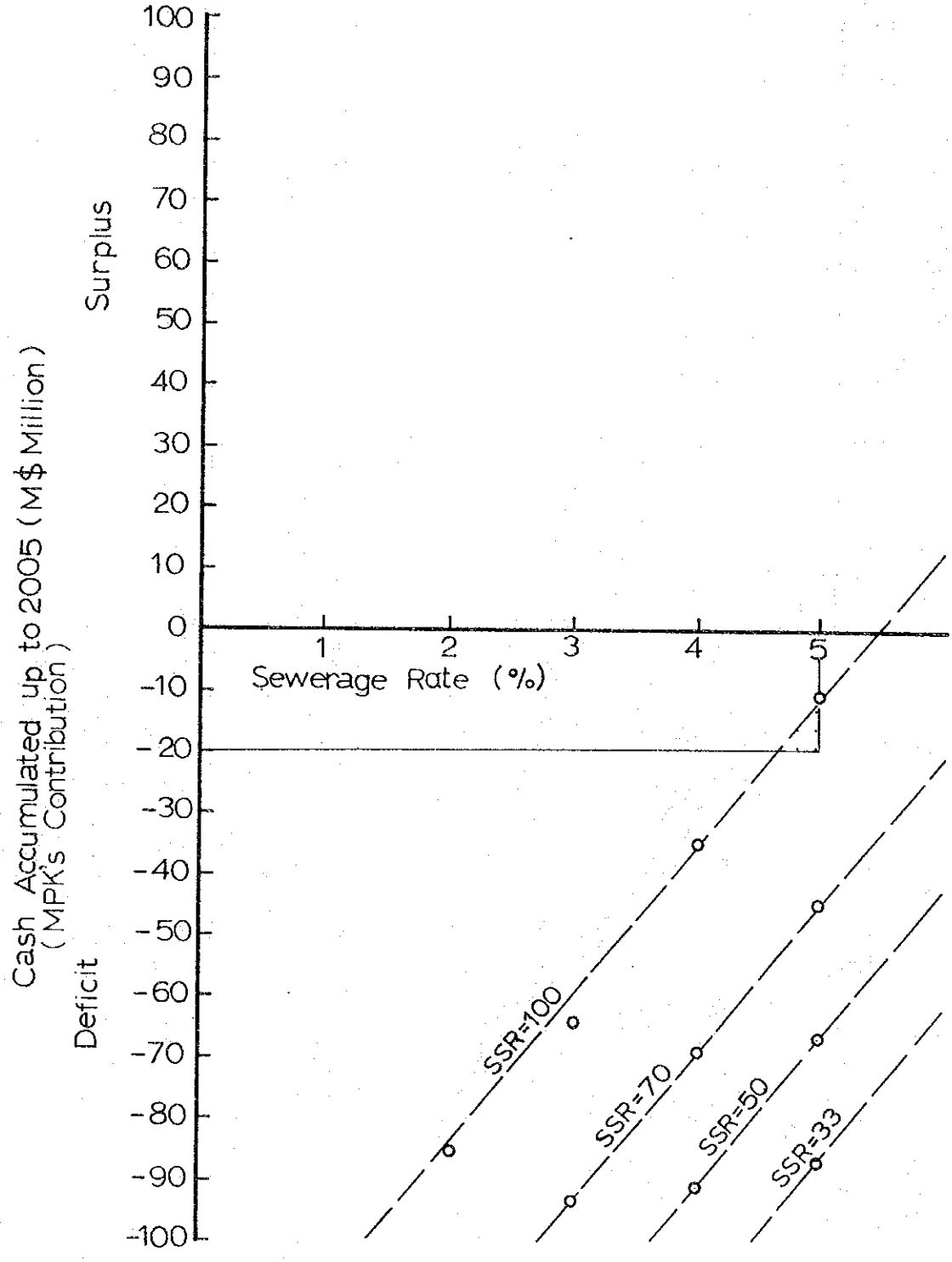
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(2) Cash Accumulated (MPK's Contribution) by Cases

Alternative A-2



SSR : Sewerage Surcharge Rate (%)

⊡ Feasible Area

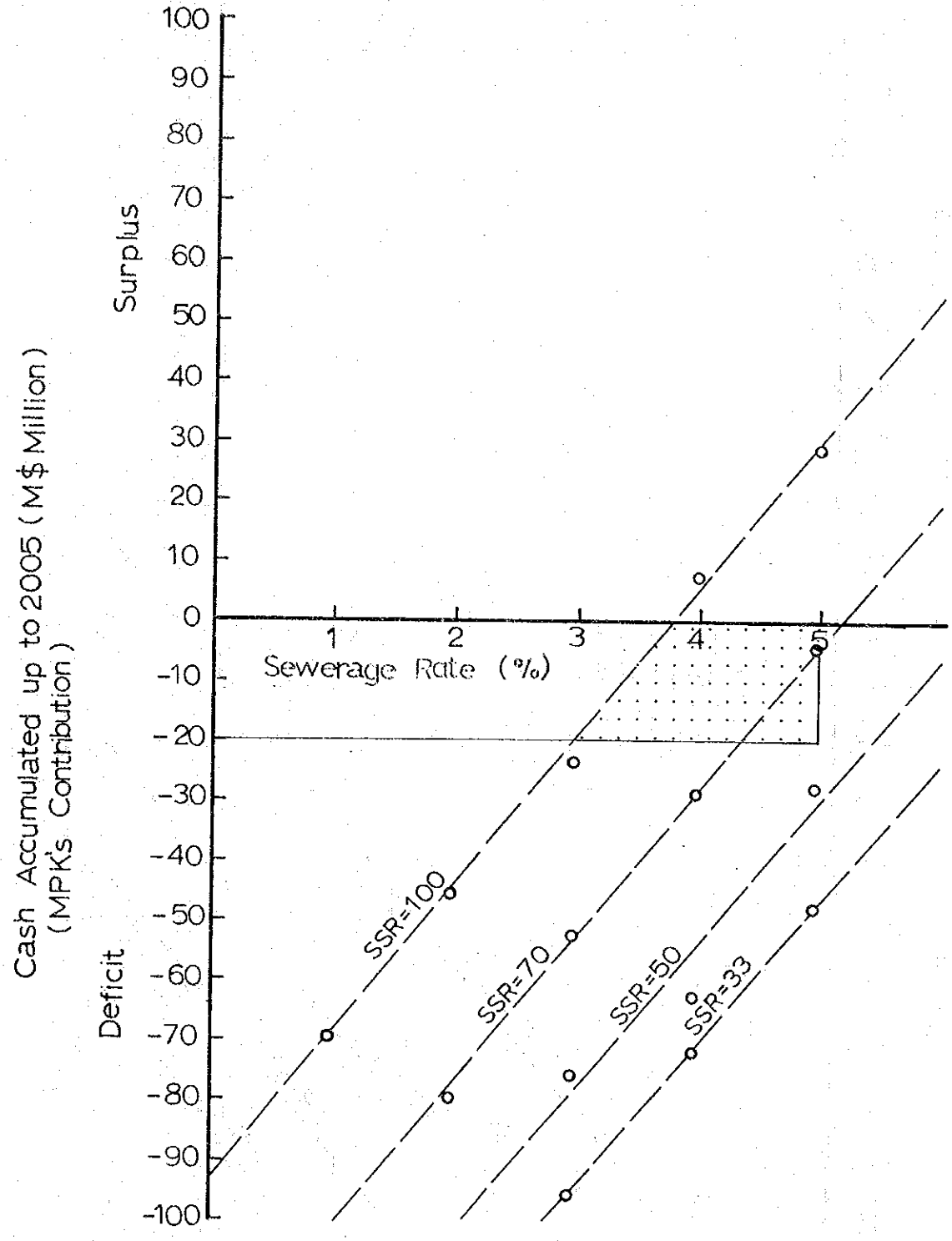
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(3) Cash Accumulated (MPK's Contribution) by Cases

Alternative A-3



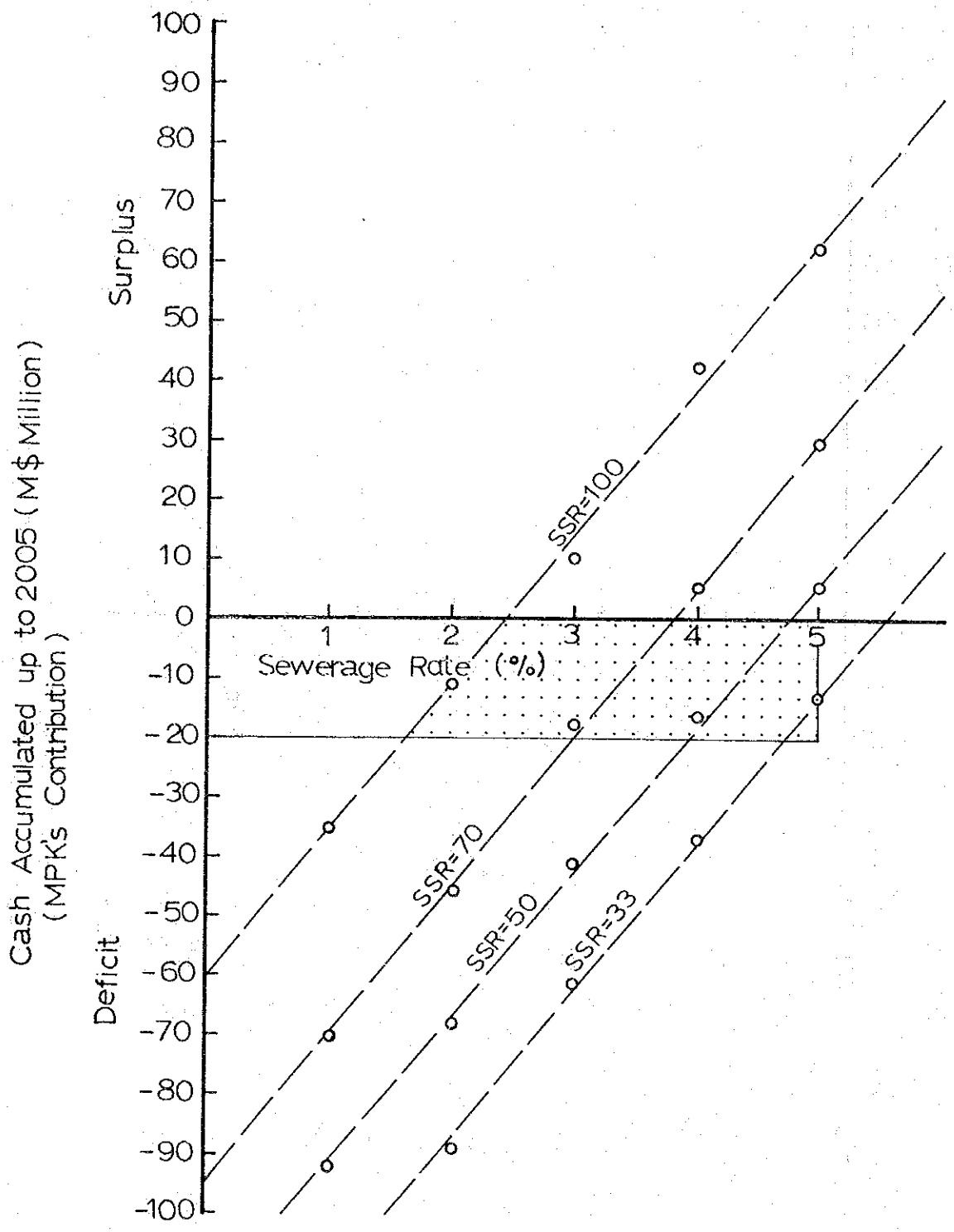
SSR : Sewerage Surcharge Rate (%)

Feasible Area

within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,
(2) 5% of the Property Surcharge Tax for the Sewerage Service, and
(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(4) Cash Accumulated (MPK's Contribution) by Cases

Alternative A-4



SSR : Sewerage Surcharge Rate (%)

Feasible Area

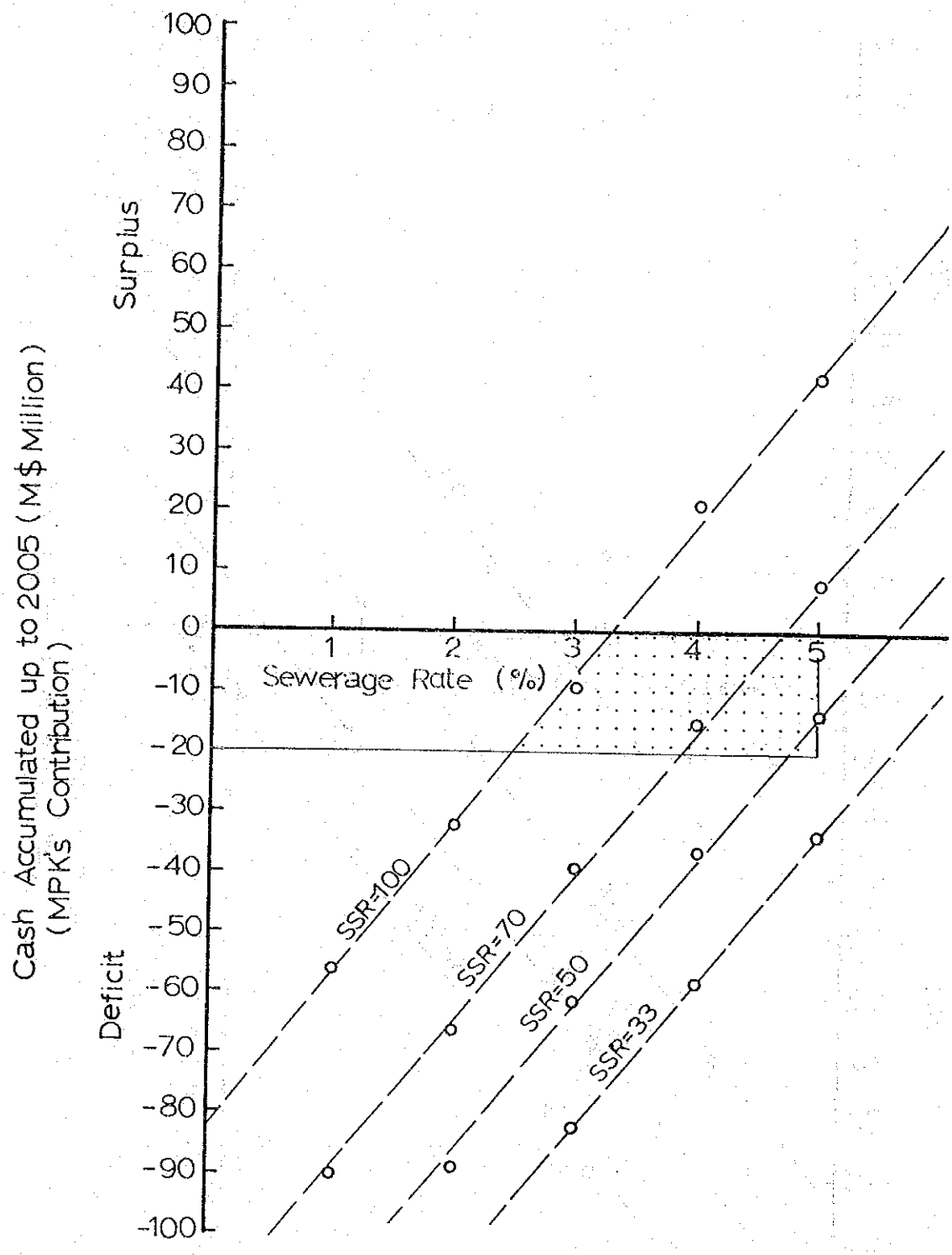
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(5) Cash Accumulated (MPK's Contribution) by Cases

Alternative A-5



SSR : Sewerage Surcharge Rate (%)

Feasible Area

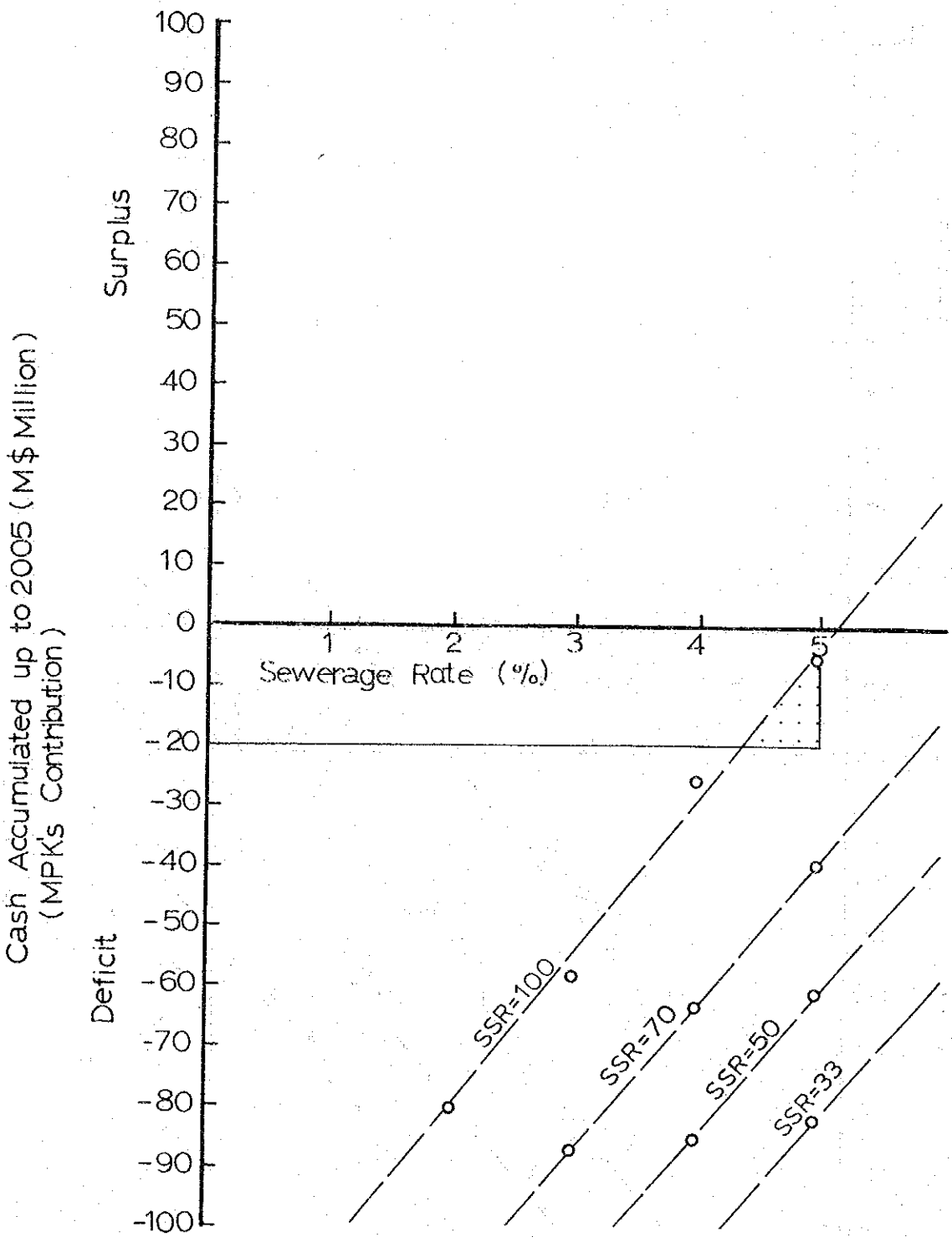
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(6) Cash Accumulated (MPK's Contribution) by Cases

Alternative B - 1



SSR : Sewerage Surcharge Rate (%)

Feasible Area

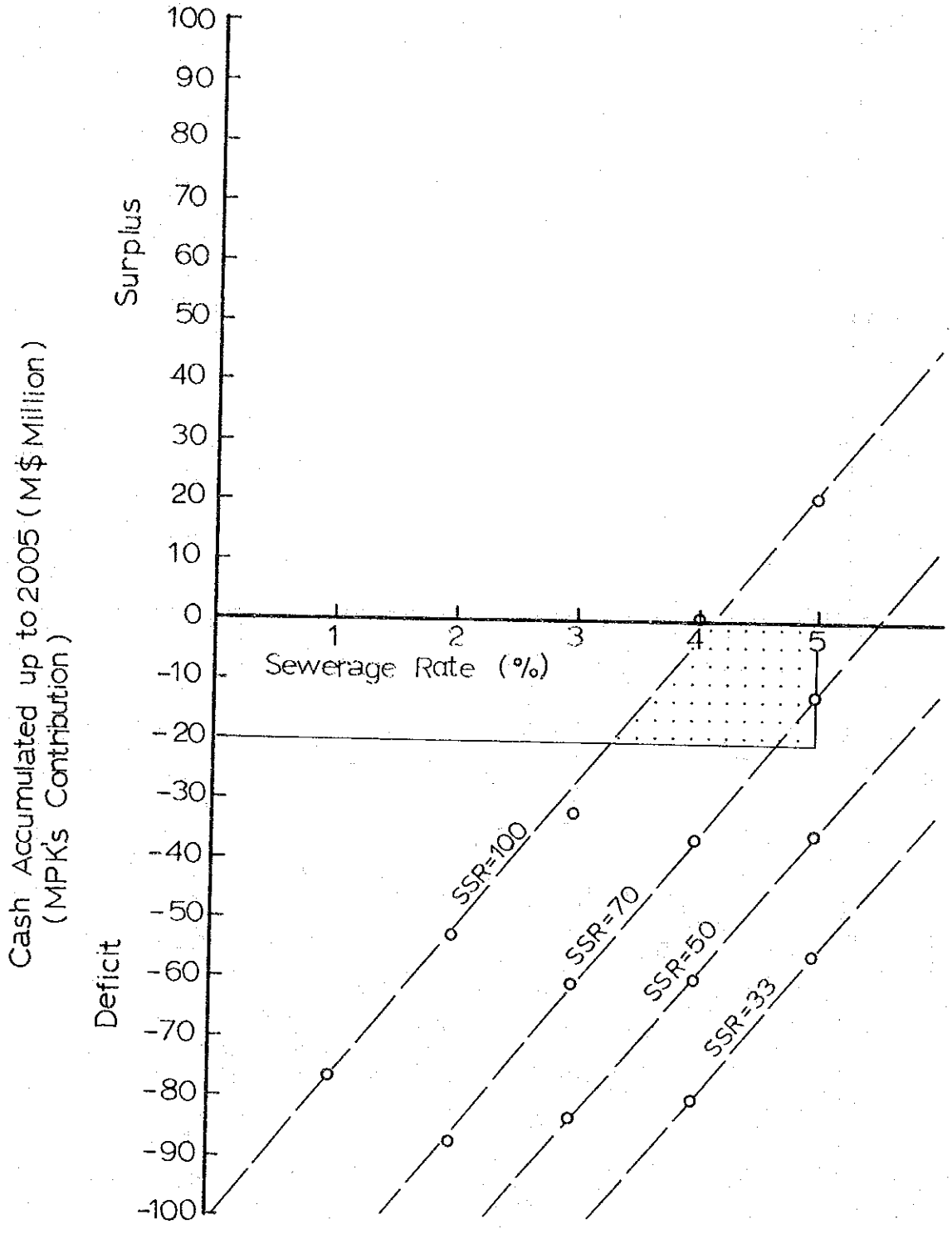
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig. 8.1.(7) Cash Accumulated (MPK's Contribution) by Cases

Alternative B-2



SSR : Sewerage Surcharge Rate (%)

⬚ Feasible Area

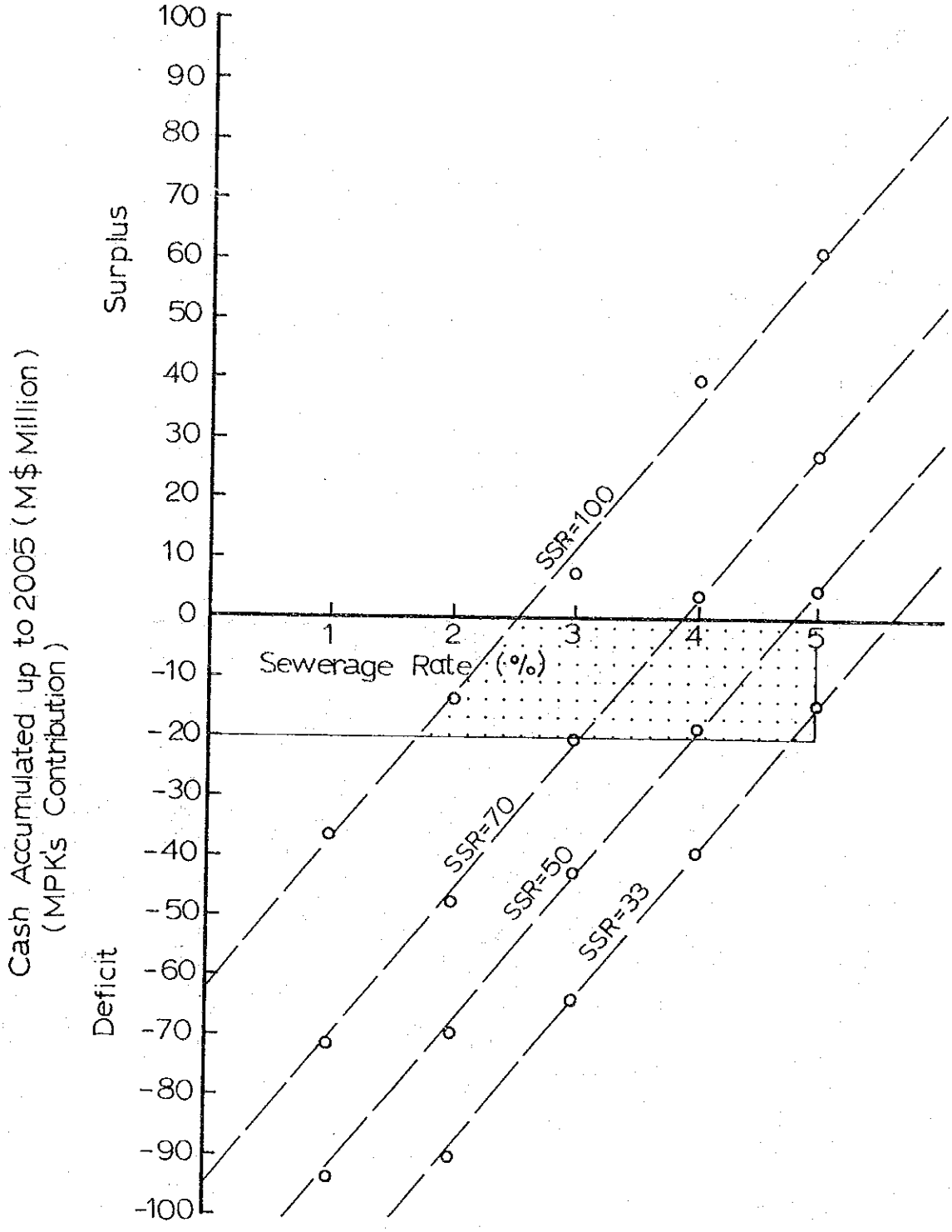
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(8) Cash Accumulated (MPK's Contribution) by Cases

Alternative B-3



SSR : Sewerage Surcharge Rate (%)

⬚ Feasible Area

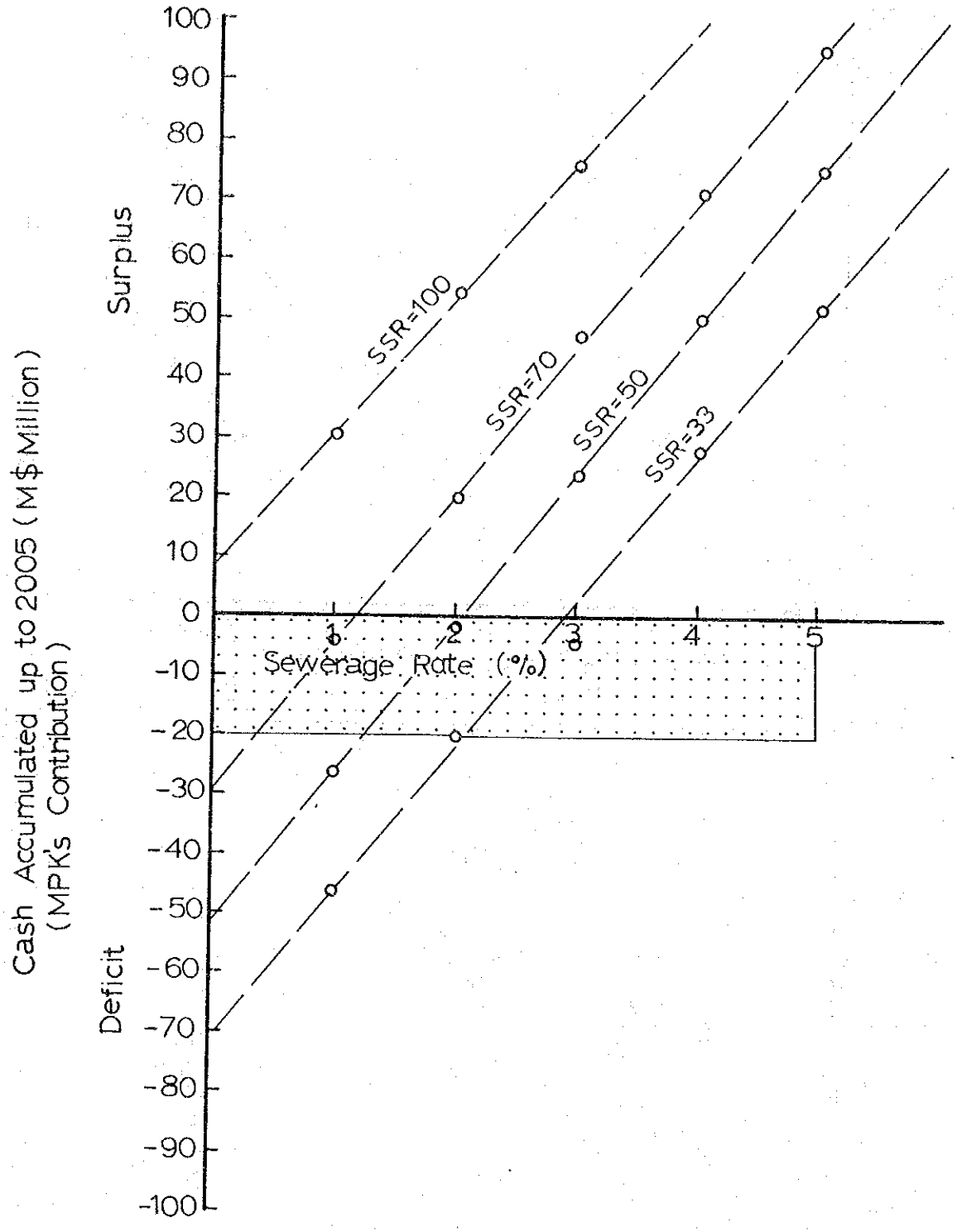
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(9) Cash Accumulated (MPK's Contribution) by Cases

Alternative B-4



SSR : Sewerage Surcharge Rate (%)

Feasible Area

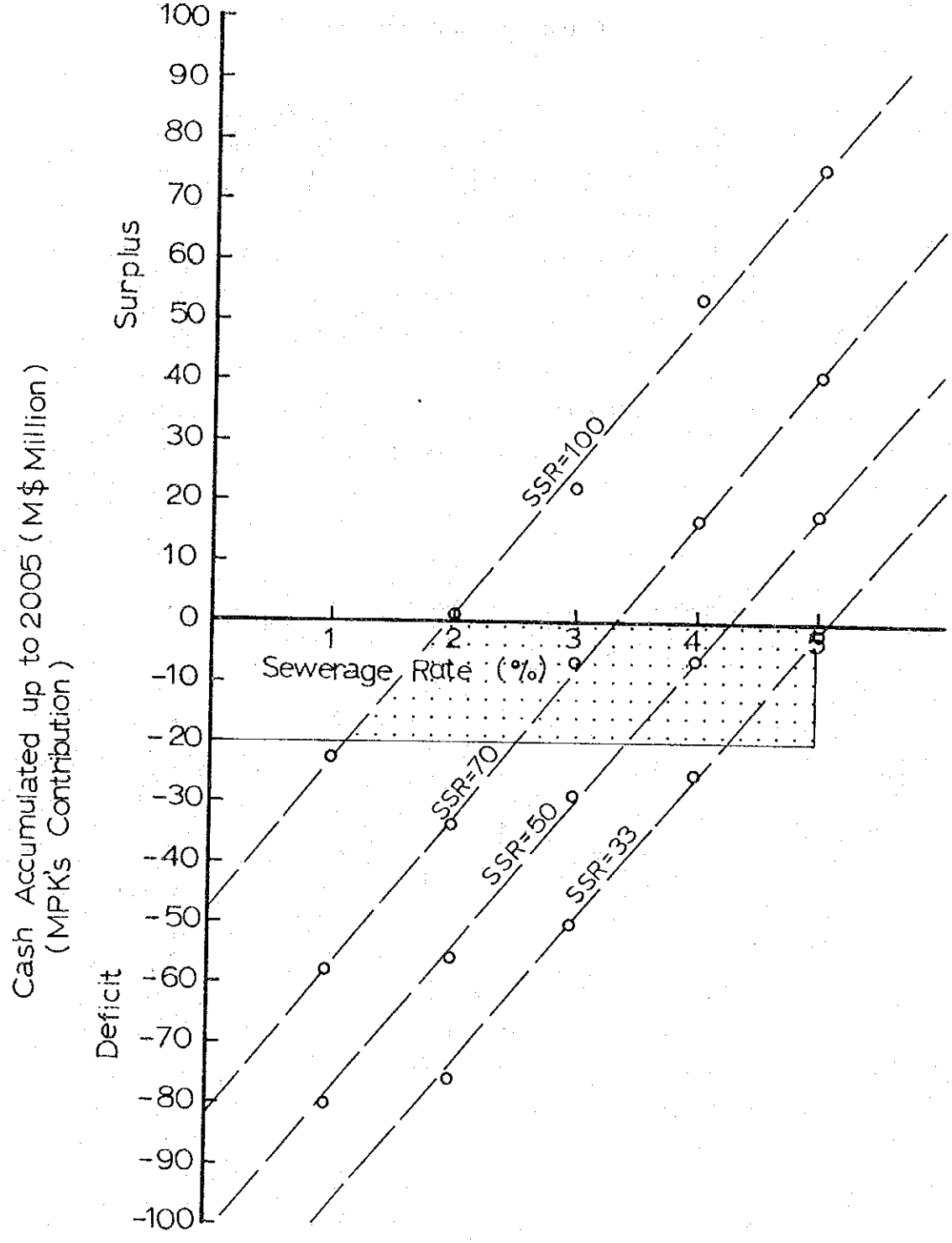
within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service, and

(3) M$ 20 Million of MPK's Contribution up to 2005

Fig.8.1.(10)Cash Accumulated (MPK's Contribution) by Cases

Alternative B-5



SSR : Sewerage Surcharge Rate (%)

Feasible Area

within (1) 100% of the Sewerage Surcharge Rate on the Water Bill,

(2) 5% of the Property Surcharge Tax for the Sewerage Service , and

(3) M$ 20 Million of MPK's Contribution up to 2005

Table 8.13. Feasible Financial Plans with each Alternative

Alternative	Loan Source	Grant Condition	Viable Comtinations		
			Water Surcharge Rate (%)	Sewerage Surcharge Tax Rate (%)	MPK's Contribution up to 2005 (M$1,000)
A-1	Foreign & Federal Gov.	No grant			
A-2		Grant for land	100	5	11,226
A-3		Grant for 1/3 of cost	70	5	4,655
			100	4	8,541
A-4		Grant for 1/2 of cost	50	4	17,261
			50	5	6,553
			70	3	18,916
			70	4	5,160
			100	2	11,570
A-5		Grant is different for each phase	50	5	14,084
			70	4	15,477
			70	5	8,341
			100	3	9,938
B-1	Federal Gov.	No grant	100	5	5,485
B-2		Grant for land	70	5	12,752
B-3		Grant for 1/3 of cost	33	5	14,890
			50	4	18,496
			50	5	5,318
			70	3	20,151
			70	4	3,925
			100	2	12,806
B-4		Grant for 1/2 of cost	33	2	20,214
			33	3	4,452
			50	2	2,006
			70	1	4,081
B-5		Grant is different for each phase	33	5	1,900
			50	4	5,506
			70	3	7,161

8.2.4. Conclusion

The foregoing financial analysis clearly indicates that unless some amount of grant is provided Kelang Municipality, it will be very difficult to undertake construction of the proposed sewerage system. However, considering the relatively low priority presently given to sewerage construction among public works projects in Malaysia, the prospects may look poor for provision of an outright grant by the Federal and/or State Government to the local governments for construction of the sewerage system in the near future. However, the necessity of providing and gradually increasing the grant is recommended, for which a reasonable plan would be to provide a grant in each of the three phases as follows:

First Phase -- grant for acquisition of total land required up to 2000
Second Phase--grant for one-third of the construction cost
Third Phase --grant for half of the construction cost

Judging from this standpoint, Alternatives A-5 and B-5 are applicable for this plan among the ten sets of Alternatives.

As shown in Table 8.13, in both Alternatives A-5 and B-5 there are several feasible financial plans. The most viable financial plan should be selected from among these feasible financial plans according to the following practical meaning;

(1) The 100 percent sewerage surcharge rate on the water bill for domestic use and 120 percent for commercial use seem impractical. The practical maximum rate of the sewerage surcharge rate on the water bill is considered to be 70 percent for domestic use and 90 percent for commercial use, judging from the prevailing custom of sewerage surcharge bill in the State of Selangor,

(a) the sewerage charge is less than the water charge.

(b) the domestic sewerage surcharge rate is lower than the commercial rate.

(2) Considering the concurrent undertaking of the sewerage and drainage works, the legal maximum rate of the sewerage surcharge tax; that is, 5 percent, is considered to form a heavy burden on the residents, because the proposed drainage project also needs revenue from the drainage surcharge tax. Therefore, the sewerage tax rate should be minimized as much as possible.

Within the limitation of 70 percent of the sewerage surcharge rate and the limitation of MPK's contribution of about M$20 million up to 2005, the lowest sewerage surcharge tax rate is 4 percent for Alternative A-5 and 3 percent for Alternative B-5 among the feasible viable plans.

Since, the huge amount of the construction cost for the proposed sewerage project is expected to make it very difficult for the Federal Government to finance the total cost, it would necessitate financing by means of loans from foreign lending agencies to some degree. Therefore, Alternative A-5 is proposed as the most viable financial plan. If a loan from a foreign lending agency is not required for the construction cost, Alternative B-5 is proposed, considering that the prevailing interest rate of the foreign lending agencies is considerably higher than that of the Federal Government. Therefore, Alternative B-5 is ranked as the second-best financial plan from this standpoint. These two proposed financial plans are summarized as follows:

If the Federal Government is able to compensate MPK for the difference in interest between Alternatives A-5 and B-5, the financial burden on MPK would be the same. However, it should be kept in mind that both of the recommended alternatives will require a grant.

Alternative	Sewerage Surcharge Rate on Water Bill (%)	Sewerage Surcharge Tax Rate (%)	MPK's Contribution (M$1,000)	Foreign Loan (M$1,000)	Federal/State Gov. (M$1,000)	
					Loan	Grant
A-5	70*	4	15,477	91,849	93,003	141,758
B-5	70*	3	7,161	0	184,852	141,758

* M$6.3 per household per month

It is possible for the above-mentioned 70 percent sewerage surcharge rate of the water bill and the 4 percent sewerage tax rate to be accepted by the sewerage users, based on the fact that the user's outlay will be lower than the amount of their willingness-to-pay.

According to the survey conducted during the study period, the average willingness-to-pay is 2.2 percent (M$23.1) of the monthly household income (Ref.: Chapter 11), whereas the sewerage user's outlay is M$13.6, assuming the average household's monthly sewerage charge to be M$7.3 (based on 70 percent of the water bill) and the sewerage rate to be M$6.3 (based on 4 percent). This results in a positive amount of M$9.5 (M$23.1 - M$7.3 - M$6.3) consumer's surplus per month per household, which can be construed to represent the residents' desire for the proposed sewerage service.

The projected revenues and expenditures of the above viable alternatives are shown in Table 8.14 (1) through Table 8.14 (2), which follow.

Table 8.14.(1) Projected Revenues and Expenditures

Alternative A-5 (70%, 4%)*

(Unit: M$1,000)

Description \ Period	-1990	1991-1995	1996-2000	2001-2005
Operating Revenue				
Sewerage Charge	-	5,045	24,342	60,572
Sewerage Tax	11,640	23,617	30,143	33,155
Total Operating Revenue	11,640	28,662	54,485	93,727
Operating Expenses				
Billing and Collection Fees (a)	-	202	487	1,211
Provision for Bad Debts (b)	-	101	243	606
O/M Costs	1,974	5,131	11,556	28,590
Total Operating Expenses	1,974	5,434	12,286	30,407
Sources of Funds				
Net Operating Income	9,666	23,228	42,199	63,320
Loan	37,597	51,884	95,367	-
Grant	20,447	25,943	95,367	-
Total Sources	67,710	101,055	232,933	63,320
Applications of Funds				
Capital Expenditure	58,044	77,830	190,735	-
Loan Repayment	9,711	16,185	40,265	87,725
Total Applications	67,755	94,015	231,000	87,725
Net Cash Increase	Δ45	7,040	1,933	Δ24,405
Cash Accumulated	Δ45	6,995	8,928	Δ15,477

Note: * (Sewerage Surcharge Rate, Sewerage Surcharge Tax Rate)
(a) is estimated at 2% of "Sewerage Charge"
(b) is estimated at 1% of "Sewerage Charge"
Δ indicates deficit

Table 8.14.(2)

Alternative B-5 (70%, 3%)* (Unit: M$1,000)

Description \ Period	-1990	1991-1995	1996-2000	2001-2005
Operating Revenue				
Sewerage Charge	-	5,045	24,342	60,572
Sewerage Tax	8,796	17,848	22,780	25,055
Total Operating Revenue	8,796	22,893	47,122	85,627
Operating Expenses				
Billing and Collection Fees (a)	-	202	487	1,211
Provision for Bad Debts (b)	-	101	243	606
O/M Costs	1,974	5,131	11,556	28,590
Total Operating Expenses	1,974	5,434	12,286	30,407
Sources of Funds				
Net Operating Income	6,822	17,459	34,836	55,220
Loan	37,597	51,887	95,368	-
Grant	20,447	25,943	95,367	-
Total Sources	64,866	95,289	225,571	55,220
Applications of Funds				
Capital Expenditure	58,044	77,830	190,735	-
Loan Repayment	8,193	13,655	32,505	67,145
Total Applications	66,237	91,485	223,240	67,145
Net Cash Increase (c)	Δ1,371	3,804	2,331	Δ11,925
Cash Accumulated	Δ1,371	2,433	4,764	Δ7,161

Note: * (Sewerage Surcharge Rate, Sewerage Surcharge Tax Rate)
(a) is estimated at 2% of "Sewerage Charge"
(b) is estimated at 1% of "Sewerage Charge"
Δ indicates deficit

CHAPTER 9

INSTITUTIONAL ORGANIZATION

CHAPTER 9 INSTITUTIONAL ORGANIZATION

9.1. Introduction

Comprehensive sewerage and urban drainage systems in Malaysia are a relatively new development concept which has recently been gaining increasing attention. Such programs have already been initiated or are planned for some municipal areas, being urgently needed for protection of water resources and flood control, including public health and environmental improvement.

The responsibility for carrying out these programs is vested in the local authorities under the Local Government Act; however, an adequate organization for administrating the sewerage and drainage systems within the Kelang Municipality is lacking. Thus, instituting such an organization is of primary importance, especially since the work on these systems is scheduled to start in 1983, according to the proposed Master Plan.

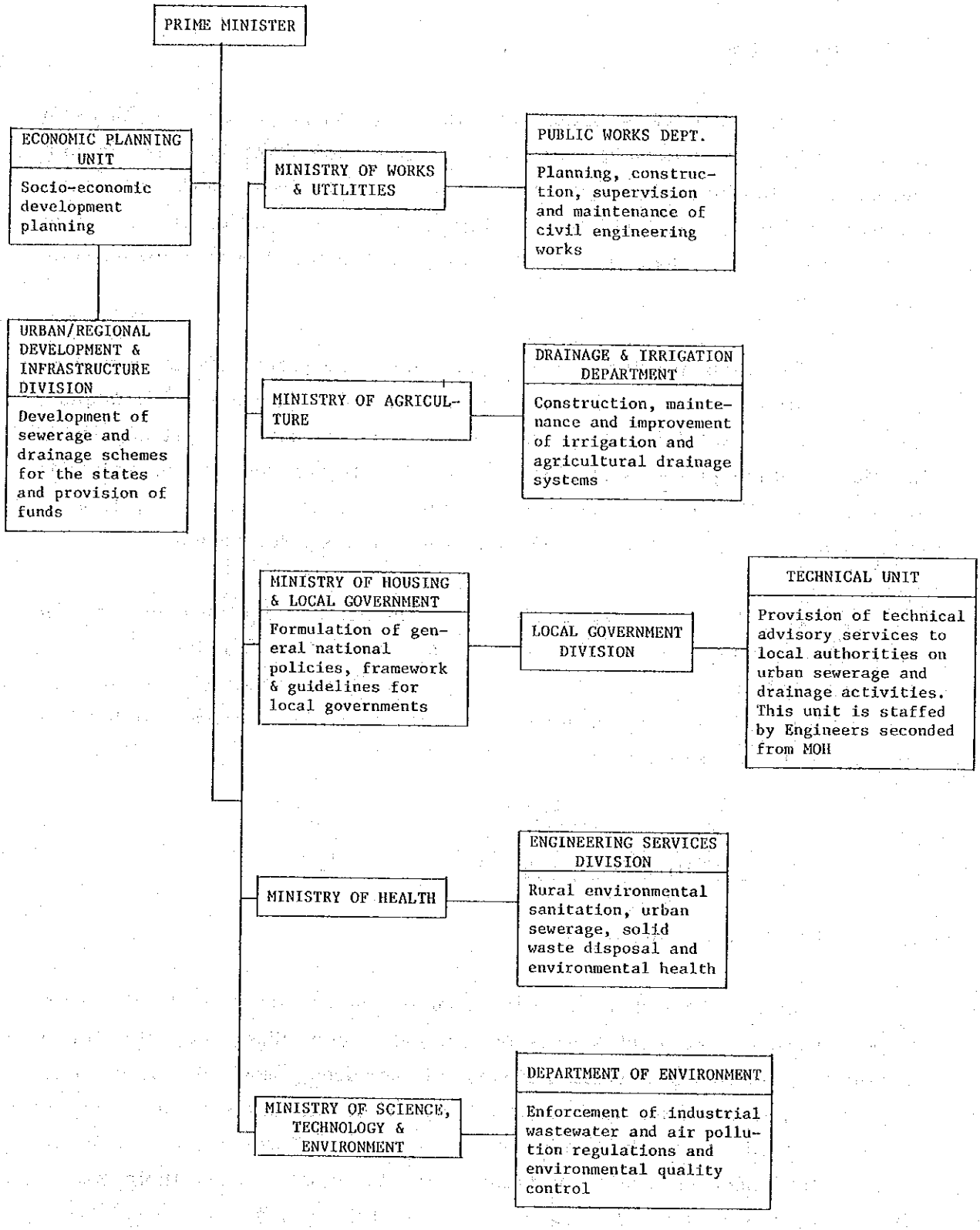
For this purpose, studies on organization and management for Kelang Municipality's sewerage and drainage project in Selangor State are presented in this chapter, based on a review of the existing organizations dealing with sewerage and drainage activities at each governmental level -- federal, state and municipality.

9.2. Review of Existing Organizations

9.2.1. The Federal Government

At the Federal level, several ministries are involved in the country's sewerage and drainage activities, with specialized departments or divisions handling the various fields of services, most of which have regulatory powers within their respective field of operations. These departments or divisions also have branches in each state, which are responsible to the State Government but maintain close coordination with their respective headquarters at the Federal level. (See Table 9.1.)

Table 9.1. Sewerage and Drainage Project-Related Ministries



1) Urban/Regional Development and Infrastructure Division, Economic Planning Unit

As a central agency directly under the Prime Minister's Department, the Economic Planning Unit (EPU) is responsible for national socio-economic development planning. Therefore, the EPU reviews and formulates national, regional and state plans from the viewpoint of the nation's economy in cooperation with the other ministries and states concerned.

The EPU's responsibility for planning the development of sewerage and drainage systems for the states, including other infrastructural facilities and provision of necessary budget allocations, is vested in its Urban/Regional Development and Infrastructure Division. Also, the EPU negotiates with foreign countries for technical assistance and/or loan arrangement in conjunction with the national Treasury.

2) Local Government Division, Ministry of Housing and Local Government

The Ministry of Housing and Local Government, which is in charge of local government affairs within the federal level, formulates the general framework and national policies regarding local government. Its most important function is that of coordination between the local authorities and federal agencies, including the EPU of the Prime Minister's Department. It processes applications for funds to carry out proposed projects, and forwards them to EPU and treasury with its recommendations.

In 1980, the Ministry set up a Technical Unit, under the Local Government Division, to carry out urban engineering activities, inclusive of sewerage and sanitation, solid waste, buildings, urban transportation and traffic planning, urban drainage and environmental health. Its main role is to provide technical advisory services to local authorities as and when needed in all fields of urban engineering.

3) Engineering Services Division, Ministry of Health

Within the Ministry of Health, this Division has mainly been concerned with the the public health engineering aspect of environmental control, including rural environmental sanitation, urban sewerage, solid waste disposal, environmental quality control and radiation protection service. In case of urban sewerage, this constitutes promoting municipal sewerage projects, involving advice to the local authorities for planning and implementation of the projects, on all phases of the activities.

However, since 1980, the gradual transfer of these technical responsibilities to the newly established Technical Unit, Local Government Division, Ministry of Housing and Local Government, has taken place between the two agencies, with close coordination, even with personnel interchange, in the development and implementation of urban sewerage projects.

4) Drainage and Irrigation Department, Ministry of Agriculture

The Drainage and Irrigation Department (DID), which is under the Ministry of Agriculture and is responsible for planning, construction, operation and maintenance of irrigation and related drainage works for agriculture, mining drainage, river conservation and flood mitigation. Therefore, this department provides the necessary assistance, guidance and coordination for the development and improvement of basic drainage and infrastructural facilities for irrigation purposes to the states.

In carrying out the flood control aspect of urban drainage works, the state governments and local authorities rely on the DID for technical and financial assistance. This practice is expected to continue until such time as when local drainage units are well established and when sufficiently trained and experienced technical personnel are available in the local authorities.

5) Public Works Department, Ministry of Works and Utilities

The Public Works Department (JKR) in the Ministry of Works and Utilities is in charge of all civil works, including construction of roads,

roadside drains, bridges and water supply. It provides general assistance to the state JKR in the form of coordination, advice, information, design of works and provision of standard drawings.

6) Division of Environment, Ministry of Science, Technology and Environment

The Ministry of Science, Technology and Environment holds full responsibility for the conservation of environmental quality and its Division of Environment is in charge of the pollution control program in the national parks and public water bodies, such as seas, rivers, ponds and streams, through its control over all waste discharges from pollution sources. One of its important responsibilities is to introduce and enforce regulations necessary for preserving the environment against any type of pollution.

9.2.2. The State Government

The Federal and State governments have close working relationships, through their common interests and the dependence of the State on the Federal Government for financial and technical assistance. There are a number of organizations in the State government which are concerned with sewerage and drainage including environmental control.

1) The State Economic Planning Unit

The State Economic Planning Unit of Selangor State (SEPU) is in charge of planning state socio-economic development programs, which it accomplishes through the guidance and advice provided by the Federal EPU. The SEPU maintains close contact at all times with related agencies within the state government for planning and implementation of all state projects. Thus, finalization of the state economic development plans is coordinated by SEPU for inclusion in the Malaysia Plan of the Federal EPU.

2) The State Drainage and Irrigation Department

The State Drainage and Irrigation Department's (SDID) main tasks are planning, design, and construction, as well as maintenance, of irrigation channels, canals and drains for agricultural development in the rural areas. The SDID is responsible for river and other related facilities. It also undertakes urban drainage activities, when requested by local government bodies. These activities are carried out by district DID offices throughout the state. Generally, the District DID engineer is appointed as a member of the District Council and serves as an advisor to the Local Authority on all matters concerning drainage, including urban drainage.

3) The State Public Works Department

This Department (SJKR) is responsible for general civil engineering works, including the construction, improvement, and repair of roads, roadside drains and bridges in the entire state. Its drainage activities consist of the construction and maintenance of all roadside drains along Federal and State roads.

With respect to the sewerage project, its task is limited to the provision of sewer networks and communal treatment facilities ancillary to other construction projects. The SJKR is operated under the general supervision of the Federal JKR; however, its funds are allocated by the state government.

4) Selangor State Development Corporation

The Selangor State Development Corporation (PKNS) is in charge of implementing urban and industrial development within the state. In particular, PKNS plays the role of executing agency for construction of low cost housing, development of industrial areas, general development of new towns, construction of roads, drains and sewers, carrying out comprehensive construction programs.

5) The State Water Works Department

The State Water Works Department (SWWD) of Selangor State was established to take over and expand the water supply system previously operated by the State Public Works Department. Its general responsibilities and functions are to provide potable water supply to the public at reasonable rates. Therefore, it is responsible for the construction, operation/maintenance and management of water installations and other related facilities, and the SWWD Accountant is responsible for budgeting, controlling, financial reports, accounting procedures, forecasting, and the billing and collection of water revenues.

6) The State Town and Country Planning Department

The State Town and Country Planning Department (STCP) is responsible for developing and planning future land use for the State. It serves as an advisor to the Municipal Council of Kelang on all town planning and land use matters.

9.2.3. The Municipal Council of Kelang

1) General

Under the Local Government Act, 1976, the local authorities' responsibilities for planning, constructing and maintaining sewerage and urban drainage facilities. The Local Authority is also empowered to recover the cost of financing such programs. However, very few local authorities in the country have the capacity at present to undertake full responsibility, mainly due to lack of funds and shortage of qualified and trained engineers. A few larger local authorities in the country are now in the process of establishing adequate institutional arrangements, but others have yet to prepare a plan for sewerage/drainage services.

2) Historical Background of Kelang Municipality

The Majlis Bandan Kelang (MBK) was established in December 1954 with its jurisdiction covering the two towns of Kelang and Port Kelang with an area of 2,497 ha. However, in 1972, the Majlis Bandaran Kelang was upgraded to its present state of the Municipal Council of Kelang covering an expanded area of 2,977 ha.

3) The Existing Organization of Kelang Municipality

The Kelang Municipality is under the direct jurisdiction of the Selangor State Government, which follows major policies set by the Federal Government. As a municipality, it is responsible for all of its policy decisions and overall financial and administrative matters. Its day-to-day administration and functions are carried out by the President through the following four Departments: Administration, Engineering, Health and Treasury (Table 9.2 lists their main duties).

Table 9.2. Organization Chart: Kelang Municipality

( ) Number of Staff

President (1)
- Chairman
- Town Council Authority

Administration Department (83)
- General Administration
- Establishment and Personnel Affairs
- Laws and Courts Administration
- Administration of Housing/Revenue
- Amendments of Rules and Regulations
- Contracting Affairs
- Formulation of Policy and Enforcement

Engineering Department (533)
- Road, Drains, Sewerage and Building Authority for the Municipal Area.
- Town Planning
- Processing of Building Plans (as the Building Authority)
- Preparing Engineering Plans
- Maintenance of Roads and Back Lanes and Road Fixtures (e.g., Signboards, Lights, etc.)
- Council's Engineering Work Shop
- Requisition and Contract Works
- Issuing of House Plates
- Control of Advertisement Billboards
- Construction and Repair of Concrete Drains and Maintenance of Earth Drains
- Maintenance of Council Buildings
- Maintenance of Roadside Tables and Open Spaces

Health Department (796)
- General Sanitation Services
  Rubbish Control, Rat Control, Sewerage Control, Cleaning of Cement Drains, Catching of Cows and Dogs, Estates and Flower Gardens, Licensing of Edible and Non-Edible Products, Environment
- Control of Contagious Disease
- Market Control
- Foods and Drugs Control
- Mosquito Control
- Breeding Control
- Pollution Control
- Housing Problems

Treasury (142)
- Collection of Assessment Tax, Fines, Rent, Licenses
- General Services
- Preparation of Revenue and Expenditure Estimates
- Payment of Salaries
- Inspection of Weights and Measures
- Payment of Bills

At present, Kelang Municipality is staffed by a total of 1,554 personnel, as shown with the number of personnel in each Department in the following Table 9.3.

Table 9.3. Number of Staff in Each Department of Kelang Municipality

Grant	Department				Total Personnel
	Administration	Engineering	Health	Tresury	
Grade "A"	3	6	1	2	12
Grade "B"	1	5	3	-	9
Grade "C"	33	25	24	43	125
Grade "D"*	46	37	45	97	225
Grade "D"**	-	460	723	-	1,183
Total	83	533	796	142	1,554

Grade classification represents salary level, based on the following qualifications:

Grade "A"	University degree or professional status (e.g., Engineer, Personnel Officer, Budget Officer)
Grade "B"	Diploma (e.g., Technical Assistant, Clerk, Cashier)
Grade "C"	Malaysia Certificate of Education (M.C.E.) (e.g., Technician)
Grade "D*"	Qualifications lower than M.C.E. (e.g., Office Boy, Typist, Junior Technician, Parking Attendant)
Grade "D**"	Lower than Grade "D*" (e.g., Laborer)

4) Engineering Department

The Engineering Department consists of five Sections, namely Administration/Clerical, Sewer and Drain, Civil Engineering, Building, and Town Planning. The functions of those sections are outlined below.

i. Administration/Clerical Section

(a) Registration of various building, planning & engineering documents.
(b) Preparation and issuance of bills such as plan fees, drainage deposits, supervision, culverts, regulation for survey, etc.
(c) Registration of architects, engineers, contractors and other related matters.
(d) Typing various letters, reports, housing data, certificate of occupation, specifications, tenders, quotations, etc.
(e) Follow-up action on various decisions of public works, planning & building, and other meetings.
(f) Despatching of letters, reports, plans, etc. to other departments.
(g) Action and replies to complaint and other letters from various resident associations, state assemblymen, political parties, etc., pertaining to various matters.
(h) Preparation of road inventory, housing data, certificate of occupation, etc. required by the Ministry of Housing, State Govts., Bank Negara, and other authorities.
(i) Preparation of plan approval, permits, survey plans and other necessary actions.
(j) Enclosing of letters, plans, etc. and follow-up action by respective technical officers.
(k) Recording and preparation of various details on engineering, buildings, planning, etc. for other federal, state and local departments.

ii. Sewer and Drain Section

(a) Maintenance of all earth sewers and drains, including main drains, and repairs to concrete sewers and drains.
(b) Investigation and design of sewerage and drainage projects.

(c) Tender calling, preparation of specifications, estimates for sewerage and drainage projects, including supervision of same.

(d) Maintenance of Council vehicles, such as scavenging lorries, open trucks, excavators, tractors, graders, road rollers, pre-mix plant, motor mowers, including servicing. Purchase of spare parts and ordering of new vehicles, including registering same.

iii. Civil Engineering Section

(a) Maintenance of roads and drains within the Council area, including grass cutting, patching of pot holes, maintaining side table, resurfacing of roads, fixing of road signs and street name plates.

(b) Maintenance of Council buildings, such as Municipal Office, community halls, flats, town hall, laborers' quarters, markets.

(c) Maintenance of playgrounds, open space and children's equipment, including provision of children's equipment.

(d) Decoration of streets during functions.

(e) Preparation of plans, specifications, estimates and design for Council projects.

(f) Planning and laying private streets under Act. 133 of the street, Drainage & Building Act.

(g) Providing comments on road plans submitted by private developers and supervising its construction.

(h) Preparing plans for street lights for new developed areas.

iv. Building Section

(a) Providing comments on building plans submitted by architects.

(b) Calculating drainage plans and deposit removal fees.

(c) Inspection of buildings for renewal of temporary building licence.

(d) Detection of unauthorized building extensions and renovation of existing buildings.

(e) Inspection of houses for approval of applications for installation of electrical and water supply systems.

(f) Preparation of complaint forms and attending court cases when required.

(g) Checking of advertisements and signboards.

(h) Inspection of buildings which have been issued permits for building or repair.

(i) Inspection of new buildings for issuance of certificate of fitness for occupancy.

v. Town Planning Section

(a) Preparation of layout plans.

(b) Preparation of Requisition for Survey (R.S.) plans.

(c) Providing comments on building plans.

(d) Reviewing applications for licences (regarding zones)

(e) Reviewing applications for State land and temporary occupation licences (T.O.L.) from the Land Office.

Only one engineer is presently working on the sewerage and drainage work, although there are three vacant posts, which have still to be filled. These posts consist of one technical assistant, one technician, and one junior technician. However, presently all drainage maintenance work is being carried out by staffs from the Road Section.

The Sewer and Drain Section is clearly lacking in personnel for planning, implementing and operating urban sewerage and drainage systems. The most serious shortages appear to be in engineering and administrative staff of management level. In order to make the proposed sewerage system viable, a study of the administrative organization of the Engineering Department is required.

9.3. Organizational Requirements

In contrast to Kelang Municipality's rapid commercial and industrial development, that of its sewerage and drainage systems has been negligible. No more than rudimentary works, such as septic tanks, night soil bucket collection, surface drains, and construction of the rudimentary drains, have been provided. Considering this situation and the increasing pace of commercial, industrial and urban development expected in the near future, a steady increase in the water consumption rate, the burden on the

primitive sewerage and drainage systems and in waste discharges to the natural waterways and open seas can be expected. Consequently, there is an urgent need for modern sewerage and drainage systems in the Project Area, for which an administrative organization will be required for implementation of the Project, as well as its operation and maintenance.

As stated earlier, the existing organizations, such as the Engineering Department of Kelang Municipality, the Drainage and Irrigation Department and Public Works Department of the State Government, are more or less concerned with sewerage and drainage activities in the Project Area. It is possible for these agencies to operate the proposed sewerage and drainage systems efficiently if substantial aid in the form of staff and funds are provided. For this purpose, the following respective alternatives are considered.

9.3.1. Organizational Requirements for the Sewerage System

1) General

At present, no modern sewerage system exists in the Project Area except rudimentary works. Therefore, experience in designing, supervision of construction, operating and maintaining sewerage activities, even in the Sewer and Drain Section, is lacking. Therefore, careful consideration must be given in setting up an organization taking into account local conditions.

2) Organizational Alternatives and Their Evaluation

Several possible organizational arrangements are considered, summarized as follows:

Alternative S/1

Strengthening the existing Engineering Department to assume full responsibility for the system

Alternative S/2

Consolidating the sewerage work with the Water Works Department of Selangor State

Alternative S/3

Creation of a new autonomous body, to be called Kelang Sewerage and Drainage Authority

These alternative organizational arrangements must be evaluated mainly from the viewpoint of 1) initial effort, 2) initial fund, 3) staff, 4) management system, 5) degree of autonomy and 6) legislation. The advantages and/or disadvantages of these alternatives are shown in Table 9.4.

Table 9.4. Comparison of Proposed Alternative Organization

Evaluation Points	Alternative		
	Alternative S/1	Alternative S/2	Alternative S/3
Initial Effort	Small	Great	Great
Initial Fund	Moderate	Large	Moderate
Staff	Only additional staff required	Only additional staff required	Entire staff required
Management System	Separate accounting system will be required	Advantage of similar existing management system	Advantage of setting up an ideal system
Degree of Autonomy	Maintained	Maintained	Fully maintained
Legislation	Based on Local Government Act, 1976	Difficult	Very difficult

Of the three, Alternative S/1 is considered to be the most feasible. MPK's intention of undertaking the sewerage and drainage activities, based on Local Government Act, 1976, was indicated by the expansion of its Engineering Department in 1980 for the purpose of carrying out sewerage and drainage activities. Therefore, this alternative has the advantage of minimizing initial cost, due to the existence of the Engineering Dept., which eliminates the necessity of establishing a new organization.

Alternatives S/2 and S/3 are not recommended for the following reasons:

- Alternative S/2 proposes consolidation of the new organization with the State Water Works Department to include sewerage activities. This alternative is considered to be appropriate from the managerial viewpoint of a self-sustaining sewerage system and the ease of billing and collection. In fact, in parts of the United States and in other countries, the integrated water supply and wastewater management system is widely practiced. However, adoption of this system in Malaysia would be difficult because of legislative obstacles which would prevent the State Water Works Department from incorporating a new sewerage function.

- Alternative S/3 aims to create a new organization authorized by the State Government which would promote self-support administrative control and maintain uniform technical standards for the sewerage and drainage systems. Its fully autonomous nature which enables control of all sewerage activities under a single authority would be an advantage. However, this approach requires not only tremendous initial effort but also complex legislative and administrative examination for establishment of the new organization. The excessively-long period of time required to establish such an institution and the consequent delay in implementation of the project would be unrealistic.

As a result of the above analysis, Alternative S/1 is recommended; i.e., that MPK expand its Engineering Department by increasing its staff, modifying its function and assuming full responsibility for the Project

Area sewerage and drainage services. For this purpose, a special accounting system for separate handling of the revenues and expenditures for the sewerage system will be required. This set-up of the Engineering Dept. with it and greater autonomy own accounting system are also expected to meet with the approval of the international lending agencies.

Since there is a shortage of professionally-trained staff in the field of sewerage in Malaysia, the recruitment of its professional staff is expected to present difficulties. Therefore, Kelang Municipality should make every effort to recruit and train its required staff as soon as possible. A detailed study for the expansion of the Engineering Department is discussed along this line at the end of this chapter.

9.3.2. Organizational Requirements for the Drainage System

1) General

The concurrent implementation of the urban drainage system and the sewerage system work in the Project Area requires inclusion of a set-up for urban drainage activity in the new organization for sewerage administration. However, a review of existing agencies reveals the absence of a central government agency responsible for urban drainage activities in Malaysia. Rather, as described in Section 9.2., many agencies, such as the Federal Drainage and Irrigation Department (DID), Public Works Department (JKR), Ministry of Housing and Local Government as well as some local authorities, are presently carrying out urban drainage works in addition to their main functions.

From a legal viewpoint, the local governments hold responsibility for urban drainage works. The Street, Drainage and Building Act gives the local authorities responsibility for constructing and maintaining surface and storm water drains, culverts, gutters and watercourses; it is also empowered to recover their improvement costs.

However, very few local governments in the country have the capacity at present to undertake urban drainage works due to shortage of qualified and trained engineers and sub-professional staff. The larger local authorities are now in process of planning drainage works and have yet to establish a drainage section in their respective engineering departments, since their scale of involvement in urban drainage is limited to such routine activities as cleaning of drains, repair and maintenance of minor drains, etc. On the other hand, in major urban drainage works, the State DID is required to correlate its activities with the increasing need of urban drainage development under the flood mitigation program.

Henceforth, legal regulations will apply to all local authorities for all activities related to urban drainage; however, as in the case of the sewerage system, extreme difficulties are expected, mainly due to lack of technical expertise. Therefore, for the time being, it will be necessary for the Local Authority to refer these activities to the State DID for their approval, comments and assistance for development of any major urban drainage system.

In the following, various institutional arrangements to enable the efficient undertaking of all drainage activities by Kelang Municipality are examined.

2) Organizational Alternatives and their Evaluation

The following alternatives are considered on the assumption that JKR will continue to undertake the construction and maintenance of Federal and State roadside drains, which are not included in the proposed project.

Alternative D/1

DID undertakes full responsibility for the construction and subsequent operation and maintenance of the drainage system.

Alternative D/2

MPK undertakes full responsibility for the construction and subsequent operation and maintenance of the drainage system.

Alternative D/3

DID takes responsibility for construction of the entire drainage system but with operation and maintenance limited only to trunk drains. On the other hand, MPK is responsible for the maintenance of the secondary and infrastructural drains constructed by DID.

Alternative D/4

Up to the year 1990, when the First Phase Program is due to be completed, drainage activities are undertaken on the basis of Alternative D/3, but thereafter, MPK takes over all urban drainage activities from DID, which is the Alternative D/2 approach.

Each of the alternatives mentioned above has both advantages and disadvantages with regard to possible problems and requirements for implementation of the project, such as funding personnel recruitment and political and/or legal implications. However, Alternatives D/1, D/2, and D/3 are not recommendable for the following reasons:

Alternative D/1 is based on the existing capability of State DID to undertake the proposed urban drainage project in terms of similar past experience, such as irrigation, rural drainage and river conservation. Another advantage is SDID's close liaison with the Federal DID which will facilitate funding arrangements. However, the legal constraint would be a definite disadvantage. In the mid-70's, an urban drainage unit established in the State DID for the purpose of undertaking drainage activities was later disbanded as a result of the Ministry's emphasis on agricultural projects and works in rural areas; thus, urban drainage is no longer within the strict purview of the DID.

Alternative D/2 is based on the legislative implication of the 1974 Act by which local authorities are administratively responsible for urban drainage activities Street, Drainage and Building Act, 1974. However, the present capacity of Kelang Municipality to undertake urban drainage works is limited only to cleaning of drains, repair and maintenance of minor drains due to shortage of professional and technical staff.

Alternative D/3 might be the most realistic approach, due to SDID's experience and Kelang Municipality staff shortage. However, legal constraints prohibit this method.

Alternative D/4, on the other hand, is recommendable as a transitional measure. If a substantial preparatory period is provided, it is not expected to put a great burden on Kelang Municipality to assume responsibility for undertaking all drainage activities in the near future. The period from the present to the year 1990 is expected to provide sufficient time and margin for Kelang Municipality to recruit and train the required personnel. Thus, the problem of lack of experience and lack of personnel could be resolved, at least by the end of the First Phase of the Project. During this transitional period, Kelang Municipality would undertake the drainage activities, despite its lack of expertise and personnel for the drainage system, with technical assistance from DID, although urban drainage is not within its strict purview. Kelang Municipality can thus receive training and manage to conduct the work under SDID guidance and assistance. It is also recommended that Kelang Municipality assign drainage activities to the existing Sewer and Drain Section of the Engineering Department, -- due to similarity of functions, such as design, construction, operation and maintenance, -- and strengthen its personnel adequately to enable them to cope with their immediate responsibilities as soon as feasible.

9.3.3. Proposed Organization

1) General

As implementation of the sewerage project proposed for the Municipality would proceed according to schedule together with the on-going and proposed program for the drainage works, it is necessary to consider further detailed organization of the Sewer and Drain Section and its staffing pattern with clearly defined terms of reference. The following are recommended:

i. The current Work Shop Unit of the Sewer and Drain Section should be made a separate section, since most of its current work has little or no direct relation to sewerage and drainage services. As shown in Table 9.5, the Engineering Department will thus consist of six sections. Functional efficiency, including controlling operations, should be emphasized in this organizational expansion.

ii. Proper arrangements should be made with the Treasury Department for separate accounting of the sewerage activities from those of the Municipality's general finance. This arrangement is indispensable for incorporating the cost-recovery system into the sewerage service system. Also, aside from administrative advantages, it will be useful in loan arrangements with any lending agency.

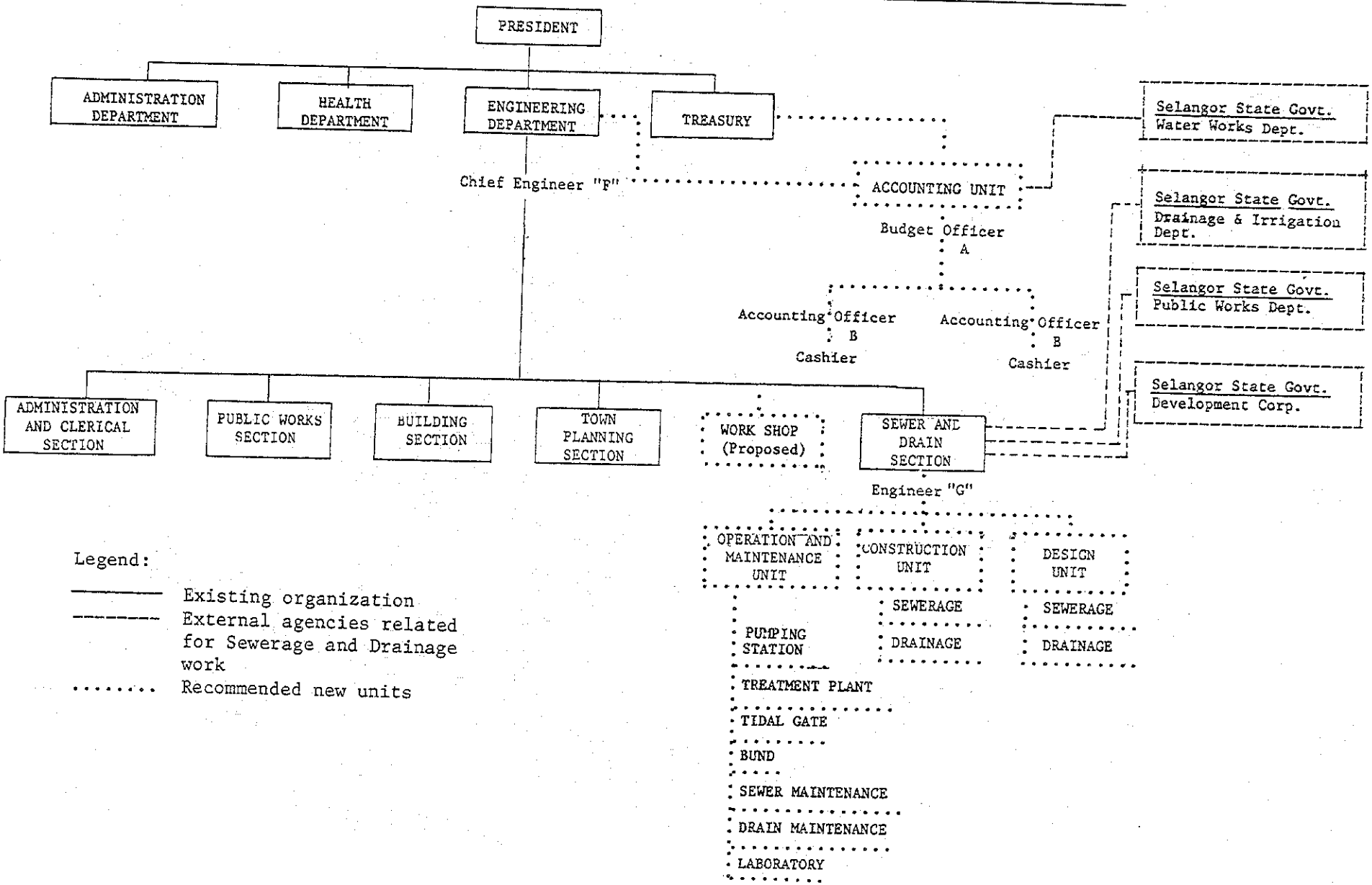
iii. The Engineering Department should take over the drain cleaning duties from the Health Department, which is presently in charge of cleaning the existing drains.

iv. Close coordination with other departments of the Municipality should not be neglected.

2) Proposed Functional Units of Sewerage and Drainage Section

It is recommended that the Sewerage and Drainage Section be divided into three new functional units: Design Unit, Construction Unit, and Operation/Maintenance Unit, as shown in Table 9.5. Each unit would cooperate with the other units in undertaking both sewerage and drainage work.

Table 9.5. Proposed Modification of Kelang Municipality Organization for Administration

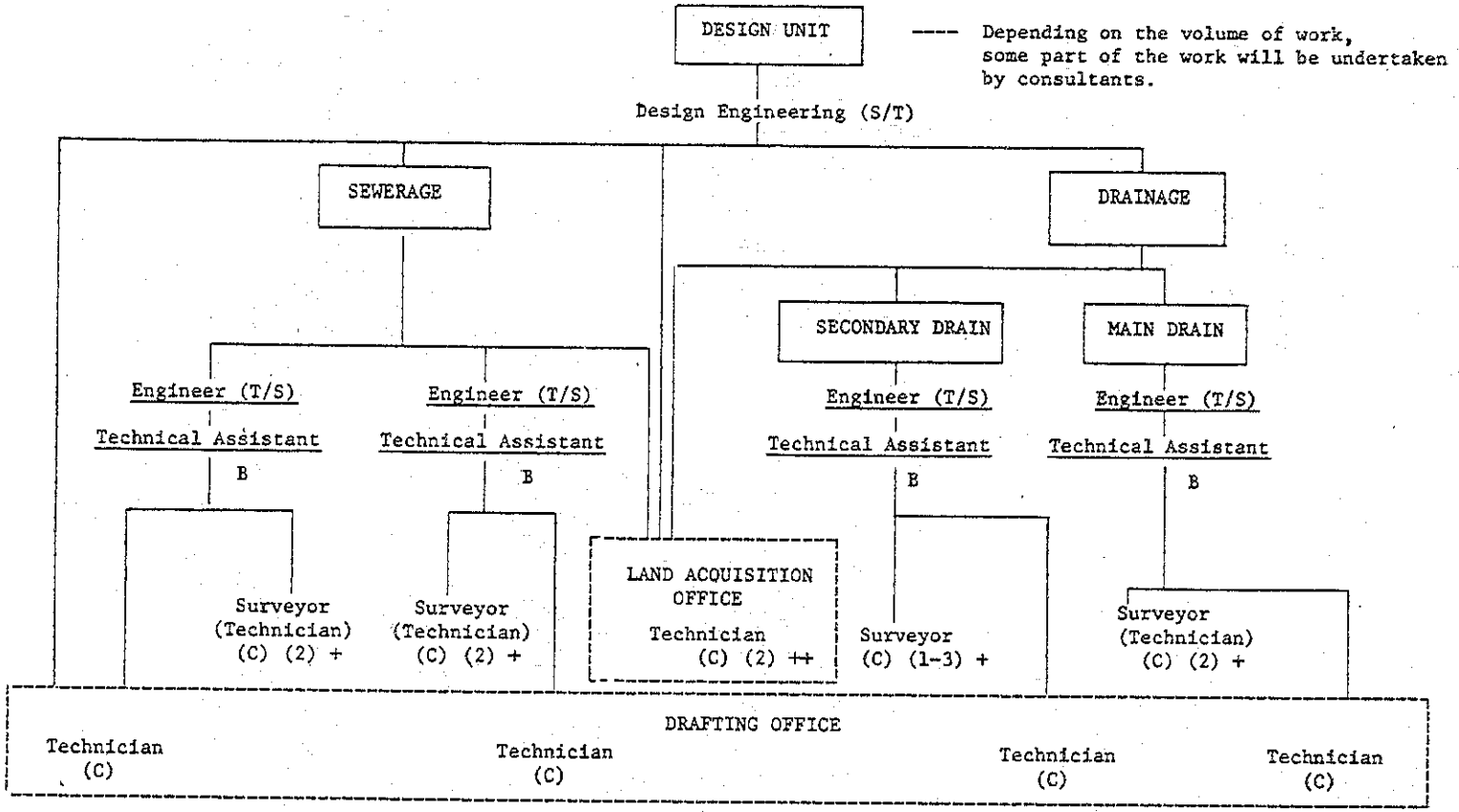


2-1) Design Unit

This unit would be responsible for preparation of engineering design and specifications of all sewerage and drainage projects and also for review and approval of the design plans submitted by private developers. It would also be responsible for collecting and compiling accurate information on the sewerage system, including priority areas, population trends, number of connections and persons served, sewage flows, receiving water quality, treatment plant performance, etc. The organization chart for this unit is shown in the following Table 9.6.

It will also maintain liaison with other Government departments for shifting squatters and service lines (e.g. cables & water mains) affected by proposed drains and culverts at the design stage.

Table 9.6. Proposed Organization of Design Unit



\+ One is special grade and one is ordinary.

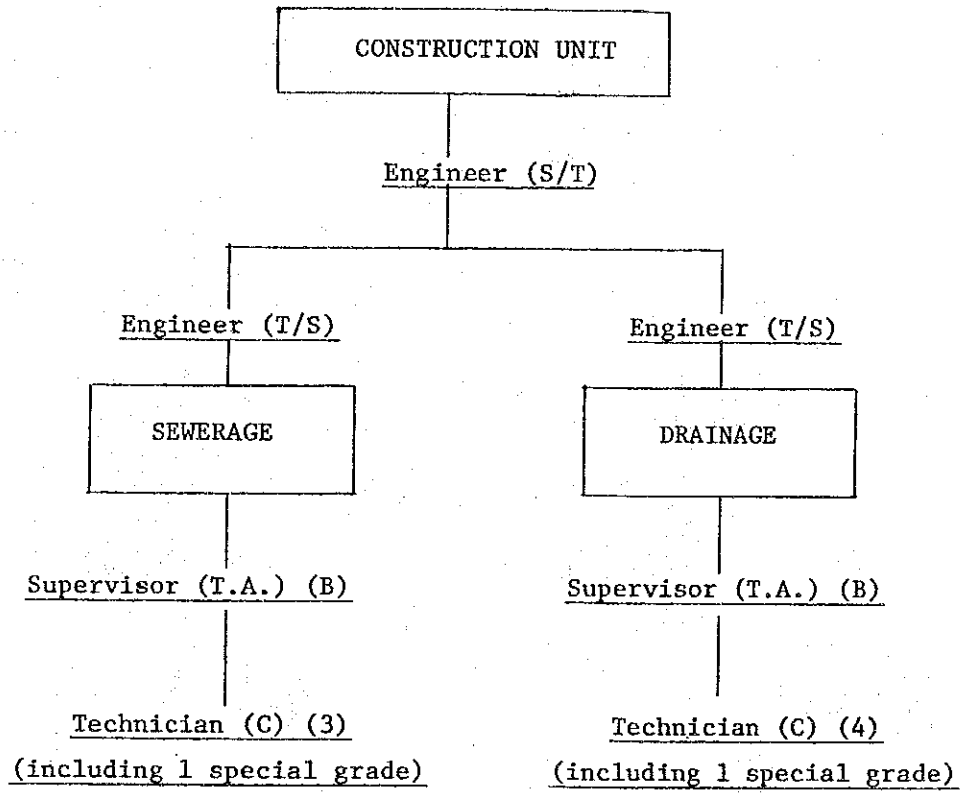
++ If all works are undertaken by Consultant, only one (1) surveyor (ordinary) will be required.
If all works are conducted by MPK, one (1) surveyor (special grade) and two (2) surveyors (ordinary) will be required.

Generally, in the organization of sewerage and drainage systems, each has its own Land Acquisition Office (LAO) and Drafting Office (DO). However, it is proposed that there be one LAO and one DO to serve both sewerage and drainage systems, for efficient manpower utilization.

2-2) Construction Unit

The Construction Unit would be responsible for management and supervision of all construction of facilities with attendant surveys and inspections to ensure compliance with required specifications and standards. The organization chart for this unit is shown in the following Table 9.7.

Table 9.7. Proposed Organization of Construction Unit



2-3) Operation and Maintenance Unit

As shown in Table 9.8, the function of this unit is divided into sewerage, drainage and laboratory. The sewerage function is to cover sewers, pumping stations and treatment plants, and the drainage function is for drains and culverts, bunds and tidal gates. The function of the laboratory is for monitoring and surveillance of industrial wastewater quality, and stabilization pond effluents.

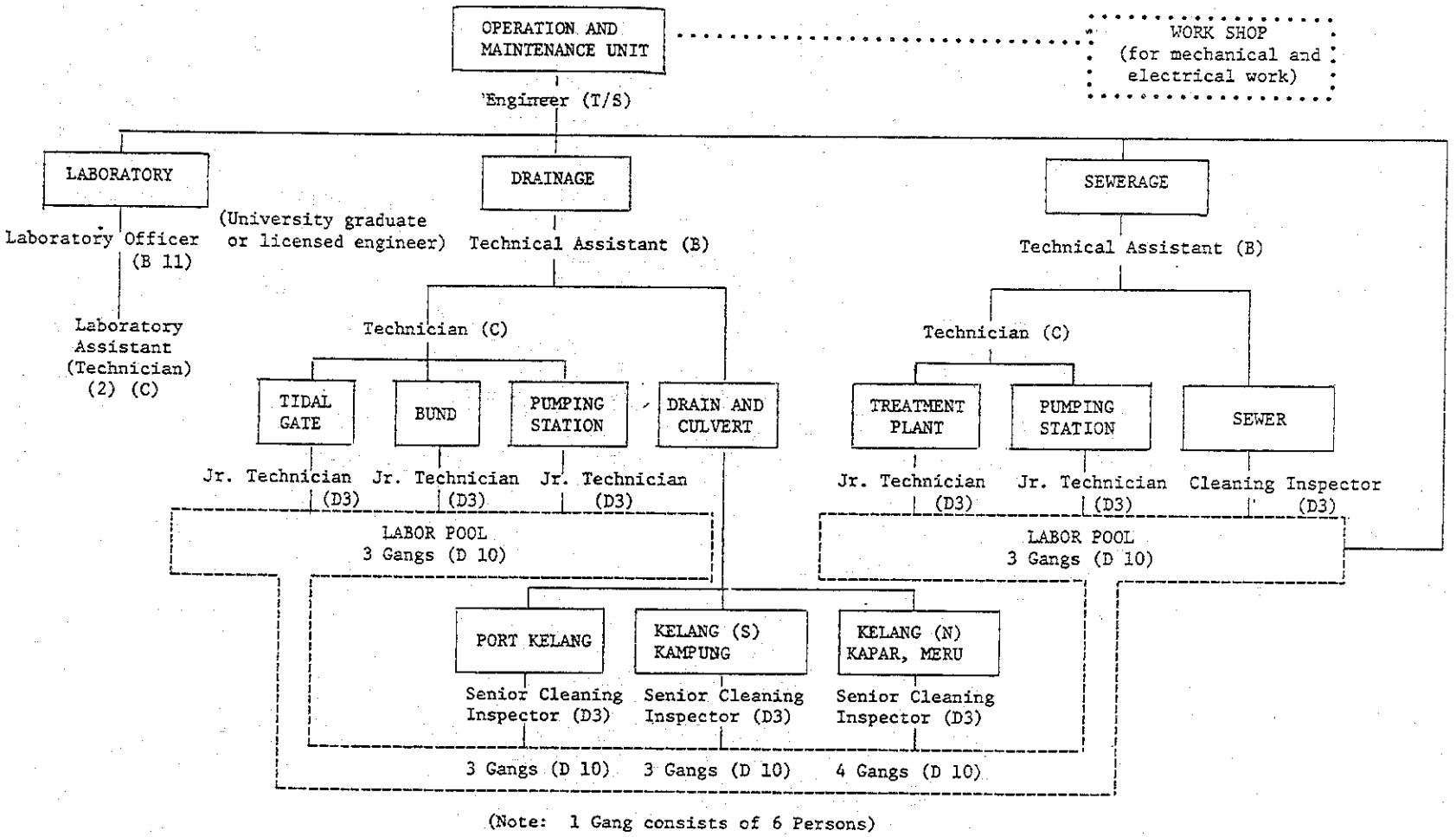
The work on sewers, drains and culverts require their proper maintenance through routine inspections for physical damage and obstruction in the sewers, including control of illegal industrial discharge into the main sewers. Proper maintenance and routine inspections are also required on bunds and tidal gates to prevent physical damage and obstruction.

The waste stabilization pond proposed for sewage treatment requires monitoring influent and effluent quantity and quality to obtain continuous records for controlling operation and as design reference for future expansion. Items to be monitored include incoming sewage, temperature, pH and DO, with daily sampling as a minimum. It is suggested that sampling of other items, such as BOD, SS, coliforms and oil/grease, be entrusted to external units because of insufficient staff. Such monitored data could form the basis for issuing necessary warnings to factories against discharging undesirable waste.

The Sewer and Drain Section would rely on the staff of the Work Shop Section concerning the relatively small volume of mechanical and electrical work, as it is recommended that mechanical and electrical staff members belong to the Work Shop Section, rather than the Sewer and Drain Section.

Assistance from a labor pool, as shown in Table 9.8, from which work gangs of appropriate number would be assigned to the Sewer and Drain Section, according to the volume of work, should also be agreed and arranged. This would have the advantage of limiting assignments only to the number of workers needed for each job. Some laborers now engaged in cleaning drains should be shifted from the Health Department to the Engineering Department.

Table 9.8. Proposed Organization of Operation and Maintenance Unit



(Note: 1 Gang consists of 6 Persons)

Legend: ——— Existing organization

------- External agencies related to Sewerage and Drainage Work

..... Proposed new units

3) Other Support Agencies

Supportive functions by other agencies of different levels should be also considered for the sake of efficiency and economy as described below:

i. Local Government

3-1) Work Shop Section

The Work Shop Section would cooperate with the Operation and Maintenance Unit concerning all mechanical and electrical equipment and facilities for the sewerage and drainage activities.

3-2) Administration and Clerical Section

This section would be responsible for the recruitment and selection of the new staff for the sewerage and drainage systems.

3-3) Public Works Section, Building Section and Town Planning Section

It is proposed that these sections be responsible for encouraging the residents to avail themselves of the sewerage and drainage systems.

3-4) Administration Department

This Department should expand its function as necessary for proper administration including the legal aspect of the sewerage and drainage systems.

3-5) Health Department

This Department should continue the work of night soil collection and desludging septic tanks until completion of the sewerage and drainage project, while cooperating with the Sewer and Drain Section in the gradual changeover. The existing duties of cleaning drains is recommended to be turned over to the Engineering Department.

3-6) Treasury Department

This Department should assist the new Accounting Unit in maintaining a separate accounting and financial system for the proposed sewerage program for a systematic and efficient cash flow of the operation.

Loans from international lending agencies and the Federal Government may be obtained for the initial sewerage construction work. International lending agencies stipulate that accounting should follow commercial practice and all revenues collected be kept separate from MPK's annual revenues and expenditures. Therefore, it is proposed that the new Accounting Unit perform the accounting work for the sewerage system, including budgeting and collection of sewerage fees with the cooperation of the Water Works Department, Selangor State. Administration of loans would be another main function of this unit.

ii. State Government

3-7) Water Works Department, Selangor State (WWD)

It is recommended that the sewerage charge be based on the users' water bill. As the Water Works Department of Selangor State is now handling water supply services, cooperation between MPK and WWD will be required for billing and collecting of sewerage charges on behalf of MPK. In this connection, agreement should be made on procedures for transfer of the collected charges and its administration fees.

3-8) Drainage and Irrigation Department (DID), Selangor State

DID should assist MPK in the work of planning, designing, constructing and maintaining the major drains up to the year 1990.

3-9) Public Works Department (JKR), Selangor State

This Department is responsible for the construction and maintenance of federal and state roads, including construction of roadside drains, which should continue. However, the maintenance work for these drains should be transferred to MPK.

3-10) Selangor State Development Corporation (PKNS)

It is recommended that the Sewer and Drain Section coordinate its sewerage and drainage facilities with PKNS concerning low cost housing projects, development of industrial areas, and general development of new towns.

9.3.4. Sewerage Staffing Schedule

Staffing projections from 1983 up to the year 2000 shown in the following tables are intended as guidelines in determining the number of personnel and laborers necessary to undertake the required functions for the proposed sewerage and drainage program. The staffing estimates show a total of 11 in the initial year of 1983, 26 in 1990 at the end of the First Phase, and 28 in 1995, at completion of the Second Stage Program and thereafter (excluding the labor pool and staff of other Departments or Sections).

It should be noted that the above estimates are so arranged as to keep the number required for the smooth operation of the sewerage and drainage services to a minimum. However, recruitment of the required number of qualified staff for the relatively short period is expected to be difficult and result in a shortage of the required staff, particularly in the Design and/or Construction Unit, which will impose restraints on implementation of the proposed sewerage and drainage systems. In this case, it is suggested that foreign engineering consultants be contracted to undertake the detailed design work and preparation of tender documents and subsequent supervision of construction at the initial stage of the program.

A schedule of estimated staff requirement and the qualifications and job descriptions of each personnel for each unit follow:

1-1) Design Unit Staff Schedule

Job Title	1983	1984	1985	1986	1987	1988	1989	1990	1995	2000
Engineer (S/T)*	1	1	1	1	1	1	1	1	1	1
Engineer (T/S)	1	1	1	1	1	1	1	2	2	2
Technical Asst.	1	1	1	1	1	1	1	2	2	2
Technician	2	2	2	2	2	2	2	4	4	4
Sub-Professional* Pool (Technician)	2	2	2	2	2	2	2	4	4	4
Land Acquisition* Pool (Technician)	2	2	2	2	2	2	2	2	2	2
Total	9	9	9	9	9	9	9	15	15	15

Note: It is assumed one design engineer would engage in M$ 4 million worth of project work a year. In case of excess work either local or foreign consultant may be assigned.

* Concurrently serve as drainage staff.

1-2) Design Unit Staff Qualifications and Job Description

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Engineer (S/T)	B.S. in C.E. (or S.E.)	8 years	Designs engineering specifications. Supervision of design engineers and draftsmen
Engineer (T/S)	B.S. in C.E. (or S.E.)	2 years	Preparation of plans and designs for construction improvement and repair of sewerage facilities, including house connections
Technical Assistant & Technician	Diploma (or H.S. Cert.)	—	Assist design engineer (as drawings and other miscellaneous work)

2-1) Construction Unit Staff Schedule

	1983	1984	1985	1986	1987	1988	1989	1990	1995	2000
Engineer (S/T)*	1	1	1	1	1	1	1	1	1	1
Engineer (T/S)	1	1	1	1	1	1	1	1	1	1
Supervisor (Technical Asst.)	-	-	1	1	1	1	1	1	1	1
Technician	-	-	2	2	2	2	2	2	3	3
Total	2	2	5	5	5	5	5	5	6	6

Note: It is assumed one design engineer would engage in M$ 7 million worth of project work a year. In case of excess work either local or foreign consultant may be assigned.

* Concurrently serve as drainage staff.

2-2) Construction Unit Staff Qualifications and Job Description

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Engineer (S/T)	B.S. in C.E.	8 years	All construction work and supervision of inspectors
Engineer (T/S)	B.S. in C.E.	2 years	Supervision of all construction work of sewerage or drainage facilities
Technical Assistant & Technician	Diploma (or Tech. H.S. Cert.)	——	Inspection of equipment and materials for construction, including house connections and public sewer laying (according to technical specifications)

3-1) Operation and Maintenance Unit Staff Schedule

Job Title	1983	1984	1985	1986	1987	1988	1989	1990	1995	2000
Engineer (T/S)	-	-	-	-	1	1	1	1	1	1
Technical Asst.	-	-	-	-	-	1	1	1	1	1
Technician	-	-	-	-		1	1	1	1	1
Jr. Technician	-	-	-	-		3	3	3	3	3
Chemist						1	1	1	1	1
Laboratory Asst.						1	1	1	2	2
Labor Pool*	-	-	-	-	-	-	6	6	12	18
Total	-	-	-	-	1	8	14	14	21	27

3-2) Operation and Maintenance Unit Staff Qualifications and Job Description

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Engineer (T/S)	B.S. in S.E.	5 years	All activities for operation and maintenance (O & M) of the sewerage and drainage systems
Technical Assistant, Technician and Junior Technician	Diploma (or Tech. H.S. Cert.)	2 years	All work related to O & M and supervising laborers
Chemist	B.S. in Chem.	---	Management and provision of laboratory services for regular monitoring tests concerning quantity and quality of wastewaters of the sewerage system and effluents from the sewage treatment plant
Laboratory Assistant	Diploma (or H.S. Cert.)	2 years	Collection of water samples and water quality examination of drains and stabilization ponds under the direction of the Chemist
Laborer	(None)	(None)	Routine work, such as desilting and cleaning of sewers and drains

4-1) Other Departments or Sections

Code : S = Sewerage
D = Drainage
T = Total

Job Title	1983			1984			1985			1986			1987			1988			1989			1990			1995			2000		
	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T
Budget Officer																1	-	1	1	-	1	1	-	1	1	-	1	1	-	1
Accounting Officer																			1	-	1	1	-	1	2	-	2	2	-	2
Senior Clerk*																			1	-	1	1	-	1	1	-	1	1	-	1
Engineer (Mechanical)																			1		1	1		1	1		1		1	1
Technical Asset. (Electrical)																									1		1		1	1
Technician (Electrical)	1		1	1		1	1		1	1		1	1		1	1		1	1		1	1		1	1		1		2	2
Senior Clerk**																									2		2		2	2
Clerk and Typist	4		4	4		4	4		4	4		4	4		4	4		4	6		6	6		6	6		6		6	6
Total			5			5			5			5			5			6			11			11			15			16

* No direct handling of money

** Senior clerk for Drainage and Sewerage Section

4-2) Qualifications and Job Descriptions of Other Depts or Section Staff

Position	Qualifications		Job Description Responsibilities
	Degree	Work Experience	
Budget Officer	B.S. in Accounting or Business Administration	5 years	Loan administration and reimbursement for the sewerage project
Cashier	Diploma (or H.S. Cert.)	___	Daily accounting work under the direction of the Budget Officer and Accounting Officer, preparing and keeping accounting records
Engineer (Mechanical)	B.S. in M.E.	5 years	O & M of treatment plant and pumping stations, including control and repair of cleaning machines and trucks and maintenance equipment
Engineer (Electrical)	B.S. in E.E.	5 years	Control, monitoring and repair of all electrical equipment required on treatment plant and pumping station. Safekeeping of all maintenance equipment
Personnel Officer	B.S. in Adm. (or liberal arts)	___	Recruitment of new staff and administration of personnel assignments and wage control
Clerk	Diploma (or H.S. Cert.)		Assist Personnel Officer in various clerical duties, such as recording and filing

9.3.5. Training

Parallel to the recruitment schedule of necessary staff of all levels, training programs should be considered for those recruited in an attempt to raise their level of qualification/experience for satisfactory performance of their assignment, by way of practical and effective approaches including the following, to be implemented as soon as possible when implementation of the 1st Phase of the proposed project is decided:

(a) On-the-job training program will be arranged with foreign engineering consultants for training of sewerage engineers and other related technical staff during the period of consulting services for planning, designing and construction supervision, including procurement procedure, etc.

(b) In particular, plant operators will be sent for an agreed period of time to receive training at existing plants elsewhere in Malaysia, where technical knowhow and accumulated experience on sewerage operation and management have been gained.

At present, no organization for training sewerage engineers and other related personnel exists in Malaysia. Due to the importance and urgent necessity of providing sewerage service, it is recommended that a training organization be set up in Malaysia as soon as possible under the leadership of the Local Government Division, Ministry of Housing and Local Government, which is responsible for carrying out urban engineering activities, inclusive of sewerage and sanitation.

In Japan, the Japan Sewerage Works Agency (JSWA), is set up for the purpose of promoting sewerage works, exploring technological aspects and training local government staff members. The following Tables 9.9 and 9.10, describing the type of training concerning sewers and wastewater treatment plants conducted by JSWA are provided for reference. (The background, legal aspect, functional outline, and financing of JSWA are explained in Appendix J in detail.)

Table 9.9. Schedule for Trainee -- Sewer

	Sewer
Training Period	20 days
Trainee, Prerequisite	More than $2\frac{1}{2}$ years' job experience.
Purpose	To enable determination of the appropriate methods of pipe selection and design and construction of the sewer.
Content of Training	· A general knowledge of the sewerage system. · Laws and regulations related to sewerage and construction. · Design of the sewers. · Exercises in layout planning and hydraulic calculation of sewers. · Lectures on wastewater treatment. · Experiments on soil testing. · Lectures on construction work and selection of construction method. · Lectures on the operation and maintenace of sewers. · Lectures on administration and finance of the sewerage system. · Tours of sewerage facilities.

Table 9.10. Schedule for Trainee -- Wastewater Treatment Plant

	Wastewater Treatment Plant
Training Period	20 days
Trainee Prerequisite	More than five years' sewerage-related work experience or technical knowledge equivalent to five years of sewerage-related work experience.
Purpose	To enable preparation and supervision of the basic design and detail design of the treatment plant.
Content of Training	• Laws and regulations related to sewerage works. • Lectures on principles of wastewater treatment. • Lectures on the wastewater treatment process and its selection. • Lectures and exercises on the design of wastewater treatment facilities. • Lectures on check points for works designed by consultants. • Lectures on the design of mechanical and electrical equipment. • Lectures on construction methods and schedule. • Exercises on planning layouts of treatment plant. • Lectures and exercises on the hydraulics of the wastewater treatment facilities. • A case study • Tours to sewerage facilities.

CHAPTER 10

LAWS AND REGULATIONS

CHAPTER 10 LAWS AND REGULATIONS

10.1. Introduction

It is essential that an explicit set of published regulations be available to implement the proposed sewerage and drainage systems. Thus, the existing regulations and by-laws pertinent to the proposed sewerage and drainage systems are reviewed. On the basis of such review, decision should be made as to whether Kelang Municipality should be given authority to issue and enforce regulations for their effective control, operation and maintenance under established national and state legislation.

10.2. Review of Existing Laws and Regulations

Kelang Municipality will be the responsible agency to implement the sewerage and drainage system that is to be newly constructed. Its legislative power is essentially derived from the following: (1) Local Government Act, 1976, (2) The Street, Drainage and Building Act, 1974, (3) Town and Country Planning Act, 1976, and (4) The Environmental Quality Act, 1974.

(1) Local Government Act, 1976

This Act is applicable only to West Malaysia. As stipulated in Section 9, the State Authority has the power to issue general directives on the policy to be followed in the exercise of the powers conferred and the duties imposed on the Local Authority. Likewise, the various provisions of the Act indicate the State Authority as the creator and permanent monitor of all local authorities within State boundaries. The approval of the State Authority is required for the creation of all posts, the annual budget and other specific subjects.

The relevant powers in this Act are as follows:

Section 39: The revenue of the Local Authority shall consist of rates, taxes, rents, license fees, charges payable to the authority, charges or profits arising from any service or undertaking carried on by the Local Authority, interest and income arising from investment or property, other revenue such as grants, contributions and endowments from the Federal or State Government.

Section 40: All monies received by the Local Authority shall constitute a fund to be called the Local Authority Fund.

Section 41: The Local Authority is empowered to borrow money subject to the approval of the State Authority for the acquisition of land, the erection of any building, the execution of any permanent work, and any plant renovation or remodeling. The amount of loan shall not exceed five times the annual value of the Local Authority.

Section 46: In addition to its borrowing powers, as stipulated in Section 41, the Local Authority may borrow money from any person for the purpose of carrying out any development for residential, commercial and industrial undertakings with the approval of the State Authority.

Section 47: The Federal or State Government may grant loans to any Local Authority at such rates of interest and on such terms and conditions as it shall consider appropriate out of its revenue or other monies as may be set aside or appropriated for the purpose.

Section 69 - 70: These provisions prohibit the disposal of individual wastewater or sewage into any stream, implying eventual use of public sewers for the disposal mentioned above.

Section 72: The Local Authority is empowered to establish, maintain and carry out sanitary services for the removal and disposal of, or otherwise dealing with, among others, night soil and all kinds of refuse and effluent.

Section 127 - 132: The Local Authority is empowered to impose the annual rate or rates, not exceeding 35 percent of the annual rental value of all rated properties. In addition to the above rate or rates, a sewerage improvement rate, within 5 percent of the annual value, can be imposed on beneficiaries of the sewerage system to meet the total or part of the cost of the sewerage system and its maintenance. Also, drainage rate within 5 percent of the annual value can be imposed to meet the construction cost of any part of the drainage system. Such rate or rates can be imposed on the whole area or areas divided into two or more parts and further differential rating can be imposed within such part or parts.

(2) The Street, Drainage and Building Act, 1974

This Act, applicable only to West Malaysia, includes provisions required for sewerage and drainage works with adequate improvement and consolidation with the provisions set forth in the Municipal Ordinance and Local Government Act.

Section 49 - 50: Power is given to the Local Authority, which is defined to include the Municipal Council, to undertake the construction and maintenance of sewerage and drainage works.

Section 51: Local Authority is given power to recover the capital cost of the sewerage and drainage works, including cost of land acquisition by means of frontage charge. It is also authorized to recover the cost from developers in the form of a deposit required before development can be started of any area.

Section 52: There are prohibitions against any building unless provision is made for drains of such specifications as may be prescribed by the Local Authority. Also, power is provided to require owners to enlarge, repair or cleanse drains and the Local Authority to undertake the work in default of the owners and recover the cost.

Section 53: This Act provides that the Local Authority shall maintain and keep in repair and, as it sees fit, enlarge, alter, arch over or otherwise improve all or any of the sewers, and surface and stormwater drains.

Section 54: The Act also provides that the Local Authority shall be responsible for the cleansing and emptying of sewers so as not to be a nuisance or injurious to public health, with penalties for making unauthorized drains into public sewers.

Section 55: Prior written permission is required to make any drain into public sewer. No night soil, excrementitious matter or trade effluent can be discharged into sewers without prior written permission of the Local Authority.

Section 58 (2) and (7): Power is given to require a new or existing building to be connected to a sewer if it is available within 100 feet of the boundary of the premises. The Local Authority itself can enforce connection to existing buildings and recover the cost from the owners.

Section 58 (3) and (14): Private disposal systems, such as septic tanks and cesspools, are allowed to be provided under the direction of the Local Authority where there is no sewer and such systems are required to be kept in proper order.

Section 62: The Local Authority is empowered to take over control of private septic tanks or other sewage purification plants and may levy fees or charges on the owners.

Section 63: Private sewers may be taken over by the Local Authority and declared as public sewers.

Section 64: The Local Authority may apply any system of sewage removal to a certain area and may levy prescribed fees or charges as it deems appropriate.

Section 74: Powers of entry to any building or land for making surveys or inspection for the purpose of executing any work are authorized by the Act.

Section 105: This Section allows the Local Authority to recover the expense and costs of the execution of any work under the Act in installments at a rate not exceeding six percent per annum within a period not exceeding ten years.

Section 132: This Section provides that all monies received in carrying out the provisions of this Act shall be paid into an "Improvement Service Fund."

Section 133: This Section empowers the State Authority to make by-laws in respect of sewers, sanitary accommodations, drains and their connections to sewers, septic tanks and purification plants.

(3) Town and Country Planning Act, 1976

This Act has not been adopted by Kelang Municipality. However under the assumption that this Act will be adopted in due course of time, the provision relevant to the Project is as follows:

Section 32: No person shall use any land or building without permission of the local planning authority to be established in the Municipal Council. Any authority established by law is authorized to undertake any development including the provision and improvement of sewer pipes and drains. A development charge is levied on the local developer who undertakes any development works which are expected to enhance the value of land. Such legal provision is construed to the effect that the developers are required to contribute a part of their profit accrued from the land development by paying a charge or alternatively providing the utility systems as required by the local planning authority.

(4) The Environmental Quality Act, 1974

The Environmental Quality Regulations have been enacted under this Act. This gives intensive powers to the Director General to control and regulate the discharge of effluent into any inland waters and into public sewerage systems.

10.3. Conclusion

Based on the review of existing legislation in the preceding section, the provisions of existing laws and regulations related to sewerage and drainage now in force in Malaysia can be considered to be sufficient to implement the proposed Master Plan. Among the laws mentioned above, The Street, Drainage and Building Act, 1974, contains considerable provisions related to sewerage and drainage services. It appears that no additional legislation will be needed for the time being. Therefore, it is clear the Kelang Municipality is fully authorized to undertake the public services, including sewerage and drainage services, within its administrative boundary.

CHAPTER 11

PROJECT EVALUATION

CHAPTER 11 PROJECT EVALUATION

11.1. Introduction

Due to the rapid socio-economic development in Malaysia, the mean monthly household income of the lowest income group, comprising 40 percent of the population, increased from M$76 in 1970 to M$186 in 1979, according to the Fourth Malaysia Plan. This represents a rise of 145 percent, compared with the 66 percent increase in consumer price index.

As income increase, what once seemed tolerable comes to be recognized as being intolerable. Therefore, a higher civil minimization level is required. Considering that provision of sewerage service is recognized internationally as a form of civil minimization service, with income level in Malaysia becoming increasingly higher, the desirability for sewerage service is expected to increase and come to be considered necessary, since benefits derived from sewerage service strongly affect the quality of life, especially sanitation and environment. The following Section explains these benefits.

11.2. Anticipated Benefits

Provision of the sewerage system is expected to substantially benefit the served population directly, which includes those of households, factories, shops and institutions. There will also be significant indirect benefits, such as the improvement and general environment which will cover even those who are no served by the system directly. Therefore, the benefits, direct or indirect, will properly be measured both in terms of quantifiable and unquantifiable manner, sometime in monetary terms, to serve as justification for a sewerage project.

Consideration is therefore made to identify the benefits according to the following two categories:

1) Environmental Improvement
2) Sanitation and Health

A description of the benefits in each of the above-mentioned categories and some attempt to quantity these benefits are presented in the following section.

11.3 Recognition and Quantification of Benefits

11.3.1. Environmental Improvement Aspect

Provision of the sewerage system is certain to improve the pollution in watercourses into which wastewater would otherwise be discharged directly without treatment from their various sources. This will also result in aesthetic improvement of the watercourses and surroundings.

Benefits categorized from this aspect are difficult to measure in monetary terms, especially in the Project Area, where use of river water for agriculture, drinking water or any other purposes is almost negligible. Despite such difficulty, they should by no means be overlooked. There has been a rapidly increasing awareness of water pollution in recent years nation-wide, as well as in the Project Area. Elimination of the water pollution problem is an indispensable element for a clean and attractive community and there is virtually no technical alternative other than through provision of a properly palnned and operated sewerage system to efficiently reduce pollutants originating from domestic and industrial wastewater.

Therefore, an attempt is made to quantify the effect of the sewerage system from the standpoint of "with" or "without" the project, by selecting BOD as an indicator of pollution, with BOD load in the year 2000 calculated both in the case where the sewerage system is provided and where it is not. In the former case, it is assumed that all domestic and industrial wastewater are collected and treated by the sewerage system to a minimum allowable level of 50 mg/ℓ BOD. Calculations shown in Table 11.1 and 11.2, and the results shown in Fig. 11.1 show that total estimated BOD load of about 36 t/day by the year 2000 can be reduced to about 12 t/day (a reduction of 66 percent) by the sewerage system. It should be noted that this reduction is achieved on the basis of the minimum 50 mg/ℓ BOD

concentration although actually even lower concentration levels could be applied. Through provision of the sewerage system, effluent BOD concentration can be lowered sufficiently by modification of treatment facilities to meet a more stringent environmental requirement as envisioned in the future.

While the present waste load generation is still in the order of about 18 t/day, the water pollution problem in the Project Area is expected to worsen during the immediate future as shown in Table 11.2, unless the proper treatment facilities are provided by way of sewerage system.

Table 11.1. Anticipated Waste Load Generation without Project in 2000 by Sewerage Zones

Sewerage Districts	Zones	Sub-zones	Population Equivalence	Domestic Waste Load (kg/day)	Identified Industries		Not Identified Industries		Total Waste Load (kg/day)	Total Waste Water (m^3/day)	Waste Load* in 1980 (kg/day)
					Waste Water (m^3/day)	Waste Load (kg/day)	Waste Water (m^3/day)	Waste Water (kg/day)			
Kelang North	Zone-1	Sub-zone-1	55,570	2,890					2,890	18,377	1,186
"	"	Sub-zone-2	41,849	2,176	53	2	3,104	497	2,675	17,011	1,284
"	Zone-2	Sub-zone-1	44,811	2,330	1,127	244	1,491	1,044	3,618	22,713	3,132
"	"	Sub-zone-2	15,224	792			1,190	190	982	6,165	245
"	"	Sub-zone-3	1,510	79			5,838	934	1,013	6,360	56
Kelang South	Zone-1	Sub-zone-1	20,722	1,078					1,078	7,703	943
"	"	Sub-zone-2	29,197	1,518					1,518	(12,871) 10,849	288
"	Zone-2	Sub-zone-1	25,407	1,321					1,321	8,203	549
"	"	Sub-zone-2	66,631	3,465					3,465	21,516	1,019
Port Kelang	Zone-1	Sub-zone-1	34,017	1,769	478	191	4,675	748	2,708	18,039	4,379
"	"	Sub-zone-2	670	35	142	8	6,587	1,054	1,097	7,308	404
"	Zone-2	Sub-zone-1	43,482	2,261			1,703	272	2,533	16,829	902
"	"	Sub-zone-2	13,194	686			2,247	360	1,046	6,950	280
"	"	Sub-zone-3	24,176	1,257					1,257	7,344	237
"	Zone-3		5,127	267			2,557	409	676	5,500	50
North Port	Zone-1		121	6			22,037	3,526	3,532	25,295	1,715
"	Zone-2		3,722	194			10,188	1,630	1,824	13,599	1
Kapar			20,221	1,051					1,051	9,604	546
Meru			11,321	589			5,307	849	1,438	12,261	315
Total				23,764		445		11,513	35,722	254,497	17,531

Note : * Waste Load in 1980 is quoted from Table G. 8, Appendix G

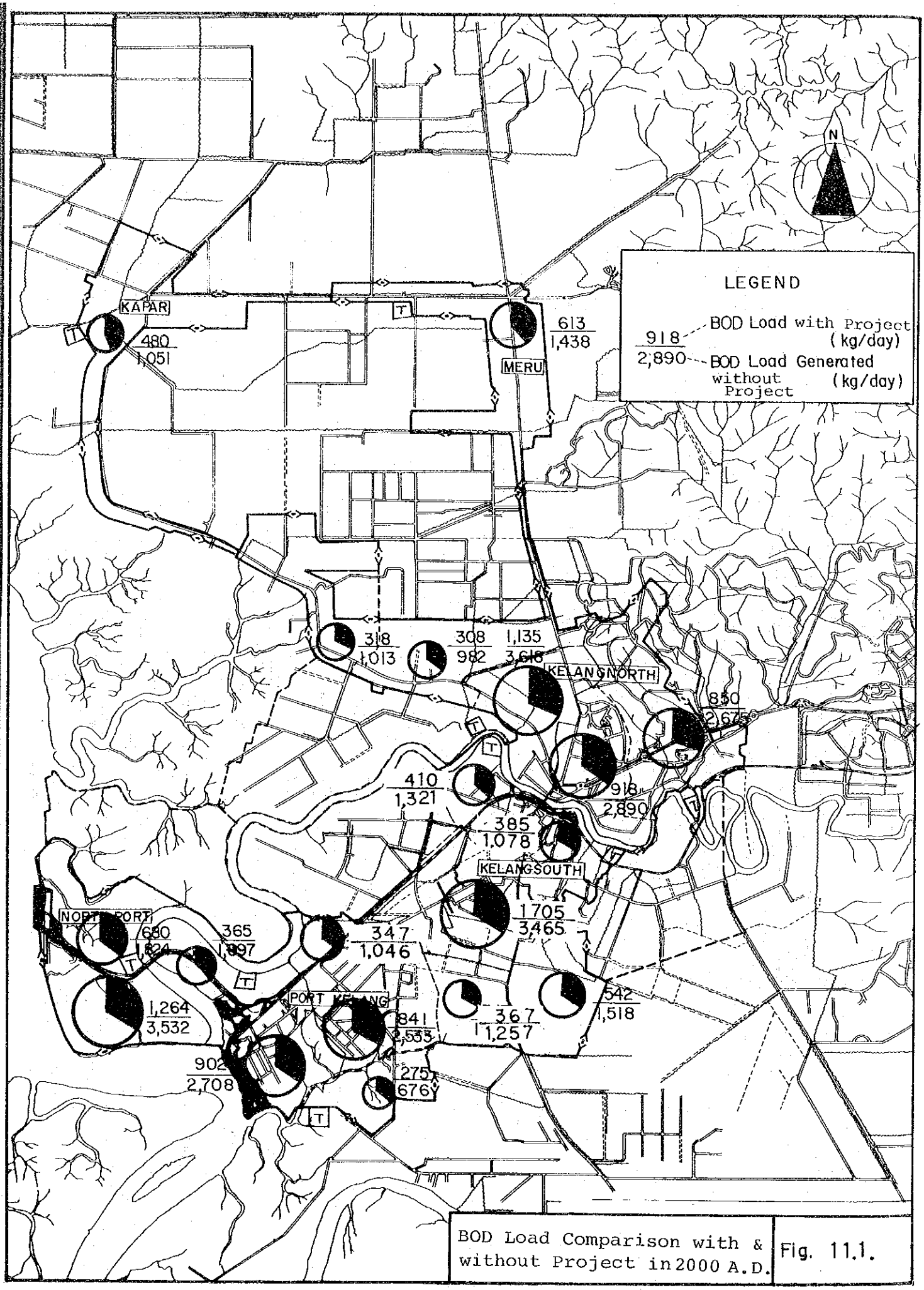
Project Area only

Table 11.2. Expected BOD Reduction Ratio in 2000 (with Project)

Sewarage Districts	Zones	Sub-zones	BOD Load Generated (kg/day)	Final Effluent BOD (mg/ℓ)	BOD Load with Treatment (kg/day)	BOD Removal Ratio (%)
Kelang North	Zone-1	Sub-zone-1	2,890	50	918	68.2
"	"	Sub-zone-2	2,675	50	850	68.2
"	Zone-2	Sub-zone-1	3,618	50	1,135	68.6
"	"	Sub-zone-2	982	50	308	68.6
"	"	Sub-zone-3	1,013	50	318	68.6
Kelang South	Zone-1	Sub-zone-1	1,078	50	385	64.3
"	"	Sub-zone-2	1,518	50	542	64.3
"	Zone-2	Sub-zone-1	1,321	50	410	68.9
"	"	Sub-zone-2	3,405	50	1,705	68.9
Port Kelang	Zone-1	Sub-zone-1	2,708	50	902	66.7
"	"	Sub-zone-2	1,097	50	365	66.8
"	Zone-2	Sub-zone-1	2,533	50	841	66.8
"	"	Sub-zone-2	1,046	50	347	66.9
"	"	Sub-zone-3	1,257	50	367	70.0
"	Zone-3	-	676	50	275	60.4
North Port	Zone-1	-	3,532	50	1,264	64.2
"	Zone-2	-	1,824	50	680	63.8
Kapar	-	-	1,051	50	480	54.4
Meru	-	-	1,438	50	613	58.4
Total			35,722		12,075	Average 66.2%

Note: Project Area only

Industrial Wastewater Effluent in Norht Port is assumed to have same BOD concentration of 50 mg/ℓ.



BOD Load Comparison with & without Project in 2000 A.D.

Fig. 11.1.

11.3.2. Sanitation and Health

Improvement of health and sanitary condition by way of provision of the sewerage system is definitely one of the benefits to be counted for. While in the Project Area, as mentioned previously (Section 2.4. Public Health Condition), the prevailing low incidence of diseases noted prevents a meaningful quantifiable measurement of benefit. It is, however, obvious that low level of incidence will at all times be maintained, through sewerage services, resulting in reduced medical expenses and increased man-power productivity.

It is noted, as cited previously (Section 2.6. Sanitary Condition), flush toilets with septic tanks are installed for approximately 77 percent of the households within the Area. The other 23 percent of the households are still covered by the bucket system (1,700 households) or pit privies (1,000 households). Desludging of septic tanks and bucket system collection of night soil from the households and disposal of these waters are being carried out by Kelang Municipality. Another benefit of the proposed sewerage system will therefore by the savings of the cost being borne by the Municipality as well as the individuals concerned for these services.

According to the Health Department of the Municipality, the annual operating cost for desludging septic tanks and night soil collection and disposal are M$98,000 and M$254,000 respectively. Provided that the implementation schedule for the proposed sewerage system recommended in Chapter 6 is followed, expenditures reduced will be as shown in Table 11.3 below.

Table 11.3. Amount of Reduced Expenditure from Elimination of Septic Tank and Bucket System

(Unit: M$1,000)

	1990 - 1995	1996 - 2000
Septic Tank	326	219
Bucket System	491	859
Total	817	1,078

The amount saved is less than the operation and maintenance cost for the sewerage system; however, the elimination of the septic tank and bucket system, which are limited for human excreta, will improve the water pollution problem caused by the direct discharge without treatment. Furthermore, significance of sewerage facilities to treat sullage water together with human excreta should be duly considered.

11.4. Project Evaluation

In general, the desirability of a specific project can be indicated by the concept of the willingness-to-pay.

Willingness-to-pay is considered to be a proxy indicator for all of the benefits to be gained from a proposed project. According to this concept, the benefits out of a proposed project, can generally be assessed in monetary terms. It is considered that the higher the level of the residents' indication of their willingness-to-pay, the greater the benefits to be generated by the proposed project.

In order to obtain information on the residents; willingness-to-pay for the proposed sewerage system project, two surveys were conducted in the Project Area. In the first survey conducted in May, 1981, questionnaires were distributed to two selected housing areas, comprised mainly of upper and middle class households. The second survey was conducted in November, 1981 in a commercial area as well as a different housing area of mainly lower income households. Of the total 142 questionnaires distributed, 23 were returned by stores and offices Table 11.4 provides a summary of the two surveys.

Table 11.4. Results of Survey

	Samplings	Average Household Size (Persons)	Average Income per Month (M$)	Average Willingness-to-Pay, Based on Monthly Income (%)
Result of Second Survey	70	7.1	838	2.6
Result of First Survey	72	5.2	1,336	1.6
Result of Second and First Surveys	142	6.4	1,051	2.2

(a) Average households size of 6.4 persons obtained from the two surveys is slightly larger than that the average 5.7 persons per household in the Project Area. The size of the lower income group is 7.1 persons, whereas that of the higher income group is 5.2 persons.

(b) Average monthly income is M$1,051, with that of the lower income group (M$838) lower than that of the higher income group (M$1,336) by M$498. Willingness-to-pay is about M$22 on the average; i.e.,

2.2 percent of monthly income with the difference of 1.6 percent in the higher income group and 2.6 percent in the lower income group.

Based on the above-mentioned results, it can be said that the need for sewerage service is greater in the low income group than in the higher income group. This may be a reflection of the present living conditions in the Project Area, where the higher income class usually lives in an area of higher living standard, with improvements made at their own expense and therefore already provided with a certain degree of sanitary services without much inconventional. On the other hand, the lower income class would have realized the apparent advantage of sewerage service from observation or knowledge of the more desirable living situation, thus placing a high evaluation on sewerage service.

Conclusive results concerning the questionnaire results from store and offices could not be obtained statistically because of insufficient valid samples.

In conclusion, the results of the field surveys for the proposed sewerage system represent the residents' high level of willingness-to-pay for the proposed sewerage system, compared with their ability-to-pay. This indicates the residents' strong desire for the sewerage system. Therefore, the construction of the sewerage system is justified.

CHAPTER 12

INTERIM MEASURES

CHAPTER 12 INTERIM MEASURES

12.1. General

In order to undertake immediate improvement of the environmental conditions of the Project Area prior to completion of the proposed First Phase of the construction program, Interim Measures of realistic and less expensive nature will be considered for implementation. Implementation of practical yet effective interim measures are considered necessary to help improve the environmental condition by removing the major sources of pollution with minimum expense through proper administrative procedures by the Municipality.

According to field surveys, the prevailing pollution of the drains and roadside ditches are expected to become considerably worse in a few years.

The cause of pollution includes the following:

1) Water pollution caused by;

   a) BOD: Operational defects of night soil facilities and sullage discharges of domestic, commercial and industrial origin

   b) Oil and grease, such as waste oil and grease from gas stations

   c) Wastewater from food processing of poultry in the market place

   d) SS: Sullage of domestic, commercial and industrial origin

2) Solid waste pollution caused by:

e) Solid waste disposal by pedestrians and enterprises into drains and roadside ditches

f) Deposition of solid wastes at the bottom of drains and roadside ditches.

12.2. Interim Measures

The foregoing major causes of water pollution are expected to be remediable by the proposed interim measures. Heavy pollution resulting from any of several causes can be substantially improved by the measures proposed in the following at reasonable cost and time with necessary legal provision to be considered by municipality.

1) Improvement of Existing Sanitary Facilities for Domestic Wastewaters

As mentioned in Section 2.6., sanitary facilities in the Project Area are classified into three categories; namely, flush toilet with septic tank, bucket system and pit privy. In each category of sanitary facilities, interim measures pending provision of the sewerage system are considered and described in the following.

a) Flush Toilet with Septic Tank

Desludging from the existing individual tanks are currently being maintained under improper conditions. An average desludging period calculated on the basis of the existing number of septic tanks and annual desludging record obtained from the Health Department is every 30 years for a septic tank. This indicates that many house owners have never desludged their septic tanks since construction. The fact that desludging is done at the request of the individual house owners is considered to be the major reason for infrequency of desludging. However, the structure of the septic tank requires that sludge should be removed once every year or

two to maintain proper functioning. It is, therefore, recommended that intensified desludging be conducted on a compulsory basis by the Kelang Municipality.

Sludge from septic tank should also be treated and disposed of properly. It should be noted that the removed sludge being more or less digested already, its organic components may be less than half of its original amount. On the other hand, as a result of digestion, the sludge can readily be separated into solid and liquid forms. Therefore, dewatering of sludge by means of sludge drying bed and disposal as sanitary land fill is considered to be the most appropriate processing method.

b) Bucket System

Night soil collected from households which employ the bucket system is currently discharged into the Kelang River and the Aur River at the two respective disposal sites without any treatment. Although the number of households using the bucket system is decreasing rapidly, the system will remain, especially in the old developed areas for the time being. Therefore, an effective treatment method should be considered.

Anaerobic digestion is considered to be an appropriate and economic process for treatment of strong organic waste, such as night soil. The climate in the Project Area makes this process advantageous, since the required retention time for digestion heavily depends on temperature. Based on the mean temperature of 26°C in the Project Area, required retention time is considered to be more than 30 days. Supernatant from the digestion tank still contains high BOD concentration and thus requires further treatment before discharge into a watercourse. Aerobic treatment, such as provided by stabilization pond and filter bed, is considered to be useful as a second process for effluent from digestion tank.

Modification of one of the existing night soil disposal facilities, located at Jalan Tanki, Port Kelang, as a digestion tank, is considered as an alternative treatment plan. In this case, combined treatment both for night soil and sludge collected from septic tanks should be taken into consideration.

The other alternative plan is combined treatment with sewage at wastewater treatment plant. Despite the fact that this alternative can not be realized before completion of at least one wastewater treatment plant, it has the obvious advantage of requiring little investment for night soil treatment. Taking into account the population presently served by bucket system and amount of BOD load generated by them, night soil can be treated at the wastewater treatment plant proposed for the First Phase program.

c) Pit Privy

Houses with pit privies are mostly located in *kampump* areas where provision of sewerage system is expected at a later stage. To improve living condition in these areas, a sanitary facility should be considered. Since in most Kampung areas, lot space for a household is relatively large compared to that in urban areas space, for sanitary facility can be obtained easily. Provided there is a water supply system and water from well is not used for domestic usage, thus providing no health problem, pour flush toilet is recommended. Excreta is flushed by manually poured water into the toilet and discharge into a pit dug nearly, causing neither odor nor health problem.

2) Improvement of Existing Commercial Facilities

Industrial wastewater is one of the causes of pollution of inland water. Thus, immediate improvement measures for control of wastewater from the public markets, some factories and gas stations are recommended.

a) Improvement Measure for the Public Markets in the Project Area

At present, wastewater in the public market is discharged into the existing drain and its quality indicated increasingly high pollution. For economical and simple operation, installation of a sedimentation tank with screening attachment at each of the market places is recommended. This tank will continue to be used even after the municipal sewerage system is constructed in the future.

b) Improvement Measure for Waste Oil from Gas Stations

Many gas stations are located in the Project Area, causing waste oil contamination in the drains. Provision of an oil separator tank in front of the final discharge point of each gas station is therefore recommended. This separator tank will continue to be used even after the sewerage system is constructed in the future.

c) Improvement Measure for Poultry Processing House

Several poultry processing houses discharge high BOD effluent, including the blood and feathers, into open drains. Thus, it is recommended that a sedimentation tank with screen be provided for each processing house. This tank will also continue to be used after the sewerage system has been constructed in the future.

3) Recommendation for Housing Development

In every new housing development, it is recommended that sewerage facilities for collection and disposal of all sewage (excreta and sullage) be installed as one of the fundamental infrastructures of the modern community at the time of development. The fact that by installation of sewers with temporary centralized treatment facility, the relatively high cost of numerous septic tanks can be averted and that effluent from the facility can meet the regulational requirements justify the provision of sewerage facilities from both economic and environmental viewpoints. After the municipal sewerage system has been constructed, the sewer pipes can be used as a part of the system while land used for the temporary treatment facility can be reclaimed and used for other purposes.

Two treatment methods are recommended by the Ministry of Health and Ministry of Housing and Local Government, based on the number of houses in the development area. In all housing schemes with 30 or more, but less than 100 dewelling units, the central Imhoff tank with filter bed system is recommended. In this case, desludging the Imhoff at appropriate intervals should be carried out by MPK. In case MPK cannot provide desludging and sludge disposal services, a sludge drying bed should be

included in the system. On the other hand, all new housing schemes with 100 or more dwelling units should have central stabilization pond treatment. Since sizable area is required for the stabilization pond, location of the treatment facility will require due consideration at planning stage. Also, design criteria for facilities, such as sewer pipe, manhole, pumping station and stabilization pond, should comply with those presented in this report. Environmental Health & Engineering Services Division, Ministry of Health and Technical Unit, Ministry of Housing and Local Government have jointly published sewerage guidelines and recommendations for sewerage requirements for housing.