SEWERAGE AND DRAINAGE SYSTEM PROJECT
IN
ALOR SETAR AND ITS URBAN ENVIRONS
MALAYSIA

VOLUME IV
APPENDICES
FOR
SEWERAGE STUDY

OCTOBER 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

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2. Socio Economic Studies

2.1 General

Malaysia is composed of 13 states, 11 of which form Peninsular Malaysia - Johore, Malacca, Negri Sembilan, Pahang, Selangor, Trengganu, Kelantan, Perlis, Kedah, Perak and Penang. The other two states are Sarawak and Sabah on the island of Borneo.

Except for the alluvial plains along the west coast of the peninsular, most of the country's 332,943 square kilometers are covered by mountains. The climate is tropical with average daily temperatures ranging from 70°F to 90°F.

The population of 12.6 million is made up of diverse ethnic origins - 55% Malays, 34% Chinese and the remainder mostly Indians.

The official language is Bahasa Malaysia but English and other languages are also widely used. Islam and Buddhism are the dominant religions.

Malaysia has a constitutional monarchy. The titular Head of State is the Yang Di-Pertuan Agong who is elected from the nine ruling sultans in Peninsular Malaysia Legistative powers are vested in the two houses of Parliament - the Dewan Rekayat (House of Representatives) and the Dewan Negara (Senate). The national executive power is vested in a Prime Minister and his cabinet.

2.2 Malaysia National Economy

Malaysia has an agriculturally-oriented economy which makes her the largest exporter of rubber, palm oil, tropical hardwood timber and pepper. However, she is now diversifying into industry to concentrate on the manufacturing of finished products from her own natural resources. This is reflected by the increase in contribution to the GNP by the

manufacturing sector from 9% in 1972 to 15% in 1978. The manufacturing sector accounts for more than 1/5 of Malaysias total exports too. Exports of machinery, transport equipment, and petroleum products have been experiencing strong growth desipite the slow external demand for Malaysian manufactured goods.

The Government gives high priority to labour intensive, agrobased and export oriented industrial projects which use a high percentage of local raw materials. Steps have been taken to distribute industries to the less developed areas so that there is a balance geographical distribution of industries. Investors whose plans conform to the Government's policy are given attractive incentives.

In promoting industrialisation, the Government has followed a programme of developing industrial estates. To date there are 64 industrial estates and free trade zones and 32 planned industrial estates. Lands in the industrial estates is an expensive with lots offered on a long term lease basis.

The Malaysian economy is largely export orinted with 50% of the GNP arising from exports. In 1978, total exports amounted to US$6,486 million, an increase of 6.6% from the 1977 figures. The manufacturing sector accounted for more than 20% of the total exports. Rubber, which has been the most important export product for years, earned US$1,362 million or 21% of the total export value. Pertroleum replaced tin as the second major export earner, grossing US$992 million or 15% of total export value whereas tin earned US$742 million or 11%.

Total imports in 1978 increased by 17% to US$5,249 million. Investment goods accounted for 1/3 of the import value; consumption goods accounted for just over 1/4. Japan continued to be the major supplier of Malaysia's imports (23%) followed by the European Common Market, the ASEAN countries and the U.S.

The Government welcomes foreign investment for the significant contribution it can make to income and employment as well as the skills and technology which accompany it. In addition, foreign ownership provides widening access to international markets for the country's exports.

Malaysia has favourable balance of payments since 1969. The surplus for 1978 was US$118 million. The inflow of private long term capital comprising new foreign direct investment and retained earnings, has been relatively high and stable ever since the country's independence. This signifies the confidence of the foreign investors in the grwoth potential and stability of the country.

Malaysia's satisfactory balance of payments, together with its high foreign exchange reserves has enabled it to adopt Article VIII of the Agreements of the International Monetary Fund. This means that Malaysia may not, without prior approval of the IMF, impose restrictions on payments or transfers for current international transaction or engage in discriminately currency arrangements or multiple currency practices. It must also provide for the free convertibility of Malaysian currency held by foreigners.

2.3 Economic Development

The economic development in Malaysia has been based on the New Economic policy. The objectives of this policy are to reduce and eventually eradicate poverty irrespective of races and to correct the economic imbalances existing between races and regions. These objectives are to be achieved by generating more employment opportunities and increasing productivity and income. The target year for achievement is 1990.

Implementation of the new economic policy has necessitated a greater involvement of the government sector in economic development. This is done through the State Economic Development Corporation and Government sponsored public corporations such as the National Corporation (PERNAS) and the Development Bank of Malaysia.

The objectives of the New Economic policy were incorporated as the main target of the Second Malaysia Economic Plan (1971-1975). Development projects under Transport as well as Commerce and Industry were given more emphasis under this plan. Utilities, Health and Family Planning as well as Social and Community Services, which were given importance during the First Malaysia Plan decreased in terms of expenditure allocation.

The achievements made under this plan were:

1. Average annual growth rate at current price - 12%
2. Average annual growth rate of real Gross National Income per capital (1970 prices) - 1.6%
3. Increase in new employment - 588,000
4. Average annual growth rate in employment - 3.3%

The current plan namely the Third Malaysia Plan (1976-1980) aims to further intensity efforts to eradicate poverty and to continue effort to change social restructure. In addition, the Plan aims to strengthen the national security too. The targets set for the Plan are to achieve a growth rate of 8.5% p.a. at the target year of 1980 for the Gross Domestic Product and to create 743,000 new jobs.

2.4 The Second Malaysia Plan 1971-1975

The main thrust of the Second Malaysia Plan (SMP) was to lay the foundations of the implementation of the New Economic Policy (NEP). The SMP itself was the first in a series within the perspective Plan, 1971-90 aimed at accelerating economic change designed to bring about a more equitable distribution of economic opportunity, income and wealth among the population.

2.4.1 Growth by Major Sectors

During 1971-75 the Gross Domestic Product (GDP) at factor cost, in real terms grew by 7.4% per annum as compared with the original SMP target of 6.8% and the revised target in the Mid-Term Review (MTR) of 7.8%. The shortfall with respect to the MTR target is largely attributable to the impact of worldwide recession on the Malaysian economy during 1974/75. The average annual rate of grwoth of GDP was 8.4% during 1971-74 as compared to 3.5% in 1975.

The fastest growing sectors were transport, manufacturing, public administration and other services with annual rates of growth of 12.6%, 10.9% and 7.2%, respectively during the SMP period.

2.4.2 Sources of Growth

Economic development during the SMP was largely stimulated by public sector expenditures for investment and consumption. These expenditures constituted the main source of growth under the SMP. The rate of growth for public investment was 17.6% p.a. in real terms while the private investment registered sharp fluctuations during the SMP period. Negative rates of grwoth occurred in 1972 and 1975 in contrast with an increase of 22.3% between 1973 and 1974.

2.4.3 Exports

Exports provided the main thrust of economic grwoth during the years of 1973 and, to a lesser extent, 1974. International prices of raw materials were favourable and the prices of Malaysia's major primary commodities reflected this trend.

In 1970, more than 50% of total exports came from agricultrual with rubber contributing the largest portion, 34%, followed by timber 16.3% and palm oil 5.1%. The mining and the manufacturing sectors contributed 22.6% and 11.4% respectively. By 1975, however, manufactured exports amounted to 23.0% of total exports even though agriculture continued to predominate with 49.5%.

2.4.4 Imports

Imports of goods and non-factor services in constant prices amounted to over 1/3 of GNP. Among the major components of the import bill were electrical and industrial machinery which accounted for 24% of the total imports, followed by agricultrual items 17%, transport equipment 11% and industrial chemical and fertilizers 5%.

2.4.5 The External Economy 1971-1975

Despite fluctuations in the world economy, Malaysia continued to maintain a favourable basic balance in the exports and imports of goods and non-factor services. Cumulatively, the basic balance remained in Malaysia's favour amounting to $3 billion for the five years between 1970 and 1975.

Malaysia's favourable trade balance and substantial inflow of funds both public and private enabled the country to accumulate some $1.9 billion in external reserves over the last five years. This enhances Malaysia's financial strength giving the Ringgit a 164.9% becking in 1975.

2.4.6 Employment and Underemployment

In the five-year period of the SMP, the economy achieved a rate of 3.3% p.a. in employment grwoth compared with 3.2% p.a. in the growth of the labour force. This resulted in a net increase of 588,000 new jobs.

Four sectors of the economy accounted for almost 90% of the increase in new jobs. The sectors are services 24%, agricultrue 26%, manufacturing 18% and wholesale and retail trade 20%.

2.4.7 Conclusion

In many respects, the SMP differed in substance and scope from previous Plans. Its premises were the two prongs of NEP. Its paramount objective is to promote growth and development in a united and progressive nation within a generation. The SMP has demonstrated the acceptance of these objectives of the NEP and the political will and capacity to realize these objectives. These will be the foundations for the TMP.

2.5 The Third Malaysia Plan 1976-1980

The Third Malaysia Plan (TMP), 1976-80 constitutes the Second Phase in the implementation of the NEP. It will build upon the significant economic and social progress obtained in the recent past, in particular the SMP.

The Plan aims to further intensify efforts to eradicate poverty and to continue efforts to restructure Society. In addition the Plan aims to strengthen the National Security, too.

The Mid-Term Review of the TMP was released on March 20, 1979. Under the Reviews proposals, an additional $13.5 billion is to be pumped into development, raising the Government TMP to $32.1 billion, an increase of 73% on original provision.

2.5.1 Exports and the Economy

The strong performance by exports provided the main thrusts to the economy in 1976-1978.

Exports registered an annual growth rate of 22% compared with the TMP target of 13.6%. Again rubber was the pale-seller.

Beyond by the strong commodity prices, per capita real gross National Income in 1970 prices, rose from $1,304 in 1975 to $1,644 in 1978 - an annual growth of 8%. This performance was well above the average by most developing countries. The GDP rose at an average annual rate of 8.5% during 1976-78.

Overall, the real growth rate of 8.7% achieved by the economy in 1976-78 exceeded the TMP target of 8.4% despite the continued slow growth of the world economy and the less than full recovery from the 1975 international recession by Malaysia's major trading partners.

Although all sectors contributed to the growth over the past few years, manufacturing grew by 14.3% p.a. in 1976-78, raising its share in the GDP to about 19% from 16.4% in 1975. This rapid growth, exceeding the TMP target of 12% per annum was achieved despite short falls in private investment in the first two years of the plan. This was due to the 18.5% grwoth in manufacturing production in 1976, following rising domestic demand and prices.

Rubber production grew by 3.3% (TMP-6%) during the same period followed by palm oil 12.5% (TMP 16.4%), saw logs 14.5% (TMP 6.7%) and construction 11.1% (TMP 8.9%). The rapid growth of the construction sector was mainly concentrated in private residental construction, particularly in medium and low-cost housing and government project.

2.5.2 Investments

Total investment in 1970 prices increased from $3,936 million in 1975 to $5,109 million in 1978 achieving an average growth rate of 9.1 per cent per annum. The increase was partly related to the petroleum industry.

Public investment expanded strongly by 17.1% in current prices and 10% in real terms between 1976 and 1978. However, the private investment had a slow growth rate of 9.6 per cent per annum. A substantial portion of this increase was due to investments in production facilities undertaken by the petroleum industry.

2.5.3 Imports

This grew at a rate of 12,5% p.a. during 1976-78.

2.5.4 Balance of Payment

Malaysia's balance of payments position imporved significantly in 1976-78 and its combined merchandise surplus amounted to $10.3 billion,

exceeding the five year target of $4 billion.

On the current account, a surplus of $3.2 billion was recorded as against the projected deficit in the Plan. The traditional deficit of the services account continued to increase which was primarily the result of large payments overseas for freight and insurrance and investment income.

The net inflow of long-term capital, which in the TMP was projected at $9.5 billion for the five-year period amounted to $5.2 billion during 1976-78. Of this total, official capital was $1.8 billion while private capital amounted to $3.4 billion.

The favourable position on the current account, together with the inflow of long-term capital, resulted in a substantial surplus in the basis balance which amounted to $8.3 billion compared with a cumulative five-year target of $4.3 billion.

2.5.5 Employment

For the 1976-78 period, the economy made substantial progress creating 474,100 jobs or about 64% of the 743,000 targeted in the plan. This had reduced the unemployment rate from 7% in 1975 to 6.2% in 1978. However, in view of the rapid increase in the labour force of 3.5% p.a., the unemployment rate for 1980 will remain at 6.1% as indicated in the plan. It was expected that the manufacturing, service and commerce sectors would provide most of the jobs. With a projected GDP growth of 7.7% per annum, 320,200 jobs would be generated in 1979-80.

2.5.6 Future Economic Outlook

The 1979 Budget has been prepared with the aims to sustain and promote Malaysia's steady economic growth and to improve the income distribution within the framework of stable prices. The details of the budget are as follows:

Budget totaling:	$12,709 million; 9% increase over 1978 budget of $11,700 million.
Appropriation for development:	$4,000 million
Operating expenditure:	$8,709 million; Increase of 8.1% over 1978 budget
Operating revenue:	$9,100 million; Increase of 11% over 1978 budget
GNP expected growth rate:	11.2%

Despite the pessimistic forecasts for world economic growth and the recent increase in international petroleum prices, the prospects for Malaysia's continued advance appear bright in 1979 and in 1980.

The MTR of the TMP envisaged that the industrial sectors - manufacturing construction and mining would account for about 30% of the GDP by 1980. Contribution from the agricultural sector was expected to decline to 23.2% in 1980, comparing from 1976. Employments opportunities would be increased with the creation of 320,000 jobs in 1979 - 80.

With the extra allocation of funds for the TMP after the MTR, agriculture and rural development, including rural development will continue to receive the highest priority to accelerate further the implementation of anti-poverty programmes, especially for the less developed states.

2.6 Banking and Finance

The Malaysian financial system may be divided into two parts, the banking system and the system of non-bank financial intermediaries as shown in Fig. A-6. The former includes the monetary institutions such as the Central Bank and the commercial banks, the merchant banks, discount houses, finance companies and the foreign exchange market. The non-financial intermediaries are comprised of the provident pension and insurance funds, the development finance institutions and the unit trusts.

Commercial banking is well developed in Malaysia. As of August 1978, there were 37 commercial banks, of which 20 were domestic banks with a total of 437 banking offices and 17 in foreign countries. The commercial banks are the largest group of financial institutions in the country and are the most important local sources of financing. At the end of 1977, total loans and advances of all commercial banks amounted to US$3,198 million and total assets of US$6,643 million, of which $4,915 came from deposits.

The commercial banks are closely supervised by the central bank, Bank Negara, which is also the sole currency issuing authority and acts as banker to the Government and the commercial banks.

The second-largest group of deposit-taking institutions, after the commercial banks, are the finance companies licensed as borrowing companies under the Borrowing Companies Act 1969. This group competes actively with the commercial banks for savings and fixed deposits, while in their credit operations, they complement the credit operations of the banks by specialising mainly in hire-purchase and housing loan finance.

At the end of 1977, a total of 12 merchant banks operated in Malaysia. The main activities of this type of financial institutions include providing financial and management consultancy services, underwriting debts and equity issues, and acting as intermediary in arranging medium and long-term financing. For their own account, they also participate in money market operations and grant all loans as well a term loans for working capital on property acquisition.

The discount houses are secondary financial institutions which mobilise funds mainly from other financial intermediaries and large enterprises. These funds are usually in the form of short-term deposits, money at call, and deposits up to 3 months of maturity.

All financial institutions are required to allocate a fixed minimum proportion of the total increase in their loans and advances to priority areas like the expansion of indigenous ownership (through the Bumiputra community), the agricultural sector, and the building and construction sector, especially for house owners. For the commercial banks, at least 30% of the increase must go to the Bumiputra community, 10% to agricultural food production, 25% to manufacturing and 10% to housing for individuals.

Financial companies which are licensed as borrowing companies are required to provide a minimum of 20% of their total increase of loans to Bumiputra, 25% to housing, and a minimum to 30% to agriculture, forestry and fishery, manufacturing, building and construction.

2.6.1 Exchange Control

The Exchange Control Ordinance 1953 and the implementary regulations issued by the Controller of Foreign Exchange provide the rules on foreign exchange controls. The Central Bank administers these rules on behalf of the Government, the Governor of the Central Bank being the Controller of the Foreign Exchange.

In May 1973, Malaysia adopted a liberal and non-discrimatery system of exchange regulations. Previously, regulations provided for an exchange controls system for transactions with countries outside the Sterling Area, while transactions within the Sterling Area were not subject to controls. Payments for foods and services are generally permitted with a minimum of formality (except Rhodesia and South Africa). Payments not exceeding M$1,000 are allowed without seeking approval or completion of foreign forms. For amounts beyond M$1,000 up to M$1,000,000 exchange control forms have to be filled out but the approval can be obtained through any commercial banks in Malaysia. For amounts exceeding

M$1,000,000, direct applications to the Controller of Foreign Exchange should be made. No exchange control permission is required for portfolio and direct investment by non-residents of Malaysia.

Companies are allowed to open inter-company accounts with their foreign offices and settle balances in these accounts, provided that export and loan proceeds are entered into these accounts only with their permission of the Controller of Foreign Exchange. A company in Malaysia controlled by non-residents is permitted to borrow amounts up to M$500,000 from Malaysian Commercial banks, exchange control permissions is required for loans beyond this amount.

The Malaysian bank accounts of residents of other countries (except Rhodesia and South Africa) are designated as external accounts. Deposits are freely permitted but subject to the formalities applicable to foreign currency payments. There are no restrictions on withdrawals.

2.6.2 Stock Exchange

On December 27, 1976, the new Kuala Lumpur Stock Exchange, limited by guarantee and as governed by the Companies Act, 1965, officially took over from its predecessor, the Kuala Lumpur Stock Exchange, Berhad. This was in line with the Government's decision to establish a separate Malaysian Stock Exchange. Formerly, the country's capital market and that of Singapore with trading rooms in Kuala Lumpur and Singapore.

Companies listed on the Stock Exchange are categorised under six sections; industrials, hotels, properties, oil palm, tin and rubber. Public companies which want to be listed on the Stock Exchange must obtain the approval of the Capital Issues Committee and the Stock Exchange Committee.

Table A-1 Balance of Payment[1]

$ million

Item	1977
I. GOODS[2]	
Exports (f.o.b)	14,865
Imports (f.o.b.)	11,113
Merchandise balance	+3,752
Non-monetary gold	-10
II. SERVICES[3]	
Freight and insurance	-890
Other transportation	+97
Travel	-190
Investment income[3]	-1,189
Government transaction, n.i.e.[4]	+27
Other services	-142
Balance on services	-2,287
BALANCE ON GOODS AND SERVICES	+1,455
III. TRANSFERS (Net)	
Private	-122
Government	+22
BALANCE ON GOODS, SERVICES AND TRANSFERS	+1,355
IV. LONG-TERM CAPITAL MOVEMENTS (net)	
Official long-term capital	+621
Government[5]	(+535)
Statutory authorities[5]	(+94)
Other[6]	(- 8)
Corporate investment	+1,183
Commercial credits[7]	-20
Balance on long-term capital	+1,784
BASIC BALANCE	+3,139

V. PRIVATE FINANCIAL CAPITAL AND UNRECORDED TRANSACTIONS (net)	
Commercial banks[8]	+197
Other[9]	-1,477
Error and omissions, including other short-term capital	-1,104
OVERALL BALANCE (surplus +/deficit -)	-755
VI. ALLOCATION OF SPECIAL DRAWING RIGHTS	-
VII. IMF RESOURSES	-265
VIII. NET CHANGE IN CENTRAL BANK RESERVES	
(increase -/decrease +)	-490
Special drawing rights	(+116)
IMF reserve tranche position	(+ 9)
Gold and foreign exchange[10]	(-615)

1. Data on services, transfers and private capital flows from 1974 may not be strictly consistent with those of earlier years as the basis for estimation has been revised.
2. Adjusted for valuation and coverage to a balance of payments basis. Imports include military goods and commercial ships and aircraft. Data from 1977 include also imports for offshore installations of the petroleum industry which are not included in trade data.
3. Include undistributed earnings of foreign direct investment companies. The counterpart of these earnings is shown as an inflow of direct reinvestment capital under "Corporate investment".
4. Include transactions of foreign military and diplomatic establishments.
5. Refer to receipts and repayments on market and project loans by the Governments and statutory authorities.
6. Refer to changes in overseas assets of the Government and statutory authorities and subscription to international institutions and international commodity agreements.
7. Refer to receipts and repayments of long-term credit extended to the national shipping and airline companies.
8. Refer to the change in net overseas assets.

9. Refer to the change in the net overseas assets of finance companies, merchant banks and other identified financial transactions.

10. With the termination of the legal tender status of the Malayan dollar in January 1969, Malaysia's estimated share of the residual assets of the Board of Commissioners of Currency, Malaya and British Borneo is reflected since that date in the accumulated assets of the Federal Government instead of the Central Bank's gold and foreign exchange holdings.

Source: Department of Statistics
Inter-Agency Planning Group

Table. A-2 Balance of Payments

$ million

	1981	1982	1983	1984	1985	1986	1987	1988	1989
I. GOODS [1]									
Exports (f.o.b.)	3,330	3,232	3,396	3,346	3,761	3,908	3,679	4,070	4,921
Imports (f.o.b.)	2,990	2,891	3,010	3,071	3,226	3,349	3,202	3,427	3,890
Merchandise balance	+340	+341	+386	+275	+535	+559	+477	+643	+1,031
Non-monetary gold	— 29	— 3	— 3	— 3	— 5	— 6	— 2	— 6	— 18
II. SERVICES (net)									
Freight and insurance	—133	—145	—155	—154	—161	—165	—170	—186	—347
Other transportation	— 8	— 8	— 9	— 15	— 16	— 11	— 9	— 12	— 14
Travel	— 67	— 70	— 69	— 74	— 60	— 78	— 69	— 73	— 96
Investment income [3]	—231	—177	—195	—210	—255	—268	—144	—154	—334
Government transactions n.i.e. [4]	+145	+131	+130	+197	+225	+189	+132	+125	+105
Other services	— 40	— 41	— 43	— 50	— 53	— 74	— 91	—100	—116
Balance on services	—334	—310	—331	—336	—341	—407	—351	—400	—702
BALANCE ON GOODS AND SERVICES	+177	+ 27	— 38	— 51	+180	+146	+134	+237	+911
III. TRANSFERS (net)									
Private	—205	—207	—206	—201	—195	—198	—183	—180	—309
Government	+ 12	+ 13	+ 25	+127	+137	+ 90	+ 43	+ 37	+ 29
BALANCE ON GOODS, SERVICES AND TRANSFERS	— 16	—167	—219	—126	+122	+ 40	— 18	+ 94	+731
IV. LONG-TERM CAPITAL MOVEMENTS (net)									
Official long-term capital	—159	+ 87	+146	+229	+174	+218	+361	+161	+264
Government	(+ 13)	(+ 22)	(+ 48)	(— 7)	(+ 70)	(— 9)	(+ 31)	(+ 63)	(+147)
Statutory authorities [5]	(+ 10)	(+ 28)	(+ 41)	(+ 27)	(+ 33)	(+ 60)	(+ 53)	(+ 50)	(+ 32)
Other [6]	(—182)	(+ 37)	(+ 57)	(+209)	(+ 69)	(+167)	(+348)	(+ 48)	(+ 85)
Corporate investment	+180	+235	+270	+165	+150	+170	+120	+ 93	+245
Commercial credits [7]	—	—	—	—	—	—	—	—	— 3
Balance on long-term capital	+ 21	+322	+416	+394	+334	+388	+512	+254	+504
BASIC BALANCE	+ 5	+155	+197	+266	+446	+428	+494	+348	+ 1,235
V. PRIVATE FINANCIAL CAPITAL AND UNRECORDED TRANSACTIONS (net)									
Commercial banks [8]	+ 77	+ 23	+ 59	—	—102	+ 33	+ 9	+115	—126
Other	—	—	—	—	—	—	—	—	— 27
Errors and omissions, including other short-term capital	—101	— 95	—212	—204	—235	—396	—543	—286	—589
OVERALL BALANCE (surplus + / deficit —)	— 19	+ 83	+ 44	+ 62	+109	+ 65	— 41	+177	+494
VI. ALLOCATION OF SPECIAL DRAWING RIGHTS	—	—	—	—	—	—	—	—	—
VII. IMF RESOURCES	—	—	—	—	—	—	—	—	—
VIII. NET CHANGE IN CENTRAL BANK RESERVES (increase —/decrease +)	+ 19	— 83	— 44	— 62	—109	— 65	+ 41	—177	—494
Special drawing rights	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)
IMF reserve tranche position	(— 2)	(— 2)	(— 12)	(— 1)	(— 20)	(— 30)	(— 33)	(— 4)	(— 8)
Gold and foreign exchange [10]	(+ 21)	(— 81)	(— 32)	(— 61)	(— 89)	(— 35)	(+ 74)	(—173)	(—486)

[1] Data on services, transfers and private capital flows from 1974 may not be strictly consistent with those of earlier years as the basis for estimation has been revised.
[2] Adjusted for valuation and coverage to a balance of payments basis. Imports include military goods and commercial ships and aircraft. Data from 1977 include also imports for offshore installations of the petroleum industry which are not included in trade data.
[3] Include undistributed earnings of foreign direct investment companies. The counterpart of these earnings is shown as an inflow of direct reinvestment capital under "Corporate investment".
[4] Include transactions of foreign military and diplomatic establishments.
[5] Refer to receipts and repayments on market and project loans by the Government and statutory authorities.
6,7,8,9,10 See footnotes on following page.

Source: Department of Statistics

Table A-2 Balance of Payments (cont'd)

$ million

Item	1970	1971	1972	1973	1974	1975	1976	1977
I. GOODS [2]								
Exports (f.o.b.)	5,030	4,864	4,736	7,363	10,023	9,057	13,519	14,065
Imports (f.o.b.)	3,952	4,159	4,356	5,664	9,345	8,330	9,556	11,113
Merchandise balance	+1,078	+705	+380	+1,699	+677	+727	+3,773	+2,752
Non-monetary gold	— 11	— 19	— 15	— 9	— 5	— 3	— 11	— 10
II. SERVICES (net)								
Freight and insurance	—304	—333	—359	—439	—714	—631	—726	—890
Other transportation	— 31	— 34	— 35	+ 49	+ 83	+ 98	+ 96	+ 97
Travel	—105	—108	—101	— 94	— 39	—103	—151	—195
Investment income [3]	—355	—383	—378	—459	—997	—726	—971	—1,109
Government transactions, n.i.e. [4]	+ 68	+ 32	+ 25	+ 29	+ 43	+ 47	+ 36	+ 27
Other services	—145	—105	—108	—101	— 94	— 95	—129	—142
Balance on services	—892	—878	—936	—1,117	—1,719	—1,402	—1,807	—2,309
BALANCE ON GOODS AND SERVICES	+305	—193	—541	+597	—1,047	—678	+1,955	+1,453
III. TRANSFERS (net)								
Private	—199	—180	—176	—183	—125	—115	—131	—133
Government	+ 19	+ 31	+ 19	+ 34	+ 21	+ 36	+ 21	+ 22
BALANCE ON GOODS, SERVICES AND TRANSFERS	+ 25	—339	—698	+340	+1,131	—757	+1,845	+1,342
IV. LONG-TERM CAPITAL MOVEMENTS (net)								
Official long-term capital	+ 31	+ 308	+692	+120	+ 276	+872	+489	+671
Government [5]	(— 4)	(+ 375)	(+ 546)	(+ 72)	(+ 227)	(+ 912)	(+ 369)	(+ 535)
Statutory authorities [5]	(+ 6)	(— 7)	(+ 14)	(+ 13)	(+ 51)	(+ 24)	(+ 50)	(+ 94)
Other [6]	(+ 29)	(+ 39)	(+ 332)	(+ 46)	(— 2)	(— 64)	(+ 70)	(— 8)
Corporate investment	+207	+ 306	+320	+422	+1,374	+761	+763	+1,183
Commercial credits [7]	+ 5	— 15	+173	+ 66	— 67	+761	+ 154	— 30
Balance on long-term capital	+213	+689	+1,185	+586	+1,583	+1,716	+1,406	+1,784
BASIC BALANCE	+338	+360	+487	+833	+437	+959	+3,361	+3,139
V. PRIVATE FINANCIAL CAPITAL AND UNRECORDED TRANSACTIONS (net)								
Commercial banks [8]	— 16	+ 68	— 15	+259	+ 65	—108	+ 66	+197
Other [9]	+ 8	+ 5	+ 9	— 5	+ 30	+ 25	—241	—1,477
Errors and omissions, including other short-term capital	—260	—230	— 92	—510	— 81	—705	—1,037	—1,304
OVERALL BALANCE (surplus +/deficit —)	+ 68	+203	+389	+576	+452	+171	+2,054	+755
VI. ALLOCATION OF SPECIAL DRAWING RIGHTS	+ 64	+ 61	+ 60	—	—	—	—	—
VII. IMF RESOURCES	—	—	—	—	—	—	—	—
VIII. NET CHANGE IN CENTRAL BANK RESERVES (increase —/decrease +)	—132	—264	—449	—576	—452	—171	—2,319	—490
Special drawing rights	(— 72)	(— 61)	(— 60)	(+ 6)	(+ 10)	(— 11)	(— 5)	(+ 116)
IMF reserve tranche position	(— 47)	(+ 35)	(—)	(— 22)	(+ 1)	(— 21)	(+ 4)	(+ 9)
Gold and foreign exchange [10]	(— 13)	(—238)	(—389)	(—560)	(—463)	(—139)	(—2,318)	(—615)

[2], [3], [4], [5] See footnotes on previous page.

[6] Refer to changes in overseas assets of the Government and statutory authorities and subscriptions to international institutions and international commodity agreements.

[7] Refer to receipts and repayments of long-term credits extended to the national shipping and airline companies.

[8] Refer to the change in net overseas assets.

[9] Refer to the change in the net overseas assets of finance companies, merchant banks and other identified financial transactions.

[10] With the termination of the legal tender status of the Malaysia dollar in January 1969, Malaysia's estimated share of the residual assets of the Board of Commissioners of Currency, Malaya and British Borneo is reflected there that date in the accumulated assets of the Federal Government instead of the Central Bank's gold and foreign exchange holdings.

Source: Department of Statistics
Inter-Agency Planning Group

Table A-3

External Reserves of Malaysia

($ Million)

AT END OF PERIOD		GROSS EXTERNAL RESERVES OF MALAYSIA (MISSION RINGGIT)				OTHER OFFICIAL RESERVES	GROSS OFFICIAL RESERVES	NET OFFICIAL RESERVES	NET FOREIGN ASSETS OF COMMERCIAL BANKS	NET EXTERNAL RESERVES
		Total	Special Drawing Rights	IMF Gold tranche position	Gold and Foreign Exchange					
1976		6,273.3	191.8	158.4	5,922.1	110.1	6,382.4	6,359.3	-252.2	6,107.1
1977		6,770.5	76.3	149.2	6,545.0	103.7	6,874.2	6,842.7	-449.1	6,393.6
1978	Jan	6,759.8	76.3	149.3	6,534.2	104.5	6,864.3	6,830.3	-509.3	6,321.0
	Feb	6,765.9	76.3	149.3	6,540.3	104.0	6,869.9	6,838.1	-442.7	6,395.4

Table A-4

Peninsular Malaysia: Consumer Price Index

Period	Consumer Price Index (1967 = 100)									
	Total	Food	Beverages and tobauo	Clothing and footwear	Gross rent, fuel and power	Furniture, furnishing and household equipment	Medical care and health expenses	Transport and comminication	Recreation extertainment education and cultural services	Miscellaneous goods and services
	Weight									
	100.0	46.8	8.9	4.8	9.4	6.6	2.0	10.4	5.6	5.5
1968	99.8	98.5	100.4	100.5	100.3	100.3	100.5	101.2	103.9	101.3
1969	99.4	97.1	100.7	100.9	100.5	101.9	100.7	100.7	104.5	103.3
1970	101.3	99.1	102.8	102.3	101.1	105.5	101.8	102.8	106.3	103.5
1971	102.9	100.6	103.5	103.0	102.0	108.2	102.6	103.8	111.1	106.1
1972	106.2	103.8	107.2	105.8	102.8	114.0	103.4	106.5	115.5	112.8
1973	117.4	120.3	108.6	129.0	104.3	128.6	107.8	109.4	119.8	122.5
1974	137.8	151.7	110.7	144.1	111.5	150.5	116.4	119.7	126.9	140.4
1975	144.0	157.4	121.2	143.3	118.9	157.8	122.4	127.1	129.5	147.9
1976	147.8	160.5	122.8	146.9	125.6	161.7	135.2	133.3	130.3	151.3
1977	154.8	169.4	127.3	152.6	133.3	167.3	140.9	138.1	132.7	159.4
1978 Jan - Feb	161.5	176.6	133.7	157.3	139.4	173.5	145.0	145.6	135.0	168.4

1 Annual indices are simple averages of monthly indices.

Table A-5

Malaysia: Employment Growth By Sector, 1978-80

	1978		1980			
	Estimated employment (000)	Share of total (%)	Estimated employment (000)	Share of total (%)	Increase 1979-80 (000)	Share in job creation (%)
Agriculture, forestry, livestock and fishing	1,972.5	43.9	2,023.6	42.0	51.1	16.0
Mining and quarrying	90.2	2.0	91.7	1.9	1.5	0.5
Manufacturing	587.3	13.1	675.1	14.0	87.8	27.4
Construction	196.5	4.4	227.0	4.7	30.5	9.5
Utilities	27.7	0.6	30.8	0.6	3.1	1.0
Transport, storage and communications	207.9	4.6	227.6	4.7	19.7	6.1
Wholesale and retail trade	559.3	12.4	613.7	12.8	54.4	17.0
Finance and insurance	43.3	1.0	47.0	1.0	3.7	1.1
Producers of government services	621.8	13.8	673.2	14.0	51.4	16.1
Other services	187.1	4.2	204.1	4.3	17.0	5.3
TOTAL:	4,493.6	100.0	4,813.8	100.0	320.2	100.0

Source - TMP Mid-Term Review 1978

Table A-6 Malaysia: Exports 1976-78

($ Million)

	1976	1977	1978	Average Annual Growth Rate (%)
Rubber	3,117	3,379	3,537	20.4
Tin	1,527	1,704	1,920	16.8
Palm Oil (crude and refined)	1,196	1,768	1,740	9.6
Crude Oil	1,550	1,908	2,413	49.2
Petroleums (partly refined and petroleum products)	353	203	110	-22.7
Sawlogs	1,471	1,519	1,562	32.7
Sawn Timber	854	790	747	24.0
Canned Pineapple	62	65	62	6.7
Pepper	137	143	145	11.0
Manufactures (excluding pineapple and petroleum products)	2,359	2,601	3,511	23.6
Others	816	891	1,005	-
Gross Exports	13,442	14,971	16,752	22.0

Source - TMP Mid-Term Review 1978

Table A-7

Third Malaysia Plan
Projection of Balance of Payments 1975-1980

($ Million)

	1975	1980	Cumulative Total '76-80
Goods and services			
Receipts	10,165	19,029	80,443
Payments	10,386	20,840	85,154
Net position	-221	-1,811	-4,711
Transfer (Net)			
Private	-160	-110	-655
Government	+35	+45	+205
Balance on current account	-346	-1,876	-5,161
Long-term capital (net)			
Public	+827	+1,518	+5,800
Private	+525	+900	+3,650
Basic Balance	+1,006	+542	+4,289
Errors and amission including short-term capital	-835	-400	-2,450
Overall surplus (+) or deficit (-)	+171	+142	+1,839
Allocation of IMF Special Drawing Rights	-	-	-
Net change in external reserves (increase - decrease +)	-171	-142	-1,839

Table A-8 Annual Growth Rates of Gross Domestic Product (At Constant Prices)

Years	Malaya 1956-60[1] (1960=100)	Malaysia 1961-65 (1965=100)	Malaysia 5 year plans 1st 1966-70 (1965=100)	2nd 1971-75 (1970=100)	3rd 1976-80 (1975=100)
1	3.0%	1.4%	6.2%	6.5%	10.8%
2	2.5%	6.9%	1.0%	9.4%	7.8%
3	0.5%	5.5%	4.2%	11.7%	7.0%[2]
4	4.5%	5.8%	10.4%	8.3%	
5	9.9%	5.6%	5.0%	0.8%	
Average	4.1%	5.0%	5.4%	7.3%	8.5%

1. Peninsular Malaya
2. Estimates

Source: Bank Negara Malaysia, Economic Planning Unit and Department of Statistics.

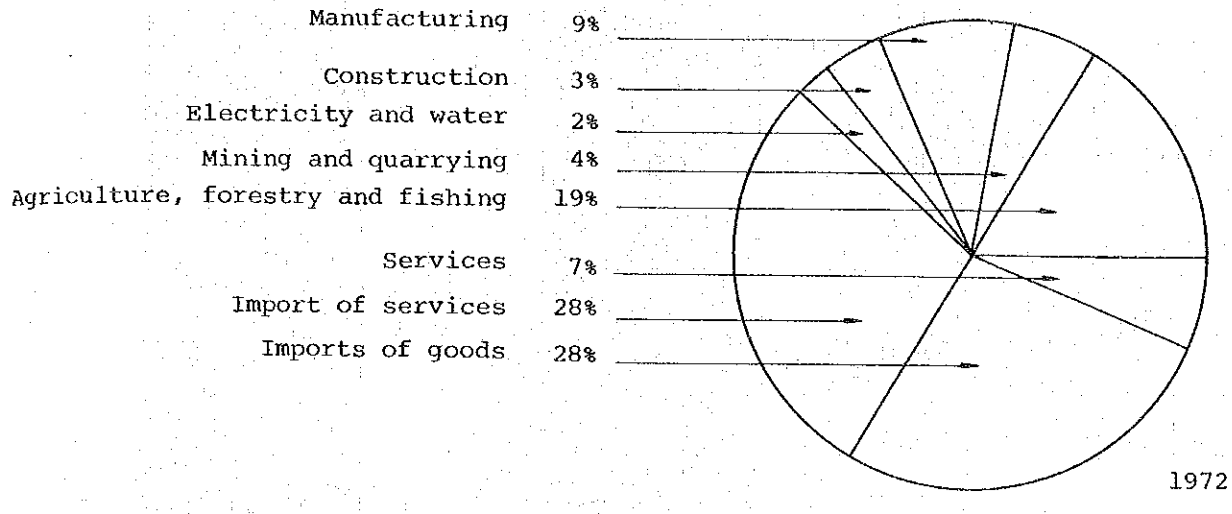
Table A-9 COMPOSITION OF THE GROSS DOMESTIC PRODUCT (GDP) BY INDUSTRY OF ORIGIN

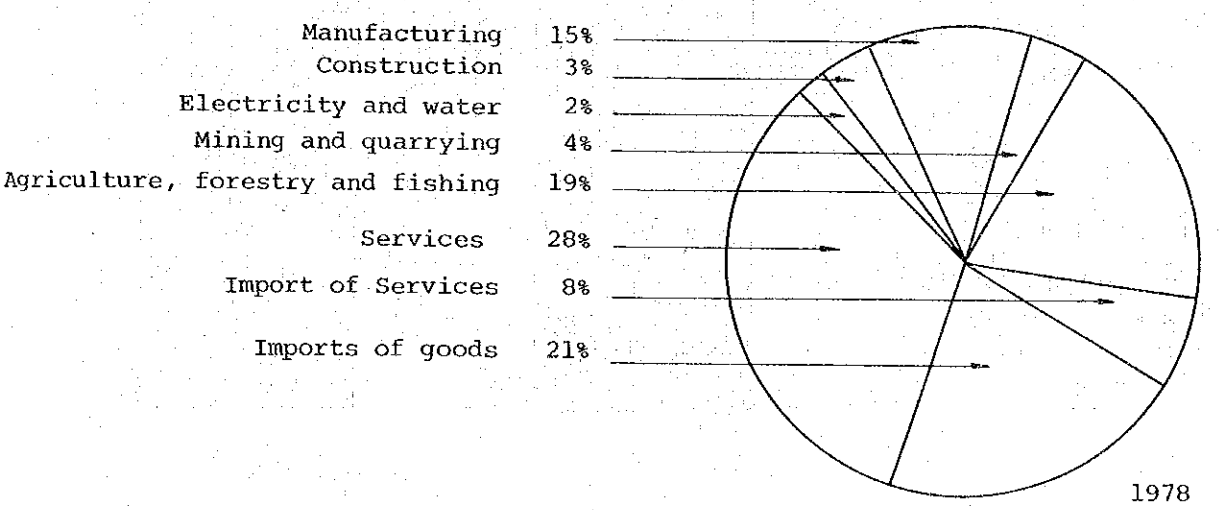
	1955[1] (1960=100)	1965[1] (1960=100)	1975 (1970=100)	1978 (1970=100)
	Per cent of GDP			
Agriculture, forestry and fishing (of which: rubber planting)	40.2 (26.0)	31.5 (21.2)	27.6 (10.0)	25 (9)
Mining and quarrying	6.3	9.0	4.6	5
Manufacturing	8.2	10.4	16.4	19
Construction	3.0	4.5	3.8	4
Services	42.3	44.6	47.6	47

1. Peninsular Malaysia only

Source: Economic Planning Unit and Department of Statistics.

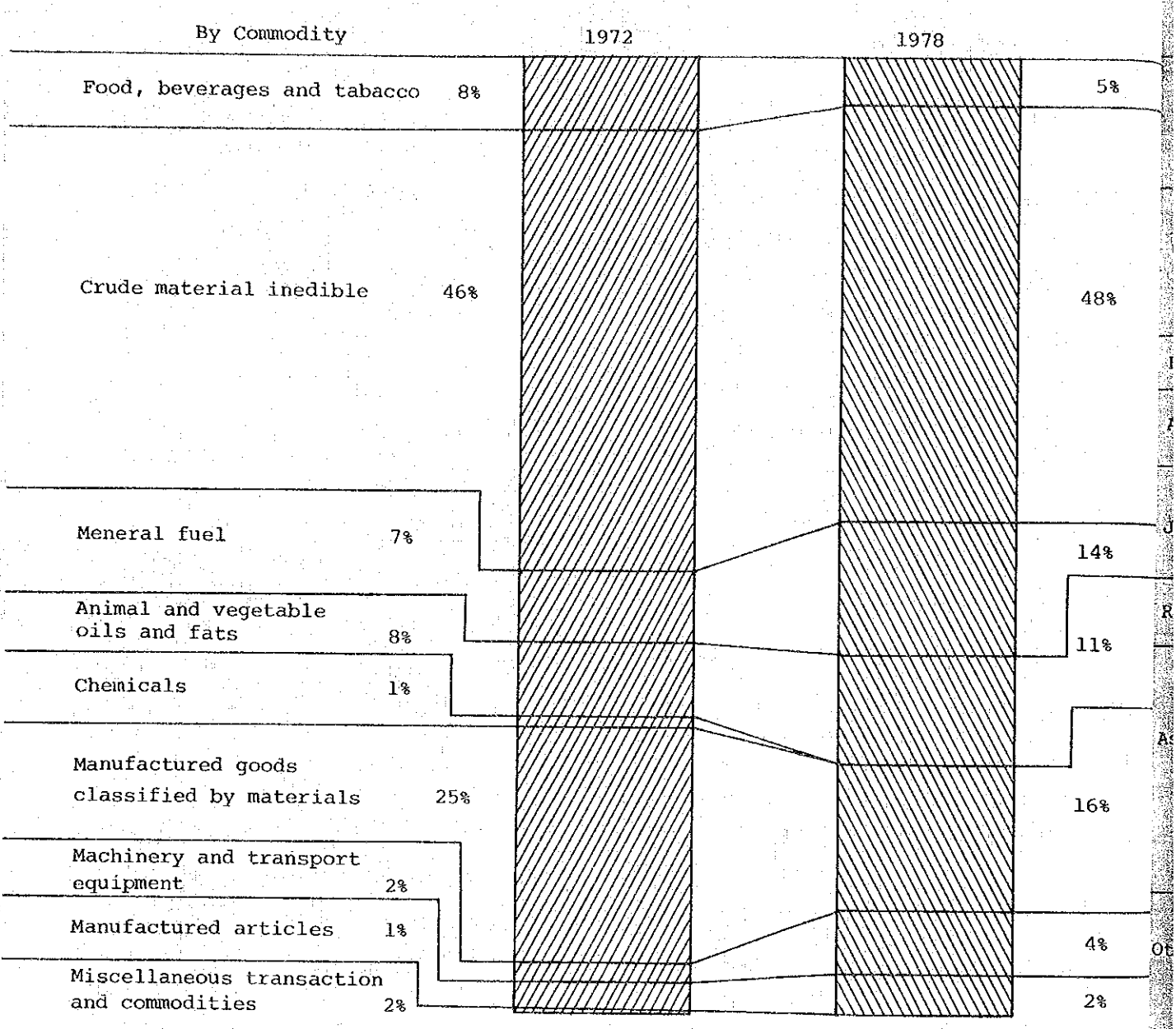
Figure A-1 Percentage Distribution of Gross National Product By Origin 1972 and 1978





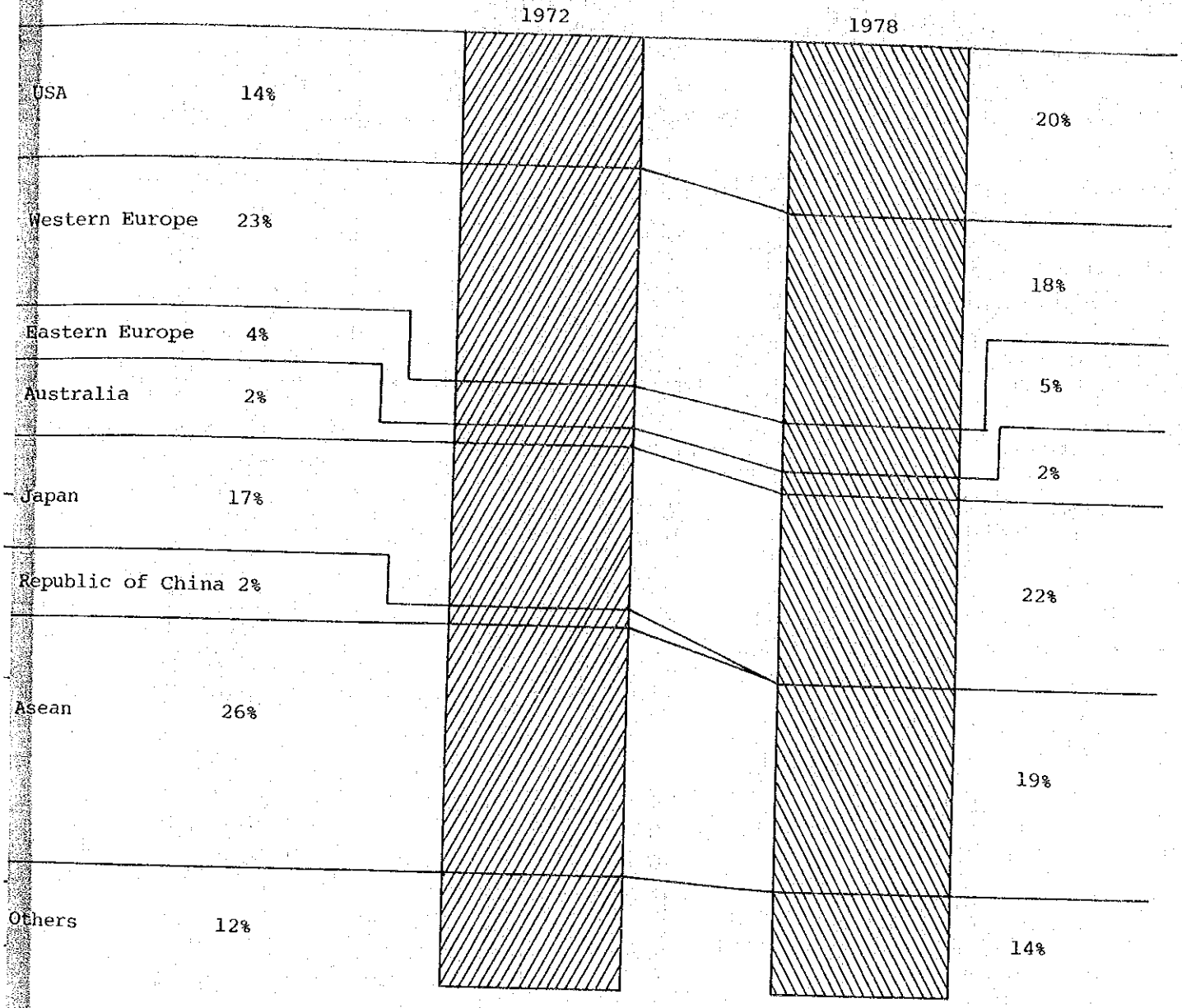
Source: Economic Report Ministry of Finance 1972/73 and 1978/79

Figure A-2 Distribution of Exports by Commodity 1972 and 1978



Source: Economic Reports Ministry of Finance 1972/73 and 1978/79

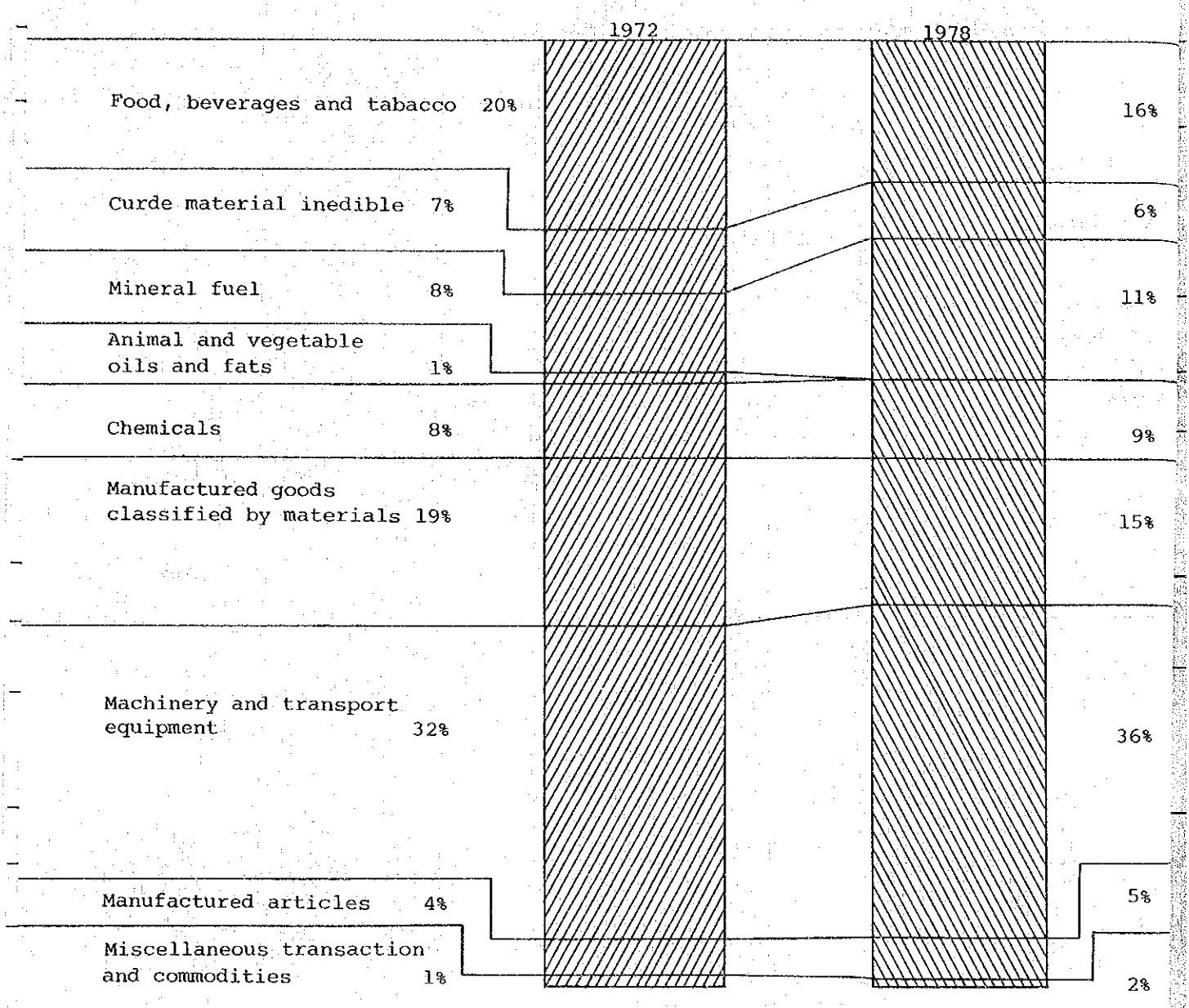
Figure A-3 Distribution of Exports by Destination
1972 and 1978



Sources: Economic Report Ministry of Finance 1978/79

Figure A-4 Distribution of Imports by Commodity

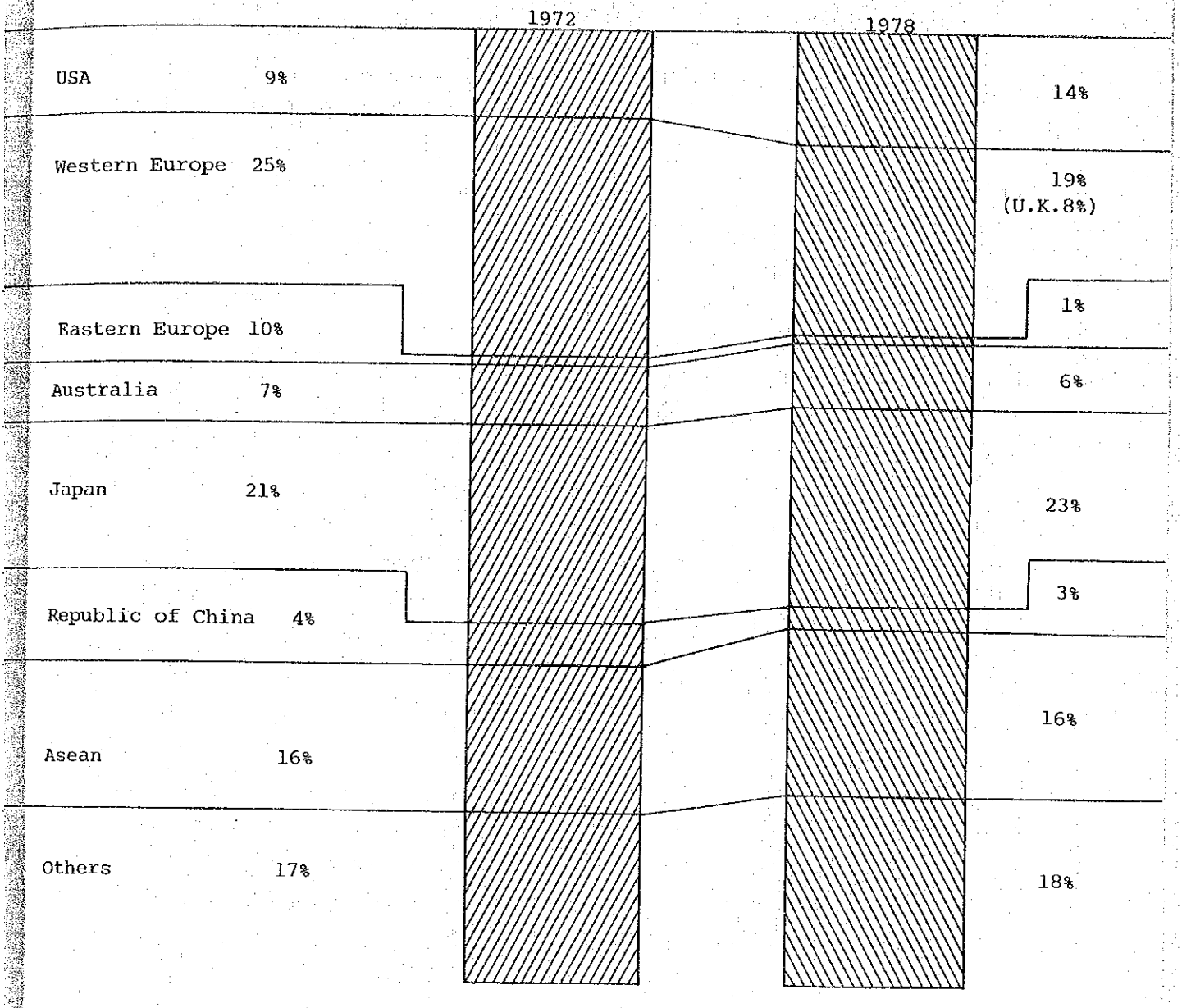
1972 and 1978



Source: Economic Reports Ministry of Finance 1977/78

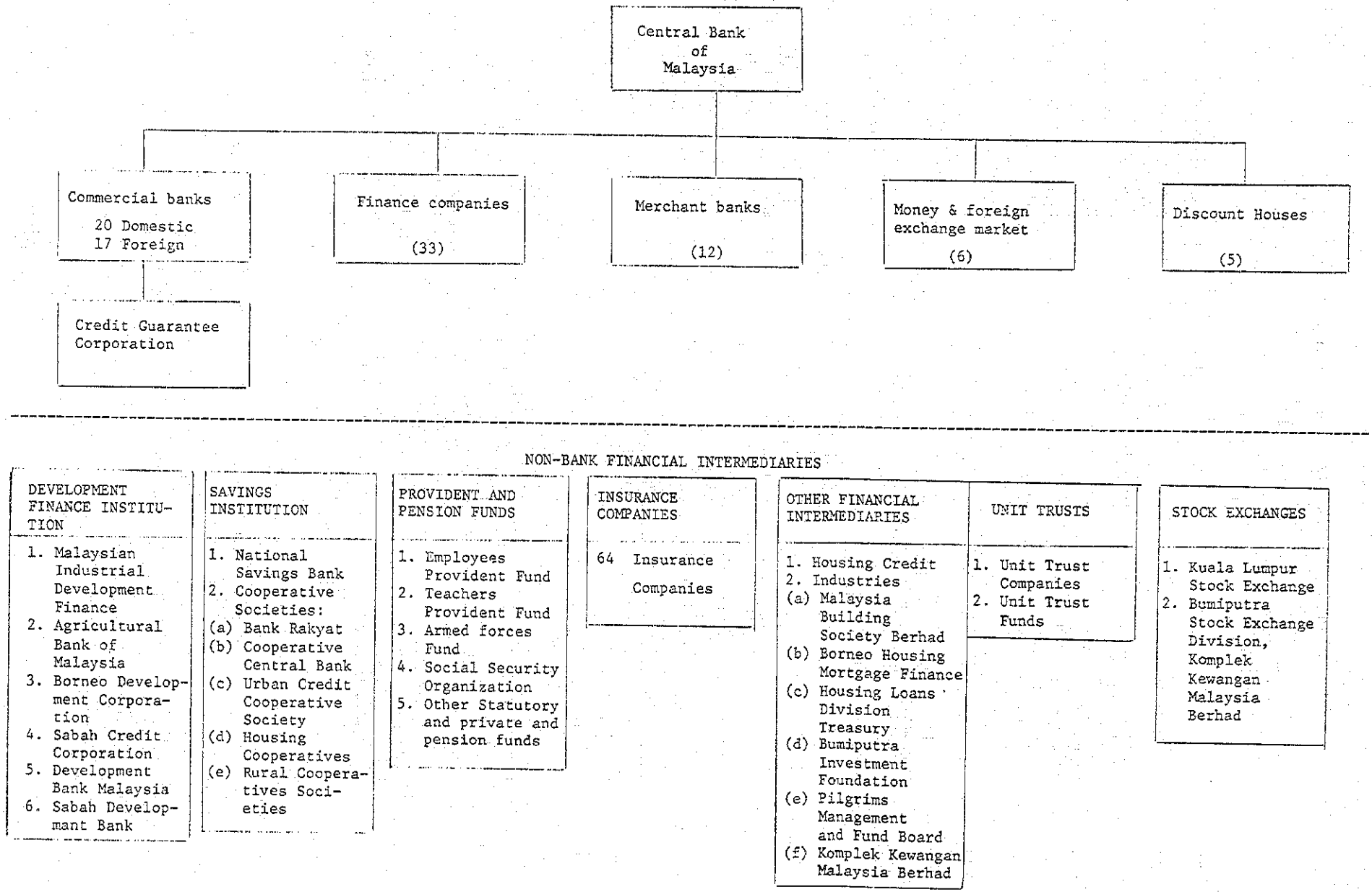
Figure A-5 Distribution of Import by Origin

1972 and 1978



Source: Economic Report Ministry of Finance 1977/78

Figure A-6 The Financial System Structure as at Dec. 31, 1978 The Banking System



2.7 Kedah

2.7.1 General

Kedah is situated on the North Western part of Peninsular Malaysia, and forms part of the 237,000 acres of Muda Scheme. This makes her the leading rice producing state in Malaysia which gives her the name of "The Rice Bowl of Malaysia".

Rice cultivator in the state occupies 320,990 acres and rubber also plays an important role in the State economic activities, taking up 452,590 acres.

2.7.2 Climate

Kedah has a tropical-monsoon climate which is warm and humid. The temperature is 32°C (90°F) and the average minimum is 24°C(75°F). Relative humidity varies between 70 per cent and 90 per cent. The State experience two periods of high rainfall and two periods of low rainfall. The maxima occur in April - May and October - November which are inter-monsoonal periods. The minima occur during the monsoons i.e. in January - February and in June. Annual precipitation approximates around 110" to 104".

2.7.3 Population

The area of the State is approximately 3,600 square miles and the population is estimated to be about 955,000 with the Malays forming the majority (71%), followed by the Chinese (19%), Indians (8%) and others (2%). A major portion of the population is relatively young with 43% in the 1 - 14 years age group. This indicates a high dependency ratio. According to the 1970 Census, the working population is estimated at 660,000 with an annual growth rate of 2.4%. The unemployment rate is estimated at 4.3%. These features indicate a high demand for education, health and employment. As the expansion in the fields of agriculture and forestry as the solution to unemployment problem is rather limited, there will be a high demand on industrial growth. To meet this demand the Government encourages the establishment of labour intensive projects.

2.7.4 Economy

Kedah has been one of the less developed States in the Peninsular Malaysia, with a per capita income of about $800 which is only 66% of the National Average per capital income (about $1,512 per capita). The total GDP of the State, in 1970, is estimated at $1.0 billion with the State's

expenditure being $63.4 million. The economy of the State is predominantly agricultural, with forestry, fishing and more recently, industrialisation being the main economic forms of activities.

2.7.5 Development

In line with the New Economic Policy the Federal and the State Government have given high priority and attention to develop the depressed and the under-developed areas in the State. Various strategies-agricultural and industrial have been proposed, adopted and implemented.

The agricultural strategy aims to:

1. Strengthen the State's rural economy through diversification and intensification.
2. Maintain and if possible, increase the number of people who earn their living from the land.
3. Increase household incomes especially amongst the poorer sections of the rural community.

The industrial strategy undertakes to accelerate and disperse industrial development in less developed areas. Extensive programmes of industrialisation for the State have been launched and implemented through the various public and quasi public agencies and statutory bodies such as the Kedah State Development Corporation, the State Economic Development Corporation, the State Economic Planning Unit and State Development Office.

The State officials have identified Alor Setar, Sungei Petani, Kulim and Baling as the potential growth centres in the next 10 years. Five industrial estates are presently being developed around the major towns to cater for the demand of the various investors and they are situated as follows:-

1. Tikam Batu (100 acres) - Light and Heavy Industries.
2. Bakar Arang (550 acres) - Light and Heavy Industries.
3. (a) Mergong I (86 acres) - Light and Service Industries.
   (b) Mergong II (82 acres) - Light and Service Industries.

4. Kuala Kedah (47 acres) - Marine-based industries.
5. Kulim (523 acres) - Light and Heavy Industries.

Total area of Industrial Sites - 1,390 acres.

The Federal Government has declared the whole state of Kedah, except District of Kuala Muda, as locational incentive areas, which means that the investment incentives in other areas are more and the tax holidays are longer than those available for the Kuala Muda District. By doing so, the Federal Government hopes to disperse industries away from existing industrial concentration in urban areas. However the Kuala Muda District can enjoy an additional year of tax relief period over urban areas.

The tax relief period up to a maximum of 10 years for all areas in Kedah except District of Kuala Muda are as tabulated:

Qualifying Fixed Capital Expenditure/Employment	Period of Tax Holidays (Years) Kulim and other areas outside K. Muda District	Bakar Arang & Other areas within K. Muda District
For fixed capital expenditure/less than M$250,000/- or employment less than 101	**5	*3
For fixed capital expenditure not less than M$250,000/- or employment not less than 201	6	4
For fixed capital expenditures not less than M$560,000/- or employment not less than 201	7	5
For fixed capital expenditures not less than M$1,000,000/- or employment not less than 351	8	6
Priority Product	1	1
Malaysia Consent	1	1
Total no. of years of Tax Relief	10	8

Note: * One additional year over urban areas

** Three additional years over urban areas

2.7.6 Infrastructures

The State Government has improved the infrastructure facilities of the State to meet the demands of the industrial estates. The National Electricity Board (NEB) has provided an underground 11 kv lines alongside surfaced roads within the industrial sites. Different tariff are being charged against the medium and large size industries.

Adequate water supply has been assured of by JKR. With the increased capacity of Bukit Penang Reservoir, Alor Setar, in September 1978, the water capacity and pressure for Mergong and Kuala Kedah Site was adequate. For the areas of Kulim, Tikam Batu and Bakar Arang, additional demand of water can be met by arrangements with Penang Water Authority, through the PWD.

Telecommunication services like telephone and telex are readily available. Ample lines are reserved for all industrial estates.

Labour-rates in Kedah, in particular, favour the needs of labour intensive export-oriented industries. The rates are as follows:-

1. Daily-paid workers: (all rates are in Malaysian Ringgit)
   Unskilled (with at least 6 years of primary education)
   - $3.50 to $4.00 per day.
   Semi-skilled (with at least 3 years of secondary education)
   - $4.00 to $6.00 per day.
   Skilled (with 3 years of secondary education plus 2 years of industrial training)
   - $6.00 to $8.00 per day.

2. Monthly Salaried Work: (all wages are in Malaysian Ringgit)
   Clerical group (with at least 5 years of secondary education)
   - $180 to $400 per month.
   Executive officers (with at least 2 years of pre-university of equivalent plus 3 years in colleges) - $400 to $1,000/- per month
   Professional and Managerial Group (with college/university education plus experienced ($800 to $2,000)

2.7.7 Banking

There are numerous banks and financial institutions to render service of the economy of the State. Among them are the various commercial banks, the Malaysian Industrial Development Finance Behad (MIDFB), the Credit Guarantee Corporation, Borrwoing Companies and the Merchant Bankers. The facilities offered are such as underwriting services, provision of loan, provision of credit facilities guarantee scheme and stock exchange activities.

2.7.8 Future Development Strategy

The recent Kedah - Perlis Development Study recommended the development of potential to assist spots in the State such as the Gunung Jerai, beaches of Pantai Merdeka and Langkawai. The study also recommended the establishment of more recreational facilities in Alor Setar and the Development of more links with tourist resorts in Thailand such as Phuket Islands and Bangkok. These developments with certainly promote tourism in Kedah.

2.8 Alor Setar

Alor Setar is the capital city of the State of Kedah and is also the residence of His Highness The Sultan of Kedah. Being a capital city, Alor Setar has grown into a major administrative centre too. Most of the Government departments and other public agencies in Kedah are based in Alor Setar.

Commercial activities have grown rapidly due to the adequate facilities provided by both the Government and the private agencies in servicing these activities. Numerous banks have been opened which offer the normal banking services industry making loans and advances, discounting trade bills and provision of business investment advisory services.

In addition to the various services available, there is a good network of road, and railways and a domestic airport that link Alor Setar with the surrounding areas which are predominantly agricultural. This has made Alor Setar into a busy centre where all the business and trading activities have focussed upon. The good communication between

Alor Setar and Butterworth where shopping facilities are available has further enhanced the position of Alor Setar as a trading centre.

As a service centre, the city plays a dominant role for Perlis too because the State is too small to support the same order of activity.

The employment in Alor Setar are largely absorved by the Governmental agricultural and the commercial sector, mainly retaining. Industrial employment is high too compared to the other towns.

The Government has planned to undertake further development on industrial estate in Alor Star thus diversifying the city's economy.

At present, an industrial estate has been established at Mergong which is 1 1/2 miles from central part of Alor Setar. The Phase I of the industrial estate which occupies and area of 86 acres have been completed while the Phase II which has an area of 82 acres is still undergoing development. Almost all the land has been taken up for light and service industries. This site has been gazetted as a locational incentive area under which a maximum tax relief period of 10 years can be granted.

There are tentatives plans to establish another three industrial estates in Alor Setar under the 4th Malaysia Plan which will commence in 1981. The areas where the industrial estates are to be located are:-

1.	Tandop, Sungai Korok - Phase I	130 acres
	PUase II	100 acres
2.	Jalan Langgar/Hutan Kampung	50 acres
3.	Barrage Site, Mergong	23 acres
	Total	313 acres

State Budget

The following is the estimated Revenue and Expenditure for the year 1979.

	1979
REVENUE	
State Revenue	$31,211,175
Grant and Loan from Federal Government	12,919,697
	44,130,872
EXPENDITURE	
Salary	28,322,867
Other Annual Expenditure	19,611,517
Other Special Expenditure	
Office	2,530,433
Loan	5,334,535
Development and water supply funds	2,000,000
Allocated Expenditure	9,663,759
Total Expenditure	67,463,111
DEFICIT	$23,332,239

BUDGETED DEVELOPMENT EXPENDITURE FOR 1979	
State Funds	$12,362,687
Federal Govt. Grant	22,456,203
Loan	49,984,084
	$84,802,974

BUDGETED WATER SUPPLY EXPENDITURE FOR 1979	
State Funds	$8,731,466
Loan	1,848,678
	$10,589,144

3. Existing Excreta Disposal System

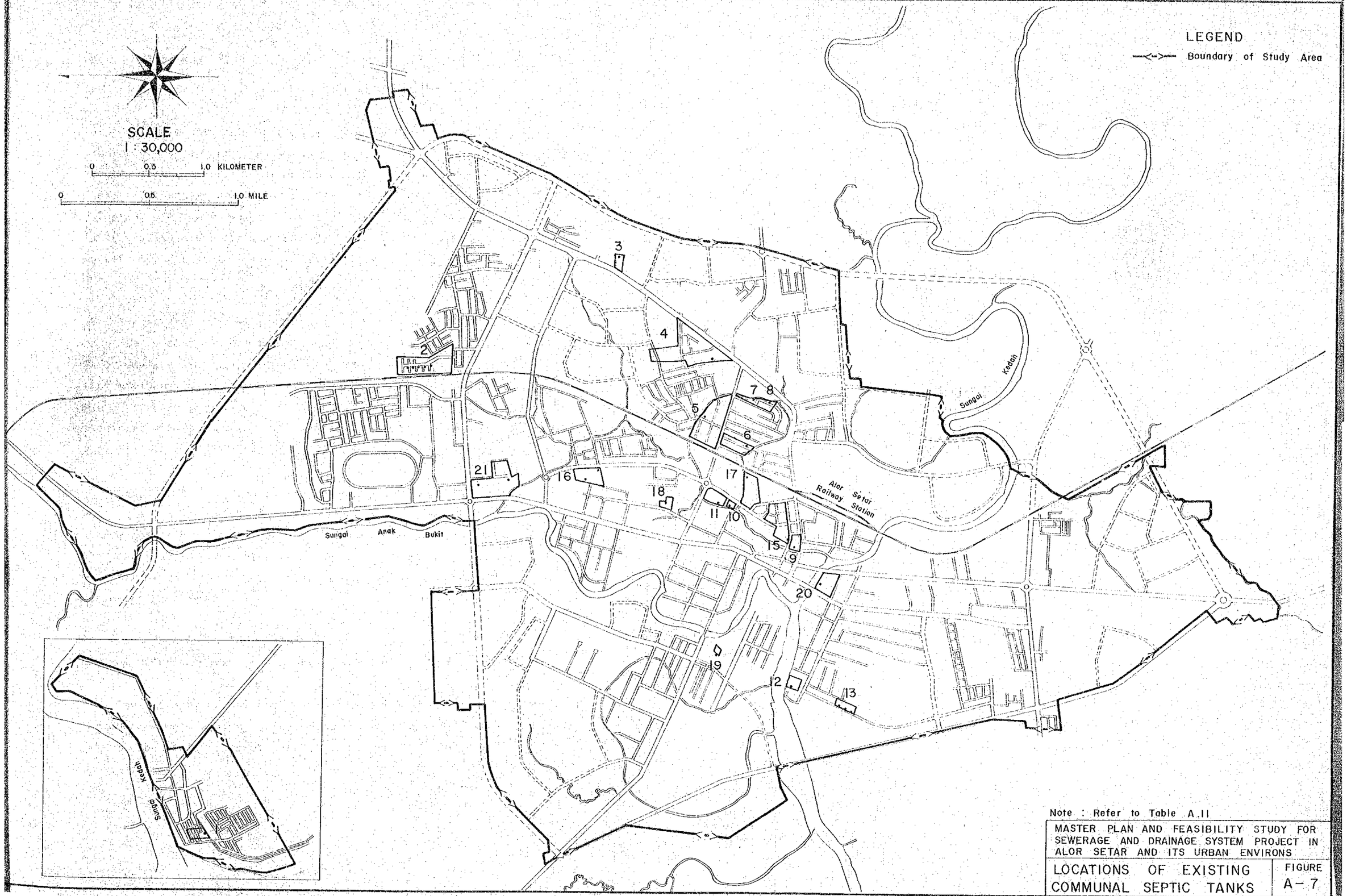
Distributions of the existing bucket (conservancy system) and commercial septic tanks are obtained from MPKS as shown in Tables A-10, A-11 respectively and in Figure A-1.

Table A-10 Distribution of Bucket System

	Area	No. of Bucket
1.	Sungai Korok sampai Simpang Kuala	488
2.	Pengkalan kapal, Pekan China, Pekan Kelayu, Penjara Lama Jalan Raja, Jalan Langgar dan Lalan Tunku Ibrahim	298
3.	Seberang Paral	125
4.	Koto Tanah	293
5.	Jalan Peganai	98
6.	Limbong Kapal	151
7.	Jalan Langgar	280
8.	Jalan Putra	215
9.	Kampong Perak	100
10.	Japan Kanchut	80
11.	Lalan Telok Wanjah	155
12.	Alor Merah	42
13.	Tanjong Bendabara & Keretapi	50
14.	Sinpang Tiga Derga	160
	Total :	2,555

Table A-11 Distribution of Communal Septic Tanks

Ref. No. (Refer to Fig.A-7)	Area	No. of Communal Septic Tank	Population Served
1.	Taman Kual Kedah	218	1199
2.	Rancangan Rumah Murah Jln Sultanah	147	809
3.	Malai Flats	180	960
4.	Kawasan Perumahan Jalan Shariff	272	1496
5.	Lorong Tiong	96	528
6.	Lorong Merpati	53	292
7.8.	Jalan Ghouse	77	424
9.	Market	-	
10.	"	-	
11.	"	-	
12.	Rancangan Rumah Tongkang Yard	59	325
13.	Jalan Bunga Raya	70	385
15.	Commercial Area	700	3850
16.	Polis Quoter	54	297
17.	"	144	782
18.	Market	30	165
19.	"	30	165
20.	"	-	
21.	General Hospital		
	Total :	2,130	11,677



Note : Refer to Table A.11

MASTER PLAN AND FEASIBILITY STUDY FOR SEWERAGE AND DRAINAGE SYSTEM PROJECT IN ALOR SETAR AND ITS URBAN ENVIRONS

LOCATIONS OF EXISTING COMMUNAL SEPTIC TANKS

FIGURE A - 7

4. Water Quality Standards

4.1 Present Activity on Water Quality Regulation in Malaysia

Surface water in Malaysia, has been polluted as a result of the rapid developments, of areas including agricultural, industrial, residential, etc. For the pollution control, the Environmental Quality Act was established in 1974 by the Federal Government of Malaysia. Following the Act, several regulations/guidelines of water quality are being prepared by the Federal Government to restore the waters to a tolerable level for beneficial uses by the people.

The strategy for the pollution control by the Government comprises a double-sided approach by: (1) setting-up surface water quality standards for various water uses, and (2) controlling effluent water quality for conservation or restoration of the quality by setting up standards for each type of beneficial use of receiving water. However, the enactments have not been sufficiently enforced, and most of them are still considered only as a guideline.

The Ministry of Health has proposed a guideline for surface water quality, in which Malaysian waters are classified into nine categories of beneficial uses, and 10 parameters of water quality are described for each beneficial use. The description of the parameters are, however, not clear except coliforms, pH, and dissolved oxygen.

As a reference, the surface water quality criteria applied in several countries are shown in Table A-12.

The Ministry of Science, Technology and Environment is preparing the effluent quality criteria for sewage and industrial wastewater. The effluent is classified into three types according to their sources:

(1) Primary plam oil mill wastes,

(2) Rubber factory wastes, and

(3) Other factory, commercial and domestic wastes

The effluent quality of palm oil and rubber factories, which discharge wastes containing high BOD (some have thousands milligram per liter) will be regulated step by step following the special yearly plan established by the Government. For primary plam oil mill wastes, the effluent standards and yearly plan have been established in 1977.

The effluent quality criteria for the other factories will be regulated by both setting up the objectives for water quality of receiving water and establishing the permissible concentration of pollution parameters in the effluent. This is still under drafting stage. The Ministry of Health, Federal Industrial Development Authority, and others are intimately involved in these draft preparation.

4.2 Tentative Effluent Quality Criteria

The effluent from the proposed treatment plants would be discharged into water bodies which have many different beneficial uses such as agriculture, fisheries, recreation, and other possible uses in future. Therefore, the effluent from the treatment plants must be controlled for these uses.

The parameters of water quality to be measured are classified into two categories by the objectives for:

(1) Operation and surveillance of the treatment plant: Water temperature, pH value, dissolved oxygen, BOD COD, suspended solids, and coliforms.

(2) Special purpose: heavy metals (mercury, cadmium, lead, chromium, etc.), arsenic, and other harmful chemicals.

Taking into consideration the draft water quality regulations of Malaysia as mentioned in the previous section, especially the environmental quality regulations for sewerage and industrial effluent currently being drafted, tentative effluent quality criteria are proposed as shown in Table A-13. These criteria are used in designing the proposed treatment plants.

BOD, and coliforms are the most important parameters to check the treatment efficiency. The values for the parameters prepared here should be applied as the tentative effluent criteria. Data accumulated during long term operation should be used for improvement of treatment plant operation and future design.

Coliform bacterial themselves are not harmful to human health, but commonly used as an index parameter of potential contamination of human excreta and, consequently, of enteric disease bacteria. According to the effluent quality criteria prepared by the Ministry of Health as a quideline, for the same beneficial uses, as those of the receiving water of the proposed sewage treatment plant effluent, coliofrms of the effluent is requlated to be a maximum of 20 N/ml. This value may be too conservative because coliforms must be highly diluted and majority portion die off. As a tentative criterion, therefore, 1,000 N/ml are proposed as shown in Table A-13.

Table A-12 Receiving Water Quality Criteria Being Applied in Various Countries

	Coliforms (N/ml)	BOD (mg/l)	SS (mg/l)	pH	DO (mg/l)
Malaysia	10.20(*)	-	-	6 - 9	3
Japan	10/50(*)	3/5/10(*)	5/25(*)	6.5 - 8.5	7.5/5(*)
Philippines	10	-	10	6.5 - 8.5	5
Great Britain	-	20	30	-	10%-40%
Netherland	20/50	3/5	25/80	6.5 - 8.5	50%-120%
USA	10/20/50/100	-	-	-	-
Brazil	100	-	-	-	-
Uruguai	40	-	-	-	-
Ghana	10	-	-	-	-
WHO	0.5/2	-	-	5.9	-

Note: (*) value varies according to type of water uses

Table A-13 Tentatively Recommended Effluent Quality Criteria for Sewage treatment Facility

Parameter	Unit	Value	Remarks
BOD	mg/l	50	5 days at 20°C
Coliforms	N/ml	0.1	Total heavy metals (Hg, Cd, Pb)

APPENDIX B

WATER QUALITY STUDY

CHAPTER 1

WATER POLLUTION STUDY

1.1 General

The Study Area consists of two towns, Alor Setar and Kuala Kedah with 3,175 ha and 125 ha respectively, are about five kilometers apart.

Although both areas extend over the alluvial plain of the Sg. Kedah, Alor Setar is located upstream of Sg. Kedah and Kuala Kedah near the river mouth of Sg. Kedah.

Being located in the flat area, the Study Area has elevations varying from two to three meters above MSWL. Both rivers are influenced by tidal movements, which causes sea water flowing upstream and flooding in case high tide coincide with heavy rains, especially in rainy season. The Tidal Barrage constructed 12 kilometers upstream from the river mouth solved these problems, but on the other hand, changed the flow condition and water quality of the rivers due to the operation of the Barrage keeping river water surface higher than a certain level at the upstream.

The annual rainfall in the area is approximately 2,000 mm, however, there is no rainfall during the season between December and March. The mean tidal range is approximately 1.5 meters at Penang Port, which is the nearest observation station located approximately 140 kilometers south of Kuala Kedah.

Sg. Kedah and Sg. Anak Bukit are utilized for transportation and fishing. Near the river mouth of Sg. Kedah in Kuala Kedah town, river side is utilized for a port of fishing boat.

1.2 Survey on Rivers and Waterways

1.2.1 Survey Method

Water qualities of waterways in the Study Area were surveyed by the project team from June to July, 1979, following the preliminary survey conducted in March, 1979.

Sampling points are shown in Figure B-1, -2. Most of the samples were taken from the surface. Water temperature, pH, electric conductivity (E.C.), and dissolved oxygen (DO) were measured at the site, while Biochemical oxygen demand (BOD_3), suspended solids (SS), chloride ions (Cl^-), and colifirms were analyzed in the laboratory. Water flow rates were also measured.

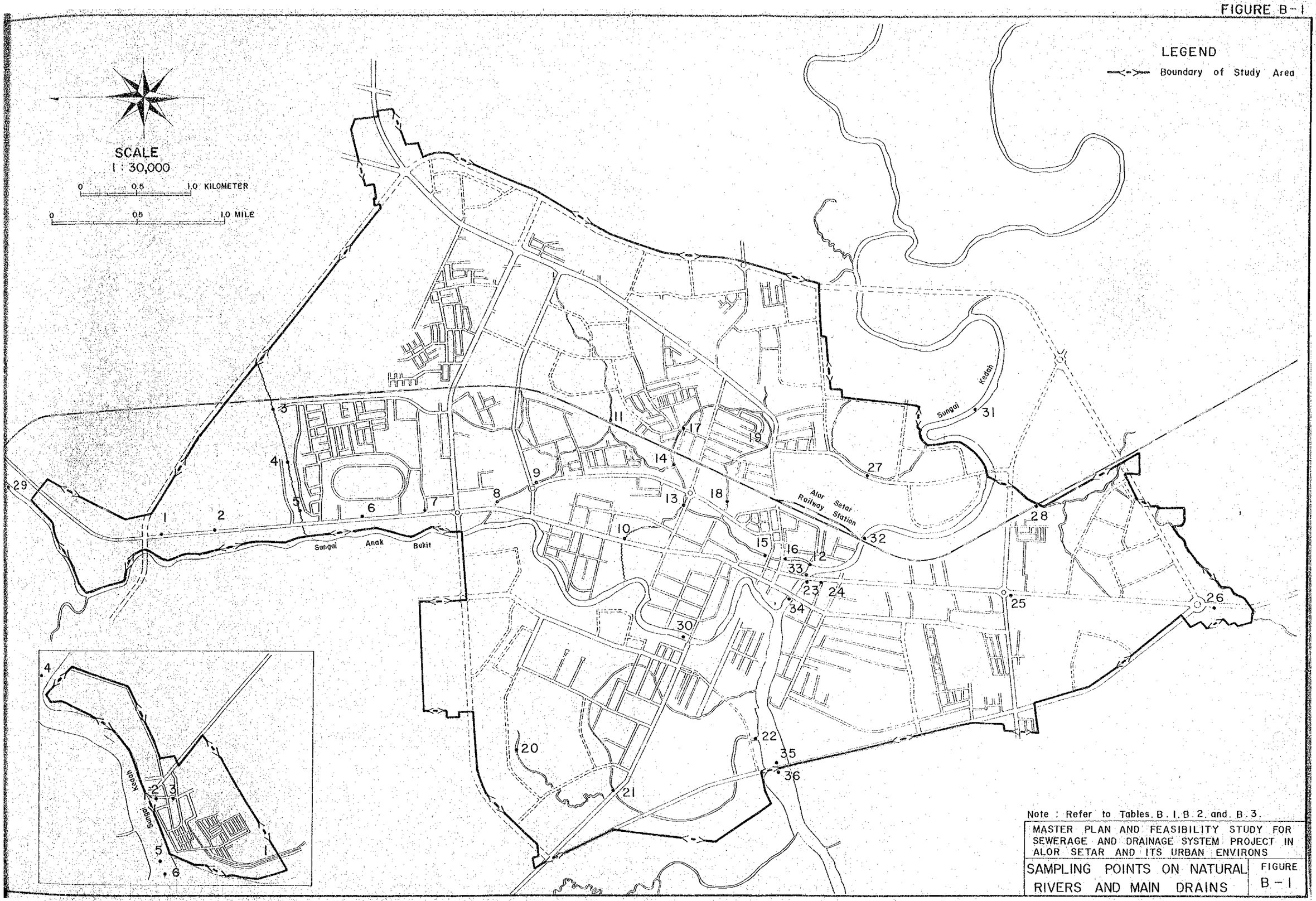
The analytical methods used were as follows:

BOD_3	:	Three days at 30^oC
SS	:	Glass Fiber Filter Method
Cl^-	:	Mercuric Nitrate Titration Method
Coliforms	:	Desoxycholate Method

1.2.2 The Results of the Survey

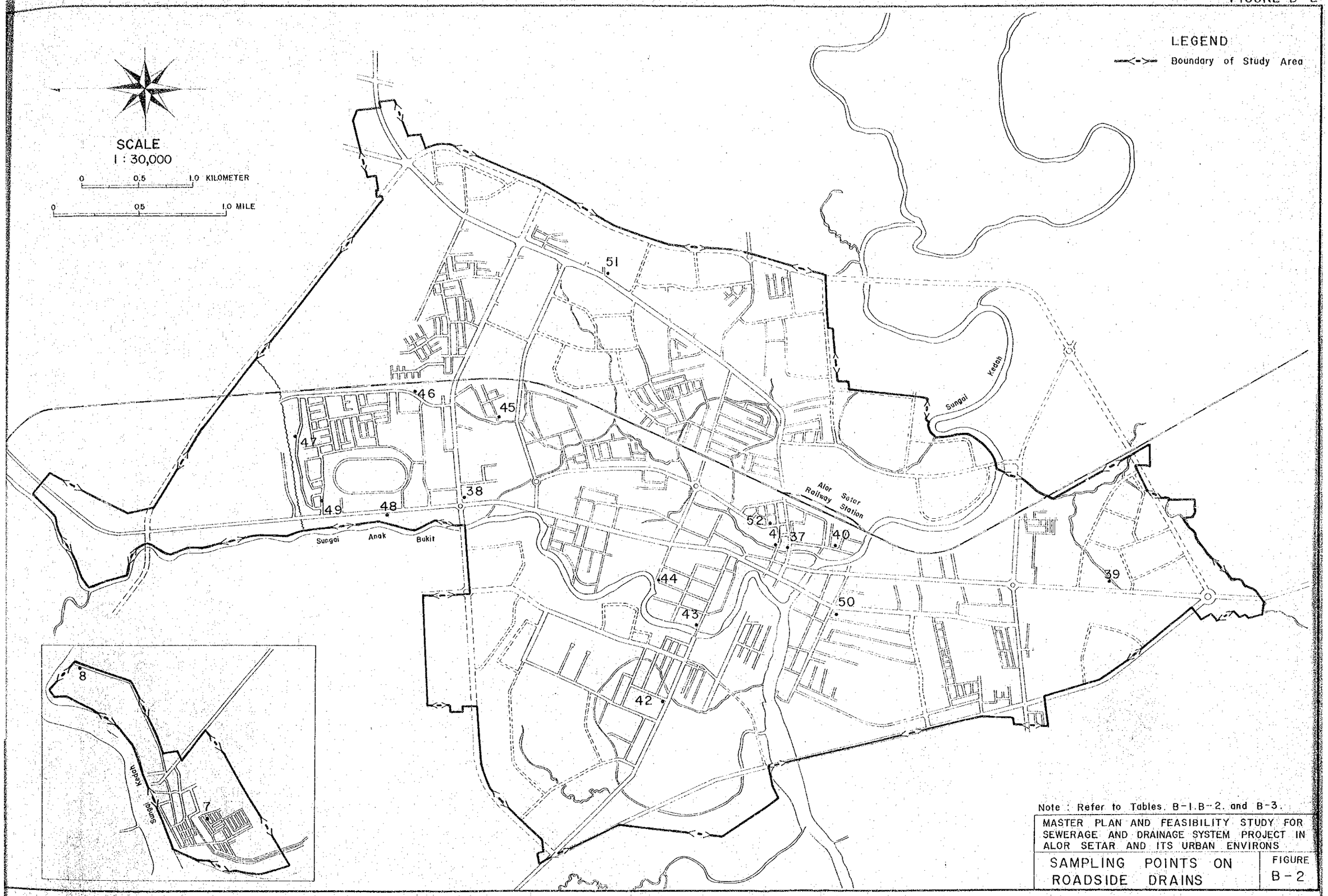
The results of the preliminary survey are shown in Table B-3 and those of the main survey are shown in Tables B-1,

The preliminary survey was carried out during the dry season, while the main survey during the rainy season. Therefore, the results of these surveys indicate different water qualities due to variations of flow condition. However, discussion is mainly dealt with the results of the main survey.



Note : Refer to Tables. B. 1, B. 2. and. B. 3.

MASTER PLAN AND FEASIBILITY STUDY FOR SEWERAGE AND DRAINAGE SYSTEM PROJECT IN ALOR SETAR AND ITS URBAN ENVIRONS	
SAMPLING POINTS ON NATURAL RIVERS AND MAIN DRAINS	FIGURE B - 1



Note : Refer to Tables. B-1.B-2. and B-3.

MASTER PLAN AND FEASIBILITY STUDY FOR SEWERAGE AND DRAINAGE SYSTEM PROJECT IN ALOR SETAR AND ITS URBAN ENVIRONS

SAMPLING POINTS ON ROADSIDE DRAINS

FIGURE B-2

Table B-1-1 The Results of Water Pollution Study

Region	Category	No.	Place	Date	Time	Flow Rate (m^3/sec.)	Flow (m/sec.)	Temp. (°C)	pH	E.Cond. (μU/cm)	DO (mg/l)	BOD_3 (mg/l)	SS (mg/l)	Cl^- (mg/l)	Coliform (c/ml)
Alor Setar	Natural River	A - 1	Drain 1, Jl. Bakar Bata	13/6	11:55	0.013	0.106	29.8	6.6	119	2.15	6.5	35.0	48.7	35
		2	Alor Tokpoi, Jl. Bakar Bata	13/6	11:00	0.028	0.111	30.3	6.1	83	6.15	3.5	78.0	18.5	30
		3	Sg. Hujong Alor Merah, upstream	14/6	9:00	0.266	0.085	28.2	6.2	67	3.75	2.2	61.3	9.2	370
		4	Sg. Hujong Alor Merah, middle reaches	14/6	9:20	0.592	0.197	29.2	6.2	55	3.46	2.6	38.7	14.4	800
		5	Sg. Hujong Alor Merah, downstream	13/6	11:30	1.01	0.190	29.0	6.4	57	3.34	3.1	55.8	8.2	840
		6	Drain 1, Jl. Bakar Bata	16/6	10:05	0	0	29.5	5.3	78	1.98	5.0	50.0	12.3	15,950
		7	Sg. Alor, Jl. Bakar Bata	13/6	12:15	0	0	28.5	6.6	451	0	9.3	37.0	49.8	1,800
		8	Sg. Bakar Bata, Jl. Bakar Bata	16/6	10:42	0.089	0.066	30.2	7.5	450	0	18.0	19.5	34.9	36,300
		9	Sg. Bakar Bata, Jl. Studium	16/6	10:55	0.037	0.049	29.2	7.3	360	1.38	5.9	24.7	32.8	26,100
		10	Drain 4, Jl. Bakar Bata	16/6	11:27	0	0	31.8	7.3	410	3.79	5.5	9.5	36.9	8,700
		11	Sg. Alor Malai, near the railway	16/6	12:16	0	0	29.3	6.7	210	0.87	3.1	40.0	23.6	10,200
		12	Sg. Raja, river mouth	18/6	10:50	0	0	28.5	6.9	405	0	19.8	35.0	53.3	70,700
		13	Sg. Raja, Jl. Telok Wanjah	16/6	11:43	0	0	30.3	7.3	480	0	34.8	21.3	54.4	11,600
		14	Sg. Raja, Jl. Titi Siam	16/6	11:52	0	0	29.7	7.4	650	0	8.6	18.7	65.5	29,000
		15	Sg. Raja, Jl. Tunku Ibrahim	18/6	11:57	1.75	0.20	28.5	7.3	421	0.89	12.0	30.0	61.5	31,900
		16	Sg. Raja, Jl. Langgar	18/6	11:06	1.35	0.18	28.0	7.2	411	0	17.5	42.0	49.2	33,600
		17	Sg. Derga 1. Jl. Ambar	16/6	12:02	0	0	29.0	7.3	700	0	14.4	12.0	62.6	50,800
		18	Sg. Derga 2, Jl. Sultan Badlishah	18/6	9:16	0.072	0.015	28.1	7.1	471	0.69	14.4	23.5	66.7	24,400
		19	Sg. Derga 2, Lorong Merpati	18/6	9:31	0.078	0.105	29.2	7.3	388	1.23	13.4	32.0	48.4	12,200
		20	Sg. Terus 2, upstream	17/6	9:15	0.233	0.062	28.0	6.6	1,050	2.17	4.3	58.0	260	3,400
		21	Sg. Terus 2, Jl. Seberang Putera	17/6	9:27	0.880	0.152	28.3	6.3	650	0.99	5.3	120	156	1,900
		22	Sg. Terus 2, downstream	17/6	9:40	0	0	29.1	6.4	910	1.98	7.7	59.0	222	530
		23	Wan Mohmd, Saman, downstream	17/6	11:05	0	0	30.5	6.7	370	0	43.7	42.0	47.2	203,000
		24	Wan Mohmd. Saman, near Public Market	17/6	11:00	0	0	30.0	6.9	460	0	57.2	46.0	82.0	319,000
		25	Wan Mohmd. Saman, Jl. Kuala Kedah	17/6	10:12	0.036	0.015	29.0	6.8	220	0.99	7.8	32.0	26.7	3,900
		26	Wan Mohmd. Saman, upstream	17/6	10:34	0.218	0.390	29.0	6.6	120	3.34	3.3	20.0	24.6	1,400
		27	Drain 6	17/6	11:20	0	0	29.1	7.3	1,080	0	18.3	44.0	248	29,000
		28	Sg. Pengkalan Kundor, near the railway	17/6	10:50	0	0	30.2	6.2	160	0.59	6.6	26.7	22.6	88,000
		29	Sg. Anak Bukit, upstream	8/7	10:20	0	0	30.5	6.4	108	3.73	3.4	14.8	10.7	40
		30	Sg. Anak Bukit, Jl. Seberang Putera	17/6	8:35	23.2	0.161	30.6	6.4	135	0.81	7.0	35.5	24.6	80
		31	Sg. Kedah, upstream	3/7	11:34	-	-	31.0	6.0	-	1.6	1.4	25.5	19.5	39
		32	Sg. Kedah, near the railway	18/6	9:45	-	-	30.3	6.2	95	1.98	2.3	46.0	36.9	35

(to be continued)

Table B-1-2 The Results of Water Pollution Study

Region	Category	No.	Place	Date	Time	Flow Rate (m^3/sec.)	Flow (m/sec.)	Temp. (°C)	pH	E.Cond. (μ℧/cm)	DO (mg/l)	BOD_3 (mg/l)	SS (mg/l)	Cl^- (mg/l)	Coliform (c/ml)
Alor Setar	Natural River	A - 33	Sg. Kedah, Jl. Sg. Kolok	18/6	11:29	-	-	30.6	6.0	94	1.62	2.1	38.5	18.5	15
		34	Sg. Kedah, Jl. Pekan Melayu	18/6	11:40	13.6	0.08	30.6	6.0	97	1.56	3.6	35.5	22.6	20
		35	Sg. Kedah, Barrage upside	17/6	9:50	0	0	30.9	6.6	132	1.23	3.8	37.0	22.6	1,320
		36	Sg. Kedah, Barrage downside	17/6	9:50	0	0	30.5	6.6	650	2.17	3.6	49.5	152	1,740
	Roadside Drain	37	Jl. Langger, near Cathay	18/6	11:05	0.006	0.103	28.0	7.1	363	2.17	260	252	35.5	47,600
		38	Jl. Sultanah	16/6	10:30	0.005	0.038	30.1	7.0	620	0	169	42.0	52.3	21,800
		39	Drain	17/6	10:25	0	0	29.3	6.2	1,160	0	231	26.7	153	76,000
		40	Jl. Limbong Kapal	18/6	10:35	0.052	0.263	27.0	7.5	342	2.27	178	444	39.0	23,200
		41	Jl. Tunku Ibrahim	18/6	11:58	0.005	0.40	28.3	7.6	252	2.54	22.8	135	25.6	1,340
		42	Jl. Kg. Berjaya, Mergong	17/6	9:00	0.017	0.021	29.1	7.3	290	0.79	19.9	31.5	26.7	95,700
		43	Jl. Putra, near Sg. Anak Bukit	17/6	8:35	0	0	28.3	7.4	850	0.59	24.1	27.0	114	66,700
		44	Jl. Tambang Badak	16/6	11:35	0	0	32.7	7.2	880	0	27.2	34.7	125	13,000
		45	Sri Taman	16/6	10:18	0.002	0.046	30.5	7.7	380	1.19	32.2	22.8	18.5	21,800
		46	Taman Golf	16/6	9:55	0.006	0.092	30.0	7.5	310	2.96	39.4	17.0	16.4	16,000
		47	Kg. Dato Syed Ahman	14/6	9:16	0	0	27.1	7.4	580	0	28.2	308	62.6	790
		48	opposit Kedah Club	16/6	9:37	0	0	28.9	6.7	610	1.42	12.5	17.3	28.4	14,500
		49	Taman Malaysia	16/6	9:25	0.04	0.15	30.7	7.3	580	0.61	137	67.0	36.9	17,400
		50	Jl. Kota Tanah	8/7	10:40	0.009	0.12	29.0	7.7	870	0	60.8	72.0	66.0	1,900
		51	Alor Malai Flats	30/6	24 hr	0.0005	0.008	30.0	7.3	-	-	171	54.8	51.8	-
		52	Jl. Sultan Badlisher	27/6	24 hr	0.007	0.19	30.4	7.3	-	-	94.7	25.3	59.1	-
Kuala Kedah	Natural River	K - 1	Drain, upstream	25/6	8:50	0.481	0.037	28.7	7.1	320	1.17	3.9	18.0	70.8	40
		2	Drain, downstream	25/6	9:50	0.655	0.116	29.5	7.2	19,000	2.00	5.1	61.0	7,200	1,560
		3	Drain, middle reach near the Market	25/6	9:27	0	0	29.1	6.7	1,300	0.80	6.9	33.0	343	990
		4	Sg. Kedah, near Industrial Estate	4/7	13:20	-	-	32.5	7.2	17,000	4.9	4.8	63.0	5,600	14
		5	Sg. Kedah, river mouth	4/7	13:30	-	-	33.5	7.6	24,000	5.5	3.4	43.5	8,010	13
		6	Sea	4/7	13:45	-	-	33.0	7.8	43,000	5.3	1.9	-	11,000	3
	Roadside Drain	7	near Oasis Restaurant	25/6	8:32	0.006	0.077	27.5	7.6	2,400	0	125	344	481	28,400
		8	Industrial Estate	25/6	10:25	0.008	0.3	32.3	7.4	8,100	0	2,350	324	1,840	12,200
		9	Taman Syed Putera	25/6	9:14	0	0	27.0	6.9	660	0.94	50.4	27.0	70.8	80,000

Table B-2. The Results of Preliminary Water Pollution Study

Mar. 21, '79

Region	No.	Place	Time	Flow (m/s)	Temp. (°C)	pH	DO (mg/l)	BOD (mg/l)	SS (mg/l)
Alor Setar	A-10	Drain 4, Jl. Bakar Bata	10:45	0	30.0	6.7	0.6	17	7
	16	Sg. Raja, Jl. Langgar	8:40	0	29.0	6.7	0	51	17
	23	Wan Mohmd. Saman, downstream	9:25	0	29.0	7.6	0	30	17
	30	Sg. Anak Bukit, Jl. Seberang Putera	9:50	0	30.0	6.7	2.8	16	5
	33	Sg. Kedah, Jl. Sg. Korok	9:40	0	29.0	6.7	3.1	17	13
	35	Sg. Kedah, Barrage upside	10:25	0	31.0	7.3	8.8	14	9
	42	Roadside Drain, Jl. Kg. Berjaya, Mergong	10:00	0	-	8.0	-	66	127

1.2.3. The results of the main survey and comments

Test items of water quality and the results are briefly explained hereinafter. Water pollution condition of each waterway is commented in Table B-4 through Table B-5, and illustrated in Figure B-3 by BOD value.

(1) Flow Condition

Flow conditions of rivers in Alor Setar are influenced by the operation of the Barrage. Most rivers do not flow when the Barrage is closed. Generally, flow rate of most rivers is rather low even if the Barrage is opened, due to a very gentle slope of water surfaces.

The survey shows that almost half of the rivers had no flow and that among the rivers which had flow, the flow rates are less than o.4 m/sec, frequently between 0.1 and 0.2 m/sec.

In Kuala Kedah, a main drain is flowing at the centre of the town, which is influenced by tide.

(2) DO

Oxygen in river water is usually supplied from atmosphere and by algal photosynthesis.

High DO value will appear both in a clean water and in only slightly polluted water in the daytime which has many algae.
However, the latter case was not observed on the main survey.

DO in a river water will be consumed if it receives organic matter included in wastes. When DO level decreases less than 1 mg/l due to organic pollution, the water will become anaerobic, causing bad smell and blackish ooze, due to oxygen reduction, sulfide formation, and ferous sulfide (black) accumulation.

River water in Sg. Kedah, Sg. Anak Bukit, and rivers in the suburbs contain more than 1 mg/l of DO, and in case water is flowing, more than 50% of the saturated DO concentration are observed. The highest DO concentration observed in Alor Tokpoi is 6 mg/l, 80% of the saturation level.

DO concentrations of rivers in highly populated area, namely Sg. Raja, and downstream of Wan Mohamad Saman are less than 1 mg/l, showing anaerobic condition.

Domestic wastes immediately after being discharged to roadside drain sometimes contain more than 1 mg/l of DO due to DO presented in drinking water.

(3) BOD_3

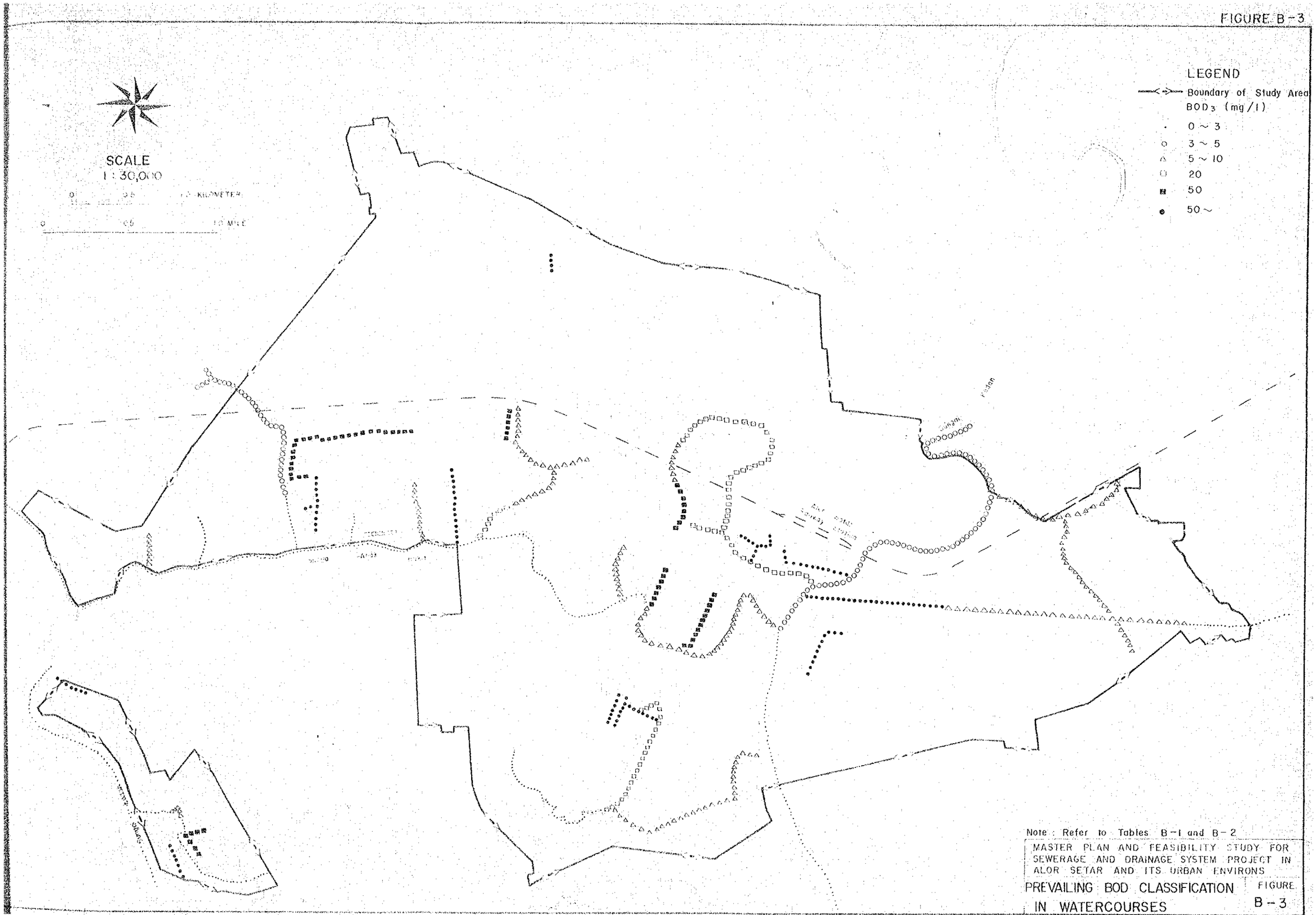
BOD is water quality parameters indicating the extent of water pollution by organic wastes, in which oxygen is consumed during their breakdown, biochemically in BOD.

BOD value can be classified according to the type of water demand and the degree of water pollution as follows:

BOD less than 3 mg/l	:	To be supplied as drinking water after treatment
5	:	To be used for fishing
10	:	Fish can hardly survive
20	:	Polluted
50	:	To be regarded as sewage
more than 50	:	To be regarded as sewage

According to this classification, all the roadside drains which give high BOD, should be regarded as sewage. Rivers which receive wastewater through these roadside drains and waterways flowing through highly populated area have also been polluted since fish can hardly servive. Except for certain parts of Sg. Kedah and Sg. Anak Bukit, however, are not polluted yen.

Natural waterways having more than 1 mg/l of DO concentration shows a tendency having less than 10 mg/l of BOD value.



Note : Refer to Tables B-1 and B-2

MASTER PLAN AND FEASIBILITY STUDY FOR SEWERAGE AND DRAINAGE SYSTEM PROJECT IN ALOR SETAR AND ITS URBAN ENVIRONS

PREVAILING BOD CLASSIFICATION IN WATERCOURSES

FIGURE B-3

Table B-3 River Classification by BOD value

Area	BOD value	No. of Samples		
		Natural River	Roadside Drain	Total
Alor Setar	less than 5 mg/l	5	0	5
	10	10	0	10
	10	10 (2)	0	10 (2)
	20	10 (6)	0	10 (6)
	50	2 (1)	6 (2)	8 (3)
	more than 50 mg/l	1 (1)	8 (5)	9 (6)
Kuala Kedah	less than 3 mg/l	1	0	1
	5	3	0	3
	10	2	0	2
	20	0	0	0
	50	0	0	0
	more than 50 mg/l	0	3	3

Note: ( ): Figure in parenthesis indicates numbers of samples taken in highly populated area.

(4) SS

The results have shown low SS values due to low flow velocity to erode waterways. SS includes both organic and inorganic solids. Therefore, a comparison of the value of SS with that of BOD will enable to understand wheather there are organic solids included or not. River waters in the suburbs show higher values of SS as compared to those of BOD, indicating the presence of inorganic solids generated by rainfall erosion.

(5) Chloride Ion (Cl^-)

Chloride ion originates mainly from sea water, human excreta and food waste. Cl^- concentration in ocean and excreta are approximately 19,000 mg/l and 5,500 mg/l, respectively.

Downstreams of the Barrage in Sg. Kedah and Sg. Terus show high concentration of Cl^- due to intrusion of sea water.

In the upstream of the Barrage intrusion of sea water is not significantly expected, because river water surface is always maintained higher than that of downstream of the Barrage. Therefore, if Cl^- concentration is higher than 50 mg/l, it will be reasonable to consider it as the result of pollution by human activity.

(6) Coliforms

Most of coliforms originates from excrements of mammals including human.

The survey results show more than 200,000 c/ml of coliforms near the Pulic Market (Pasar Besar), due to washing of mammal intestines there. Roadside drains which receive domestic waste show more than 10,000 c/ml of coliforms.

Table B-4-1 Water Pollution of Rivers in the Study Area (1)

River	* No.	Scale	Water Pollution Condition
Drain Alor Tokpoi	A- 1 A- 2	Small Small	Although SS value is high due to rain, water quality is good to be used as drinking water after treatment.
Sg. Hujong Alor Merah	A- 3 4 5	Medium	Although SS value is high due to rain, water quality is good. Slightly high count of coliforms suggests human waste in the catchment area.
Drain	A- 6	Small	Although water quality is not bad, high count of colifoems indicates polltuion by domestic wastes.
Sg. Alor	A- 7	Small	Although water pollution is not evident, anaerobic condition occurs due to water stagnation.
Sg. Bakar Bata	A- 8 9	Small	Polluted. DO is consumed, flowing downstrem, by domestic wastes.
Drain 4	A-10	Small	Water pollution is not serious.
Sg. Alor Malai	A-11	Medium	Although SS value is high due to rain, water quality is good. High count of coliforms indicates pollution by domestic wastes.
Sg. Raja	A-12 13 14 15 16	Medium	Flowing through highly populated area, almost entire range of streams is polluted due to domestic wastes.
Sg. Derga 1 Sg. Derga 2	A-17 A-18 19	Medium	Flowing through highly populated area, river is polluted by domestic wastes.
Sg. Terus	A-20 21 22	Medium	Although Cl^- concentration is rather high due to saline ground water, water quality is good.
Wan Mohmd. Saman	A-23 24 25 26	Medium	Upstream is slightly polluted by sewage from suburban dwellings. From midle reach to downstream, river is heavily polluted by domestic wastes from highly populated area and by the Public Market. High count of coliforms is due to washing of mammals intestine in the Market as well as domestic wastes.
Drain 6	A-27	Medium	Flowing near highly populated area, river is polluted. High Value of Cl^- is due to saline ground water as well as domestic wastes.

Note: * Refer to Figures B-1 and B-2

(to be continued)

Table B-4-2 Water Pollution of Rivers in the Study Area (2)

River	* No.	Scale	Water Pollution Control
Sg. Pengkalan Kundor	A-28	Large	Slightly polluted due to domestic wastes.
Sg. Anak Bukit	A-29 30	Large	Water quality is good, except near highly populated area.
Sg. Kedah	A-31 32 33 34 35 36 K- 4 5	Large	Water quality is good. In the upstream water can be used as drinking water after treatment. Flowing down from the Barrage, Cl^- concentration increases due to sea water. Water quality slightly worsened near factories in Kala Kedah.
Drain	K- 1 2 3	Medium	Water quality in the upstream is good. At middle reach, it is polluted by wastes from dwellings and the market. Flowing down, although Cl^- concentration is high, water quality is improved by dilution with sea water.

Note:

(1) Scale

Small: River width less than 2 meters
Medium:River width from 2 to 10 meters
Large: River width more than 10 meters

(2) *; Refer to Figures B-1 and B-2

Table B-5-1 Water Pollution of Roadside drains in the Study Area (1)

Roadside Drain	No.	Water Pollution Condition
Jl. Langgar near Cathay	A-37	Although DO is present due to surface water runoff, the water looks like a sewage.
Jl. Sultanah	A-38	Polluted by wastes from the General Hospital and dwellings.
Drain	A-39	Polluted by wastes from noodle factories, and dwellings.
Jl. Limbong Kapal	A-40	Although DO is present due to surface water runoff, the water looks like a sewage.
Jl. Tunku Ibrahim	A-41	Mainly receiving sullage water from department stores, water quality is not bad.
Jl. Berjaya, Mergong	A-42	Polluted by waste oil from car repair workshops. Although waste oil is spreading forming films on the surface, water quality is not so bad as it loods likes.
Jl. Putera	A-43	Polluted by domestic wastes from high populated area.
Jl. Tambang Badak	A-44	
Sri Taman	A-45	Although diluted with ground water polluted by domestic wastes,
Taman Golf	A-46	
Kg. Dato Syed Ahman	A-47	Roadside drain in kampong area in the suburbs was polluted by domestic wastes, though coliforms count was low due to less number of septic tanks.
opposite Kedah Club	A-48	Slightly polluted due to housing development.
Taman Malaysia	A-49	Polluted by domestic wastes. The water looks like a sewage.
Jl. Kota Tanah	A-50	
Alor Malai Flats	A-51	Polluted by domestic wastes from the low income residences. The water looks like a sewage.
Jl. Sultan Badlisher	A-52	Polluted by commercial and institutional wastes.
near Oasis Restaurant	K-7	Flowing through Kuala Kedah, polluted by domestic wastes. Although the water looks like a sewage, Cl^- concentration is high due to ground water.

(to be continued)

Note: * Refer to Figures B-1 and B-2.

Table B-5-2 Water Pollution of Roadside Drain in the Study Area (2)

Roadside Drain	No.	Water Pollution Condition
near Factory Estate	K-8	Polluted by wastes from sea fish processing factories. Much more worse than sewage.
Taman Syed Putera	K-9	Polluted by domestic wastes.

Note: * Refer to Figure B-1 and B-2.

1.2.4. A Comparison with the results of Preliminary Survey

The preliminary survey was carried out in March 1979. It was in dry season, and the Barrage was kept closed. Almost the entire section of the rivers in the upstream of the Barrage was not flowing.

The results of the preliminary survey are shown in Table B-2. Comparing to the results of the main survey, the preliminary sirvey gives lower value of SS, higher value of BOD, and higher DO level in Sg. Kedah.

These results are attributable to poor flow condition and insuficitnt flushing of wastes.

A high DO is observed at Sg.Kedh due to algal photosynthesis which release oxygen gas in the daytime.

Algae and water hyacinth appeared in a certain portion of water surface are known to reproduce their cells by taking organic matter from the water. The root of water hyacinth has a function of filteraction. However, serious difficulties will be encountered in order to remove and dispose of the excess and/or the dead plants.

1.3. Saline Water Distribution in the Upstream of the Barrage

Saline water distribution in the upstream of the Barrage was surveyed by measuring the water's electric conductivity.

The result of survey is shown in Figure B-4. In rainy season, the Barrage is opened in order to release river water from upstream in case low tide. Therefore, saline water can hardly be found.

In dry season, the Barrage is usually closed except when ships are passing. The results of survey show that a salt-water wedge is formed, suggesting saline water intrusion upstream of the Barrage.

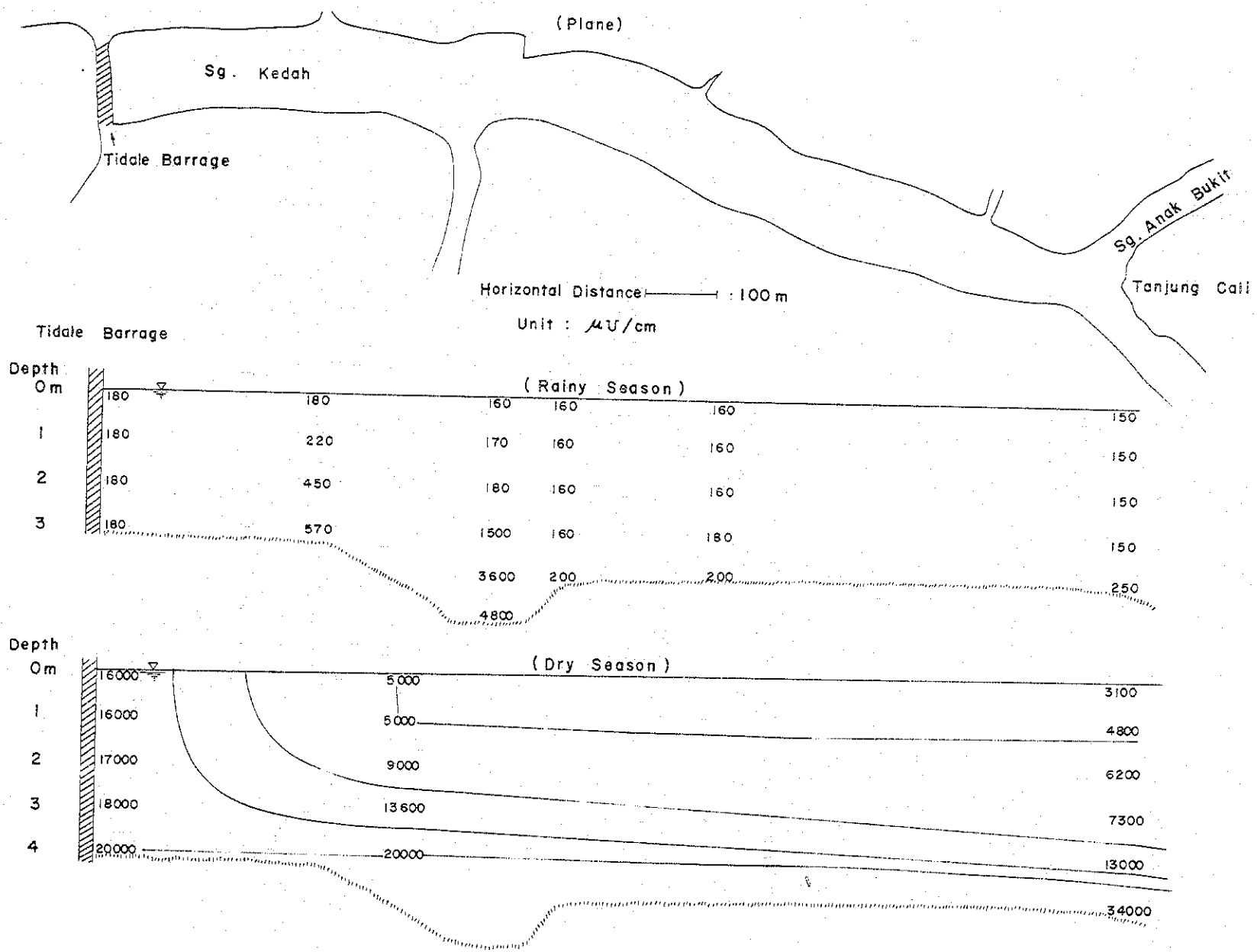


FIGURE B-4 SALINE WATER IN THE UPSREAM OF SG. KEDLAH

Chapter 2
CHARACTERISTICS OF WASTE WATER

2.1. Survey on Domestic Wastes

2.1.1. General

To obtain per capita per day wastes load and flow rate for domestic wastes, a survey on waste quantity and quality was carried out in the two residential areas selected. Basic information about two residential areas are shown in Table B-6.

Table B- 6 Basic Information for Residential Area selected

Place	Area (ha)	Number of Houses	Population	House Type	Wastes
Taman Malaysia	1.56	24	125	-semi-detached -isolated	Sullage Septic Effluents
Alor Malay Flats(B)	0.32	48	288	-four-storied flats	Sullage

The survey was conducted every two hours for a duration of 24 hours at June 30/July 1,1979.

Flow rate was measured by multiplying cross sectional area and flow velocity of the roadside drains. Water quality analysis was performed in terms of temperature, pH, BOD_3, SS, and Cl^-. Analytical methods were same as employed in the previous water pollution study as described in Section 1.2.1.

2.1.2. Results of Survey

The results of the survey are shown in Table B-7 and Figure B-5.

Both results show typical characteristics of domestic wastes. Flow rate increases during daytime especially in the morning and in the evening, and decreases towards midnight. This tendency would appear when the residents spent their daily life in a similar life pattern.

Table B-7 The Results of Domestic Wastes Survey

Item		Taman Malaysia							Alor Malay Flats (B)						
		Flow	Temp.	pH	BOD_3	COD_{mn}	SS	Cl^-	Flow	Temp.	pH	BOD_3	COD_{mn}	SS	Cl^-
Date		m^3/hr	°C		mg/l	mg/l	mg/l	mg/l	m^3/hr	°C		mg/l	mg/l	mg/l	mg/l
30/6	10	2.02	29.0	7.8	137	61.2	69.0	45.1	2.36	31.0	7.6	183	89.0	43.5	41.0
	12	1.91	30.5	7.7	112	53.7	43.0	34.9	2.23	31.2	7.2	188	56.8	71.0	62.6
	14	2.31	32.0	7.3	124	60.8	62.0	45.1	2.40	33.5	7.1	129	44.6	48.0	41.0
	16	1.89	32.0	7.4	112	48.7	37.3	28.7	1.31	31.2	6.8	162	75.0	49.0	60.5
	18	1.48	30.5	7.5	86.0	34.5	31.3	31.0	2.13	30.3	7.2	144	62.9	42.5	47.2
	20	2.26	29.8	7.3	55.0	28.4	21.5	29.7	3.22	30.0	7.1	156	42.6	64.0	43.1
	22	0.86	29.5	7.3	134	46.6	35.7	51.3	1.79	29.0	7.5	139	44.6	44.0	47.2
	24	0.84	28.9	7.6	90.2	38.0	32.0	52.3	1.10	28.2	7.2	204	41.6	61.0	59.3
1/7	2	0.34	-	-	86.4	45.1	42.0	46.2	0	-	-	-	-	-	-
	4	0.34	27.8	6.9	86.4	45.1	42.0	46.2	0	-	-	-	-	-	-
	6	0.34	27.5	7.6	89.4	43.1	31.3	57.4	0.47	27.8	7.5	212	64.1	39.0	76.9
	8	1.86	28.0	7.6	79.2	46.1	28.0	39.0	2.65	28.0	7.7	194	69.1	85.0	39.0
Max.		2.31	32.1	7.8	137	61.2	69.0	57.4	2.65	33.5	7.7	212	89.0	85.0	76.9
Min.		0.34	27.5	6.9	55.0	28.4	21.5	28.7	0	27.8	6.8	129	41.6	39.0	39.0
Mean		1.37	29.6	7.5	100	46.0	39.3	41.9	1.64	30.0	7.3	171	59.0	54.8	51.8
Total		32.9 m^3/d	-	-	3.33 kg/d	1.55 kg/d	1.36 kg/d	1.88 kg/d	39.3 m^3/d	-	-	6.54 kg/d	2.30 kg/d	2.25 kg/d	1.89 kg/d
Load		263	-	-	26.6	12.4	10.9	15.0	136	-	-	22.7	8.0	7.8	6.6
Unit		l/cap.d			g/cap.d	g/cap.d	g/cap.d	g/cap.d	l/cap.d			g/cap.d	g/cap.d	g/cap.d	g/cap

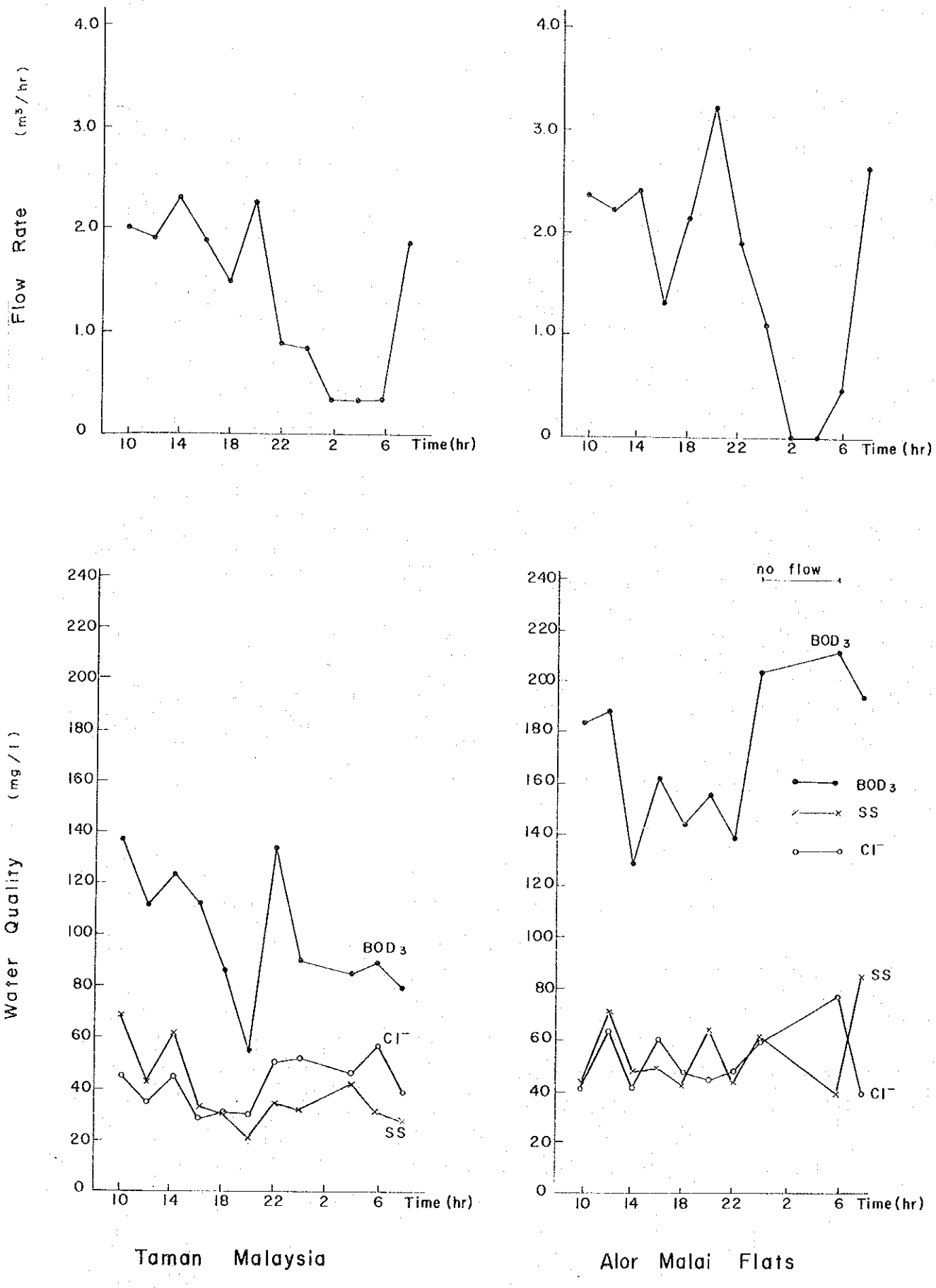


FIGURE B-5 RESULTS OF DOMESTIC WASTES SURVEY

For both areas, SS values appear to be low compared to BOD value. This is due to solid settlement in the upstream roadside drains as a result of low flow velocity BOD value may also be decreased concurrently.

Therefore, per capita per day waste load which will be employed as design criteria should be greater than that obtained in this survey.

The quantity of wastes appeares to be much highter due to storm runoff. Therefore, per capita per day waste quantity should be projected compared to that estimated by the water consumption data.

Per capita per day load of Cl^- was 15.0 g/cap/d for Taman Malaysia which included Cl^- in excreta, and 6.6 g/cap/d for Alor Malay Flats which did not include Cl^- in excreta.

Cl^- load in excreta is approximately 6 g/cap/d. Therefore, Cl^- load in sullage is 6.6 g/cap/d for Alor Malay Flats and 9 g/cap/d for Maman Malaysia, and both are thought to be reasonable value for domestic wastes.

2.2. Suevey on Commercial and Institutional Wastes

2.2.1. General

To obtain unit waste load from commercial and institutional areas, a survey on waste quantity and quality was carried out at representative centre selected in Alor Setar.

The place selected is sorrounded by Jl. Sultan Badlisher, Jl. Tunku Ibrahim, and Lolong Padi, 4.7 ha in area, 940 in population including offices, stores, restaurants, and others.

The survey was performed at a drain which receives sullage from the area, while excreta from the communal septic tank, effluent of which was discharging into Sg. Raja.

The survey was carried out every three hours in the daytime on June 27, 1979.

Table B-8 The Results of Commercial and Institutional Wastes Survey

Time	Flow	Temp.	pH	BOD_3	SS	Cl^-
	m^3/hr	°C	-	mg/l	mg/l	mg/l
27/6 9	43.9	29.1	7.2	31.6	12.0	34.9
12	35.3	31.5	7.2	60.2	25.0	72.8
15	22.3	31.2	7.1	205	28.5	80.0
18	26.3	31.5	7.5	109	39.5	75.5
21	18.4	30.0	7.4	128	35.5	65.8
28/6 6	21.6	29.0	7.1	34.3	11.3	25.6
Max.	43.9	31.5	7.5	205	39.5	80.0
Min.	18.4	29.0	7.1	31.6	11.3	25.6
Mean	28.0	30.4	7.3	94.7	25.3	59.1
Total	61.3 (m^3/d)	-	-	55.7 (kg/d)	15.4 (kg/d)	35.3 (kg/d)
Local Unit	652 (l/cap/d)	-	-	59.3 (g/cap/d)	16.4 (g/cap/d)	37.6 (g/cap/d)
	130 (m^3/ha/d)	-	-	11.9 (kg/ha/d)	3.28 (kg/ha/d)	7.51 (kg/ha/d)

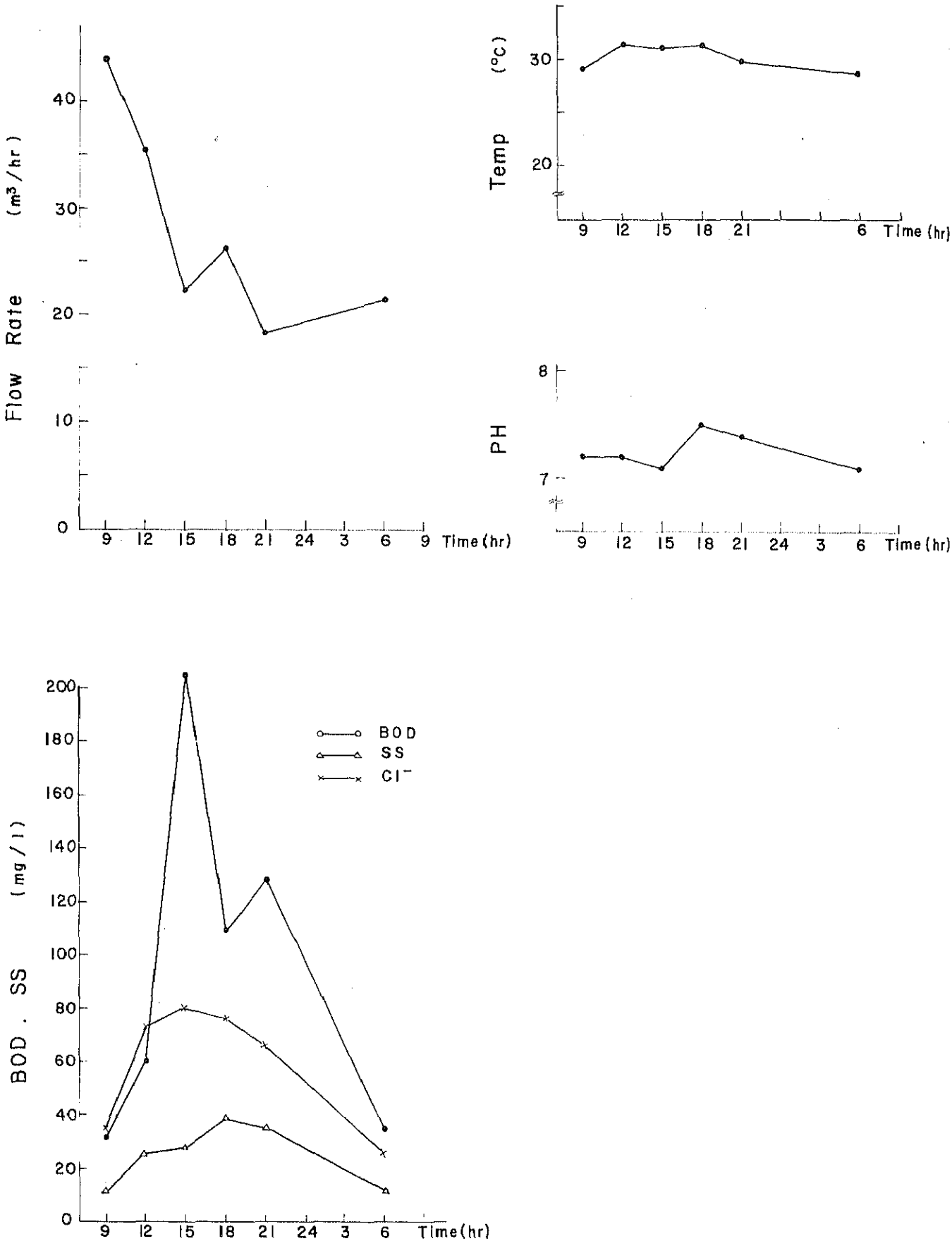


FIGURE B-6 RESULTS OF COMMERCIAL AND INSTITUTIONAL WASTES SURVEY

Flow rate was determined by multipling cross sectional area by velocity of flow in the drain. Water quality analysis was performed in terms of temperature, pH, BOD_3, SS and Cl^-. Analytical methods are same as employed in the previous water pollution study.

H_2S gas concentration is also measured as 0.8 and 1.5 ppm at 18 and 21 hours respectively as strong bad smell was sensed emanating from the waste water.

2.2.2 Results of the Survey

The results of the survey are shown in Table B-8 and Figure B-6.

Although water quality varied widely with peak concentration at 3ppm, it showed general characterictics of sewage. SS value is low compared to BOD value, due to settlement by weak flow.

Waste quantity increased from morning to noon, with a lag of three hours difference of peak between quantity and quality. These results suggest that water is used for washing in the morning, and strong wastes from eating places from afternoon to evening.

Waste quantity appeares to be significantly increased due to storm runoff and extraneous water, therefore, waste load should be properly adjusted considering water consumotion data.