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REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF HOUSING BUILDING
PLANNING AND URBAN DEVELOPMENT (CIPTA KARYA)

MEDAN URBAN DEVELOPMENT, HOUSING, WATER SUPPLY AND SANITATION PROJECT

SUMMARY

OCTOBER 1980

ENGINEERING-SCIENCE, INC.
SINOTECH ENGINEERING CONSULTANTS, INC.
A JOINT VENTURE
in association with
PADCO and P.T. DACREA

MEDAN URBAN DEVELOPMENT, HOUSING,
WATER SUPPLY AND SANITATION PROJECT
Jln. Singamangaraja 1-3, P.O. Box 28, Phone 20718, Medan-Sumatra, Indonesia

Our ref.: 80/1040/MUD/202/5 20 December 1980

Ir. Radinal Mochtar
Director General Cipta Karya
Ministry of Public Works
Jalan Pattimura 20
Kebayoran Baru
JAKARTA SELATAN

Subject: Medan Urban Development, Housing, Water Supply and Sanitation Project

Dear Sir:

In accordance with the agreement with you on 29th August and summarized in your letter of 30th August, we are submitting 150 copies of each volume of the Final Report for the Medan Urban Development, Housing, Water Supply and Sanitation Project. We would greatly appreciate timely issuance of the Certificate of Completion by Cipta Karya.

Our final statement will be submitted within 30 days of submission of the final report.

Yours faithfully,

C.J.G. Thompson
Vice President
International Div.

c.c.: Ir. Ruslan Diwiryo, Director of City & Regional Planning
Ir. Susanto Mertodiningrat, Director of Sanitary Engineering
Ir. Sunaryo, Head Sub-Directorate Town Planning
Ir. K. Pohan, Project Manager MUDS
AID - Jakarta, attn.: Mr. P.Thorn, Project Officer
ES - Arcadia
SINOTECH - Taipei
DACREA - Jakarta

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City of Medan A-1
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STUDY OVERVIEW

INTRODUCTION

This report summarizes the work undertaken on the Medan Urban Development, Housing, Water Supply and Sanitation Project from January 1979 through February 1980. The study was formally reviewed by the Government of Indonesia at a series of meetings in July, 1980. The comments and suggestions arising out of this review process have been taken into account in this and the other study report volumes.

AUTHORIZATION

On 12 October 1978, an agreement was signed by the Government of Indonesia, Ministry of Public Works, Directorate General of Housing, Building, Planning and Engineering Science, Inc., for consulting services in connection with the Medan Urban Development, Housing, Water Supply and Sanitation Project. The Project was financed under the terms of a loan to the Government of Indonesia from the United States of America Agency for International Development (AID loan No.497-T-040, dated 28 July 1976). Engineeering-Science, Inc. and Sinotech Consultants, Inc., a joint venture, carried out the work in association with Planning and Development Collaborative International and P.T. Dacrea. Additional architectural expertise was provided to the project from P.T. Perencana Jaya through sub-contractual arrangement with P.T. Dacrea.

OBJECTIVES AND SCOPE OF WORK

The objective of the Project was to assist the Government of Indonesia in directing the long term urban development of Medan, particularly with regard to: (1) the construction of new, and improvement of existing, urban settlements within the context of the governments kampung improvement (KIP), sites and services and core housing (SSCH), and low cost housing (LCH) program and (2) improvement and expansion of water supply, sewerage, drainage, and solid waste disposal systems.

The scope of work was divided into five major components as follows:

1. Preparation of a long term urban development plan.

2. Preparation of a feasibility study for housing development projects including a kampung improvement program and a sites and services and low cost housing scheme.

3. Development of long-range master plans for water supply, wastewater, drainage and solid wastes systems in the study area through 2000.

4. Preparation of first stage feasibility studies for water supply, wastewater, drainage and solid wastes systems to meet needs through the year 1990.

5. Detailed engineering for the first stage sites and services and low cost housing schemes.

In addition, in-service professional training programs were conducted.

CONDUCT OF THE STUDY

Existing urban development plans, housing programs and water supply and sanitation facilities were studied and evaluated, and the results utilized as a basis for developing long-range plans for the study area. The recommended long range urban development plan provided a framework within which detailed planning of the housing, water supply and sanitation improvement programs were carried out. A program of improvements to be accomplished under Repelita III (fiscal years 1979/80 through 1983/84) was identified which would be within the financial and physical capacities of local, provincial, and central governments. Special emphasis was placed upon improvement of physical and non-physical infrastructure in areas occupied by the urban poor.

The findings and recommendations of the study are contained in a series of technical memoranda and report volumes. The major reports are listed below:

Volume I Summary

Volume II Interim Strategic Plan and Feasibility Study

Volume III Long Range Urban Development Plan

Volume IV Housing Development Program

- Part 1 - Housing Development Situation and Strategy
- Part 2 - Kampung Improvement Program
- Part 3 - Sites and Services / Low Cost Housing Program

Volume V Master Plan and First Stage Program for Water Supply and Sanitation

- Part 1 - Master Plan and First Stage Program for Water Supply
- Part 2 - Master Plan and First Stage Program for Wastewater
- Part 3 - Master Plan and First Stage Program for Drainage
- Part 4 - Master Plan and First Stage Program for Solid Wastes

THE EXISTING SITUATION AND FUTURE REQUIREMENTS

THE STUDY AREA

Medan is located on the coastal plain of North Sumatra between the Malacca Straits and a range of volcanic mountains which run roughly north-west to south-east throughout the island of Sumatra. Geographic proximity to major neighbouring cities such as Kuala Lumpur and Singapore gives the city an international character in terms of trading business (see Figure 1).

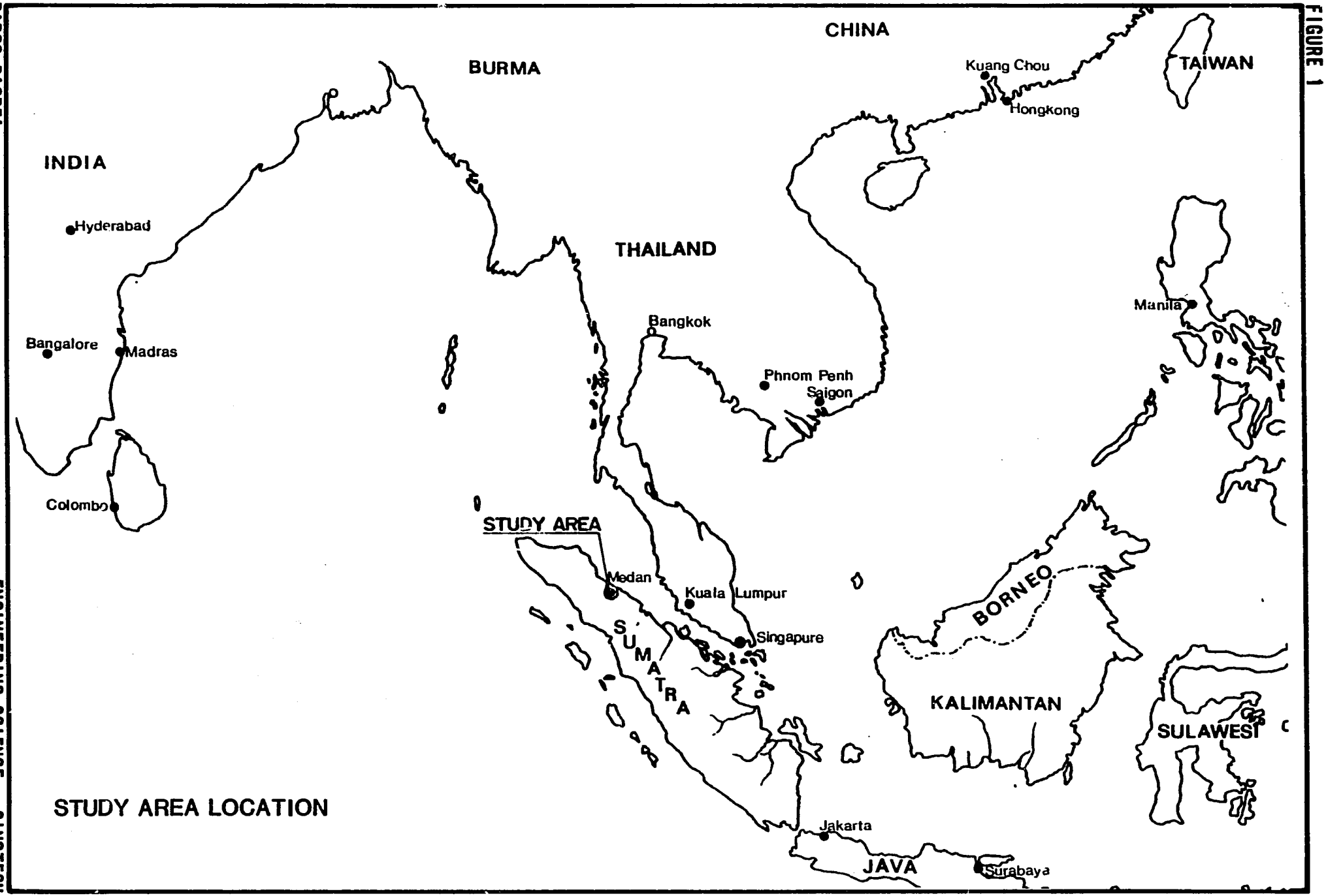
Medan and Belawan port are the hub for an entire region which extends beyond the provincial boundaries of North Sumatra to include Aceh, Riau and parts of West Sumatra (see Figure 2).

Much of Medan's influence over such a vast area is attributable to Belawan port, the third largest port in the country, and the presence of an international airport. Medan has grown to become the centre of the region in terms of international trading, finance, business, employment opportunity, higher education and industrial development, as well as being the processing and distribution centre for products of the surrounding agricultural areas.

The city has a population of approximately 1.2 million people and is the fourth largest city in the country. The total land area of the city is 26,500 hectares, divided into eleven political districts called kecamatans. Geographically, the urban form of the city is rather irregular. Urban development has occurred mainly around the central area of Medan. Except in the oldest portions of the city, housing is primarily single storey and of relatively low density. In the oldest portions of the city, densities are much higher, consisting largely of three or four storey walk-up flats with businesses located on the ground floor. Growth trends are visible outside the city boundaries with village development paralleling the banks of rivers. River and railroad alignments contain a small amount of high density informal housing for very low income groups. The rest of the city's area is made up of agricultural land, including tobacco, coconut, and rice paddy.

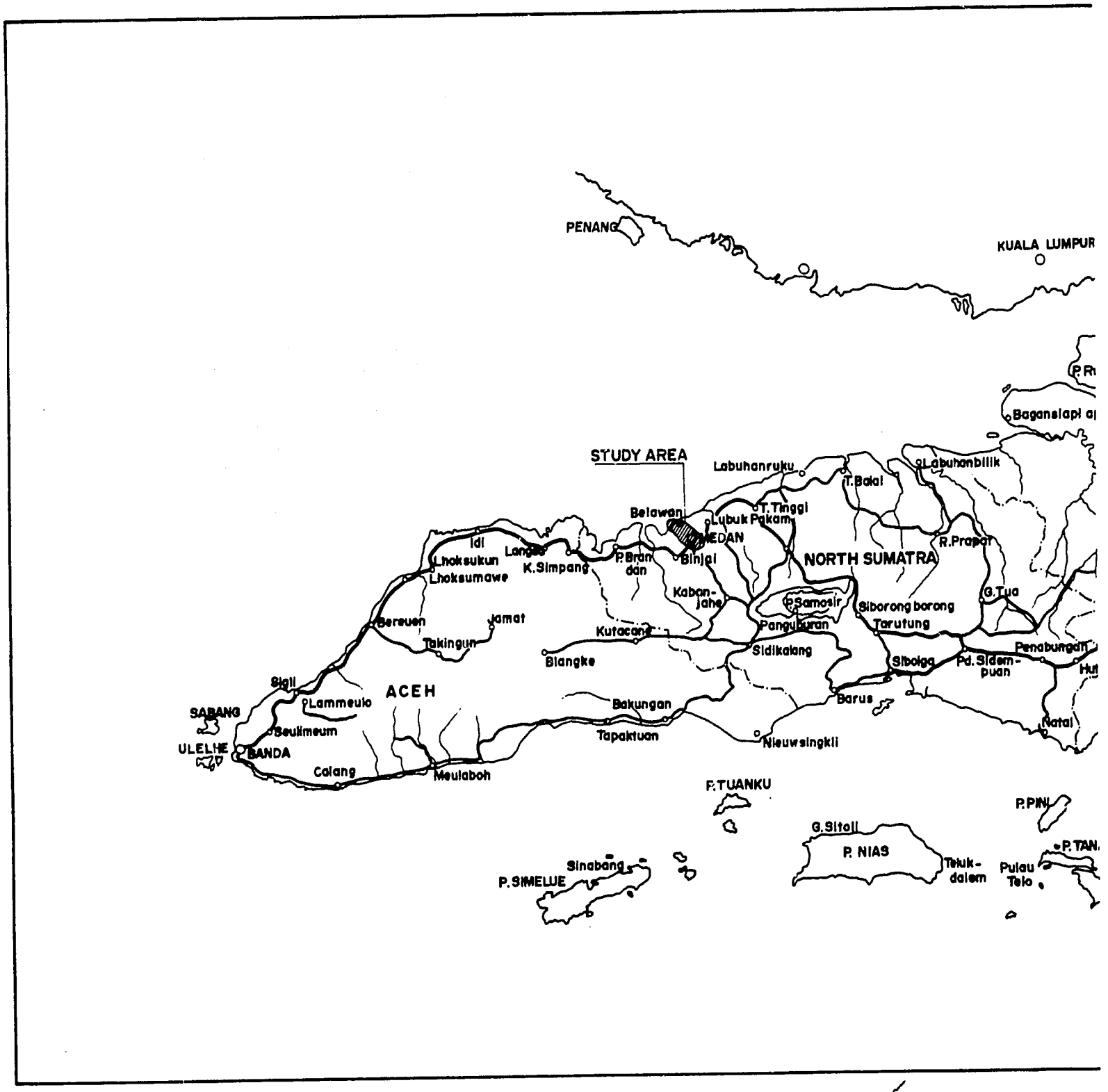
MEDAN'S ECONOMIC PERFORMANCE

Kotamadya Medan experienced fairly high rates of economic growth during the 1969-1973 period as a result of recovery from the conditions of the mid-1960s and of apparent increasing investment and exports during the expansion of the region and of the world economy in the early 1970s.



STUDY AREA LOCATION

FIGURE 1



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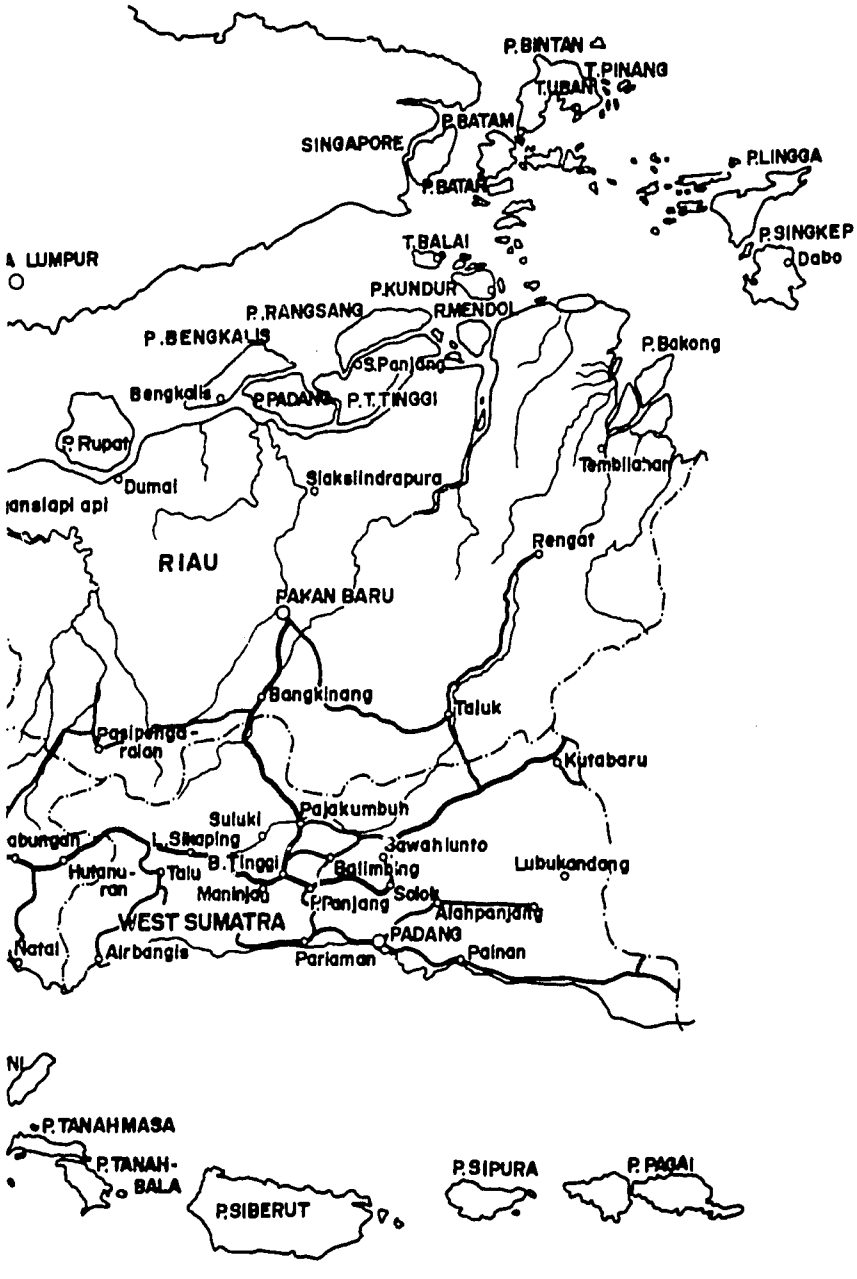
THE MEDAN REGION



LEGEND

PROVINCIAL BOUNDARIES

MAIN ROADS

STUDY AREA

0 35 70 109 140 175

KILOMETRES

6

During that period, Medan took steps to rehabilitate and increase its economic and social infrastructure. Public sector investments were made in roads, bridges, ports, communication and power. Private sector expansion in processing and manufacturaing, trade, finance and other services further bouyed the economy. The Medan city government, with the assistance of central government programs and finance, improved and enlarged education, health, water, housing and other social infrastructure facilities and services.

While there are no reliable estimates of metropolitan Medan gross domestic product (GDP) investment, or other important economic indicators, analysis of available series for regional GDP suggests that the rate of growth of income and investment has slowed since 1973 and that Medan, the key city in North Sumatra, is not fulfilling its potential, either as a city per se or as a regional growth center in providing basic services critical to development of the surrounding area.

Private domestic and foreign investment has also apparently slowed from past growth rates. Bank credits for North Sumatra, which were 7.4 percent of all-Indonesia credits in 1974, now represent only 3.2 percent of Indonesian total credits. The volume of trade exports, with the notable exception of palm oil and coffeee, ranges from stagnation to reduced growth in recent years.

Analysis of Medan's development expenditures, including national subsidies, reveals that total real per capita expenditures increased markedly in 1975/76 but have remained at around the same per capita level for the past three years.

There is an evident need to direct Kotamadya programs and policies to improve the economic climate and institutions for private business, trade and finance and to improve the planning and financial functions of the city government. Private business in Medan functions within an enormous set of difficulties. As a result, there is very little incentive for present companies to expand or for new domestic or foreign companies to select Medan as a promising site for manufacturing, unless they meet local demand or process regional raw materials. Under these conditions, local industry is at a disadvantage compared to imports from Jakarta and from Singapore, Hong Kong, China and other more developed countries. Tourism is relatively underdeveloped with little private sector promotion and even less government direction or assistance.

MEDAN'S FINANCIAL PERFORMANCE

City government planning, implementation and finance are inadequate to meet existing urban economic requirements and basic social needs, let alone provide minimum infrastructure and services for future development. Kotamadya Medan's current receipts during the Repelita II period from its own taxes and fees increased on average by around 16 percent a year measured in nominal (actual) prices. However, in real terms its own revenues increased by less than 4 percent a year with the largest increase occurring in 1975/76. Real revenues in 1978/79, the last year of Repelita II, were lower than in 1975/76.

Medan's current expenditures from its own revenues and from central government assistance rose on average in real terms by 16 percent a year. Thus, Medan's own savings (current receipts minus current expenditures) in real terms increased only marginally over the Repelita II period. Actually, in view of the fact that some 25 percent of all development expenditures were wrongly classified as current expenditures (in 1978/79), Medan's own savings declined over the Repelita II period. Government investment as measured by Medan's real budget expenditures from all sources (excluding central government-operated projects) rose on average by 26 percent a year but this growth mainly occurred in 1975/76 (an increase of 95 percent). Real investment since then has declined each year with investment in 1978/79 being only 87 percent of investment in 1975/76. This inadequate financial performance explains the apparent relative decline in urban government economic and social infrastructure since 1975/76 and the increasing infrastructure deficit which built up over this period.

POPULATION

The last complete population census including Medan was taken in 1971, so that, eight years later, estimates of population are subject to a widening margin or error. In 1973, 200 sq km were annexed from Deli Serdang which brought the port of Belawan within the city boundary and increased the population by about one-third. Although Medan appears to be growing a little faster than the province of North Sumatra, there is little evidence of drift into the city from rural areas.

The growth rate of population in Medan has slowed down over the last fifteen years to under three percent per year since 1973. An annual growth rate of 2.6 percent to 1990 and 2.5 percent thereafter is considered the most probable for Medan's population. Projections to the year 2000 are as follows:

Year	Population
1980	1,202,000
1985	1,367,000
1990	1,551,000
2000	1,950,000

The age structure of the Medan population for 1978 shows that 15 percent of the population is under 10 and nearly two-thirds is under age 25. This population bulge is already affecting the number of children requiring school and welfare facilities and will, during Repelita III and beyond, begin to swell the labor force, notably the number of young job seekers. As pupils stay longer at school, the population aged under 15 becomes of greater importance; in 1978 it was estimated at 482,000 and it forecast to increase to around 538,000 by the end of Repelita III and over 600,000 by 1989.

In 1977, Medan was estimated to have 181,400 households each having an average household size of 6.2 persons, and an average population density of 4,230 persons/sq km.

LAND USE

The existing land use pattern in the study area is illustrated in Figure 3. The Medan municipality contains 26,510 hectares of which 16,350 or 62 percent, are open space in one form or another. However, much of this open space has not been developed because it is either low lying swamp, subject to regular flooding, or in productive agricultural use.

Residential areas predominate over all other uses within built up areas. These areas comprise 90 percent of the developed area. However, their use is mixed as many residential plots have small shops within their boundaries.

It can be seen that urban growth has already exceeded the municipal boundaries and has started to form strong urban corridors reaching towards surrounding small towns.

Residential land needs for the next twenty years reflect the land resources required house projected population increases. These needs are shown below:

PROJECTED LAND USE IN MEDAN

Category	Estimated Land Use (ha)			
	1980	1985	1990	2000
Residential	9,390	9,720	10,160	11,340
Industrial	350	410	480	630
Commercial	380	430	480	620
Institutional	470	540	600	740
Open Space/Park	40	90	140	280
Total	10,630	11,190	11,860	13,610

In order to accommodate the anticipated population demands for new residential uses approximately 110 hectares per year will be needed or approximately 550 hectares over Repelita III.

A small portion of this demand can be met in the first two five year periods through use of infill sites (vacant land parcels in existing built up areas). In the older sections of Medan, infill land is very limited as most of these areas are essentially 100 percent built-up.

Large housing developments such as Medan II with 7,800 units capable of housing 46,800 people will absorb a portion of the housing demand for the first 5-year period.

The proposed Medan III site will house roughly 47,000 persons, and when combined with Medan II, will accommodate a large share of the lower income housing demands for the first five and ten year periods. After 1990, there will be a steady demand for residential land outside the urban boundary. A portion of this demand will likely occur in areas adjacent to existing residential areas but outside the municipal boundaries. Over the next 20 years, a total of approximately 2,300 hectares of new residential land will be required.

Commercial land needs represent about eight percent of the total urban land requirements. The need for commercial land will occur at a rate about equal to the need for new residential land. Much of the new commercial land will serve new housing areas and should be planned as subcentres to reduce congestion in the city centre.

LAND SPECULATION

A major problem in all large Indonesian cities including Medan is land speculation. Land speculation acts to the detriment of the social equity objective of the government because it prices low income households out of the land market and limits local governments' abilities to supply urban services requiring land.

Government investment in infrastructure and housing is one of the major sources of land speculation. The increases in surrounding property values due to the development of housing projects such as the Perumnas Helvetia project have ranged from 200 to 400 percent over a two-year period. However, more dramatic increases have occurred in areas surrounding the proposed Toll Road as land values changed from agricultural to urban prices. Over the same period, these increases have exceeded 1,000 percent. Such increases limit the form of development which can occur around these government projects and reduce the impact which these infrastructure projects could have had on provision of urban services to low income groups.

THE EXISTING MASTER PLAN FOR URBAN DEVELOPMENT

Residential areas in Medan under the existing Master Plan for urban development are organized in a hexagonal planning concept whereby basic neighborhood units comprising 5,000 to 10,000 people are joined together in a building block fashion to form larger administrative areas for which urban services are provided on a progressive basis. For each Master Plan neighborhood, standards have been developed for educational, health, public or community buildings and religious facilities as well as parks, recreational and commercial areas. An analysis of existing land use in Medan indicated that only about 2.5 sq m/person of public land was devoted to education, health and religious facilities and recreational areas. By way of comparison, the Master Plan standards for the same public facilities calls for 18.4 sq m/person.

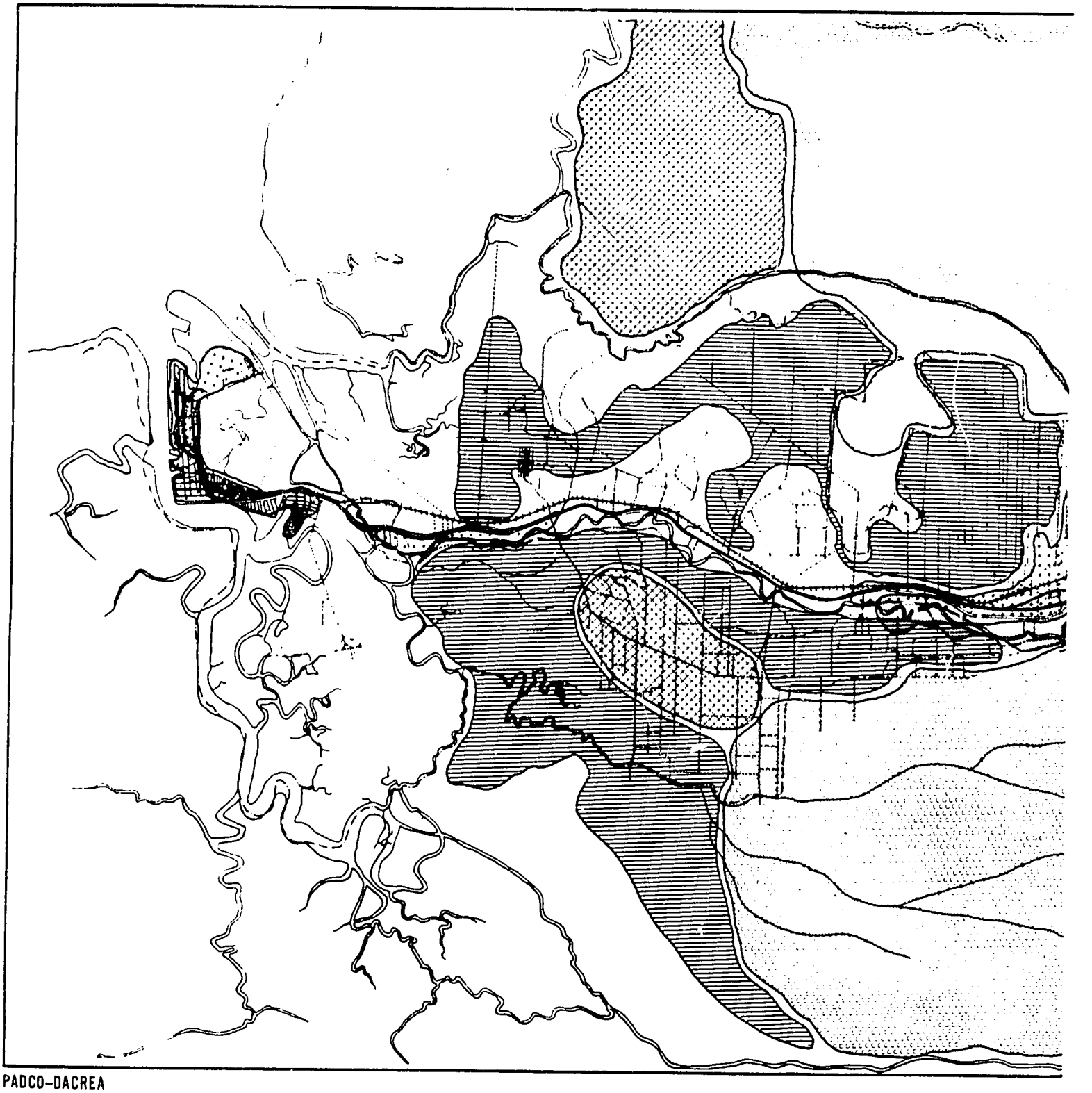


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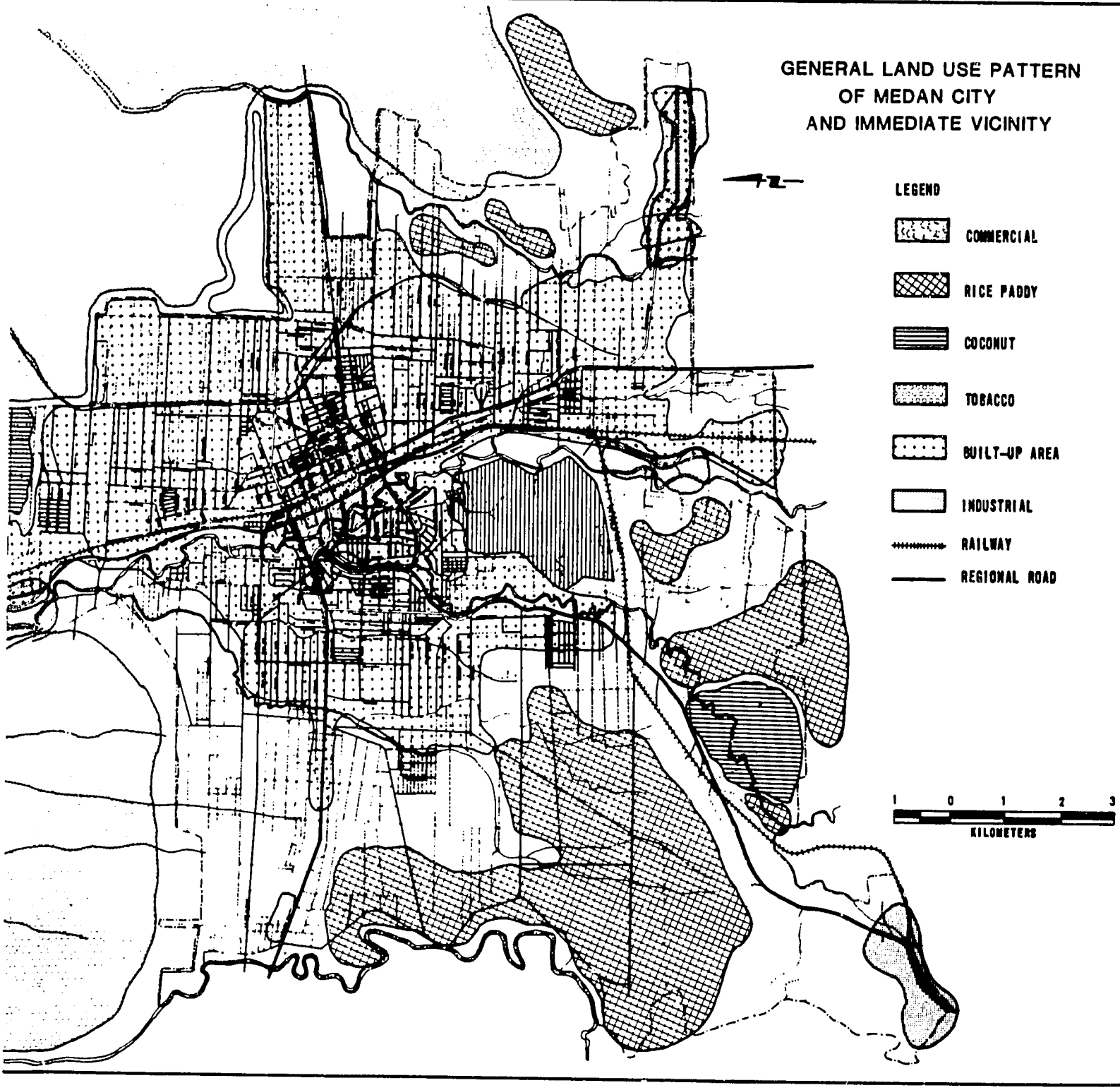
FIGURE



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This deficit in the provision of public use facilities is due to high land costs, the lack of budgetary provisions for land acquisitions, and to complicated land acquisition procedures which make compulsory land acquisition almost impossible. As a result, current land acquisition procedures often are unable to provide sufficient land for existing public projects let alone meet Master Plan standards.

The Master Plan established a hierarchy of roads providing different road widths for different functions. These range from main roads having minimum widths of 25 m designed for high speed through traffic to 10 m wide fourth class roads aimed at local vehicular traffic within residential neighborhoods. These road standards cater primarily to vehicular traffic and do not take account of the pedestrian nature of much of Medan's population. These standards unnecessarily increase the total land requirements and consequently the cost of developing housing for low and middle income households. By way of comparison, Perumnas housing projects generally have circulation standards of between 15 to 18 percent of the housing development area. The result of these Master Plan circulation standards is to increase the land costs of low income housing by almost 40 percent.

HOUSING

An estimated 28,000 households required housing in Medan in 1979 due to the condition of existing housing stock. If current housing construction trends persist, by the end of Repelita III a cumulative total of 146,000 households will require housing. However, current estimates of the growth of housing stock indicate that combined public and private building activities will only supply about 35,000 units to meet those needs.

Generally, the physical condition of much of Medan's housing is poor. A 1976 housing survey indicated that 78 percent of Medan's 153,051 buildings were built from semi-permanent or temporary materials. Much of this housing lacks adequate sanitation and water supply and exposes households occupying those units to health and safety risks. A fire in a low income kampung (1979) destroyed up to 900 dwelling units in a matter of a few hours.

A wide range of housing conditions are found in kampungs which have developed spontaneously without public sector development assistance. In general, the worst housing conditions are found in the interiors of the "old" kampungs which surround the Kotamadya's commercial district, the temporary residential areas located along the Babura and Deli Rivers, along the rights of way of railways and in close proximity to many of the city's markets. In these areas, individual plots are small and poorly defined with the bulk of the land being built upon. An average dwelling unit is approximately 55 sq m.

Analysis of the living conditions of Medan households already housed shows that roughly 59 percent or 113,000 households could benefit from some form of urban upgrading program such as the Kampung Improvement Program (KIP). Up to 78 percent of those households living in semi-permanent or temporary housing could benefit from some form of home improvement program such as

building materials loans, loans for improved sanitation, or others. To date, the government sponsored housing programs of Perumnas and the Bank Tabungan Negara (BTN) have all been aimed primarily at government employees. By the end of Repelita III, an estimated 28,000 units will have been allocated or are projected to be built in Medan, primarily for government employees.

High land costs have made land for housing purposes scarce and have forced government low cost housing projects to seek land on the periphery of Medan where easy access to employment opportunities is limited. The land costs of the Bank Tabungan Negara's low cost housing projects have ranged between Rp.2,100 to 3,500 per square metre and they have had to be located anywhere from five to ten kilometres away from the city centre. Land values for private housing projects are often much higher, ranging up to Rp.50,000 per sq m in desirable locations such as the Polonia district. In other, less desirable locations, middle and upper income households are generally required to pay between Rp.3,000 to 10,000 per sq m for individual plots on underdeveloped land.

Rents for housing, even in low income kampungs in Medan, tend to be high. A random sampling of 300 rental units in low income kampungs selected for KIP indicated that roughly 58 percent of the households paid rents between Rp.3,000 to 7,500 per month for one and two room dwellings, many of which lacked individual water supply or adequate sanitary facilities. Furthermore, the bulk of these rents were quoted as annual rents and thus actually ranged between Rp.36,000 and Rp.180,000 as landlords frequently require rents to be paid up to two years in advance. These high rents place a severe strain on household incomes, and often force households to borrow at unfavorable interest rates to pay them.

The number of new housing units presently being constructed by both private building and public agencies is inadequate to meet minimal existing and projected housing requirements. The present situation in housing, given a continuation of present trends, is summarized below:

Year	Number of Housing Units		
	Required	Constructed	Deficit
1976	26,270	5650	21,020
1980	28,410	5720	22,690
1985	31,660	5810	25,850
1990	35,356	5890	29,460

WATER SUPPLY

Only 25 percent of the residents of Medan are served by the local water utility (PAM Tirtanadi), the remainder obtaining their water from open, often contaminated, public and private shallow wells. A very few people obtain water from public standpipes, most of which are either in a state of disrepair or have water at adequate pressure for relatively short periods. Those served by the municipal system are predominately upper and middle income groups who can afford the very high connection charge currently levied by the utility. The present connection fee is structured to cover not only conventional connection costs (line from street main plus meter and appurtenances), but also a portion of other capital and operation and maintenance costs. Sixty percent of the estimated non-residential water demand is met by Tirtanadi, the remainder being obtained from privately constructed deep wells.

High connection fees, coupled with inadequacies in distribution facilities, result in a totally inadequate service to lower income groups and encourage the development of alternative sources for both residential and non-residential uses. Although adequate sources of water are available locally, these have not been developed sufficiently to meet existing and potential demand.

WASTEWATER

In Medan, wastewater collection and disposal is provided almost entirely by a combinatlion of surface drains and individual on-site disposal systems. The separation of wastewater flows into grey and black water components is typical throughout the city. Grey water is discharged to the surface drainage system which is comprised almost entirely of open roadside ditches. Black water (toilet wastes) are discharged to septic tanks or soak-away pit latrines. The poor soil conditions found in the city limit the success of these systems and visual inspections suggest that a considerable quantity of septic tank effluent is entering the surface drains either directly or indirectly.

More than 15 percent of the residents of Medan do not have household toilet facilities. These conditions exist primarily in high density low income urban areas where the lack of sanitary facilities creates major public health risks. Virtually all of the rivers and streams flowing through Medan are grossly polluted; these are used for washing and bathing. Excrement on the ground contributes to the high incidence of hook work and round worm.

DRAINAGE

Runoff from rainfall is carried by means of roadside ditches and some closed conduits to major channels which discharge to the Deli river, Kera river and their tributaries. Runoff from very small parts of the study area find outlet to the Belawan and Percut rivers.

Flooding in the study area attributable to high flows in these rivers has been limited to the lower reaches of the Deli river below its junction with the Babura.

Local flooding, however, is frequent and widespread, affecting large areas in the eastern and western sections of the city, particularly along the Binjei Road.

The main factors which contribute to flooding and related problems are:

- Obstruction to flow caused by the accumulation of solid wastes and debris
- The growth of vegetation in and along the banks of streams
- Channel siltation
- Inadequate channel capacity to carry increased rates of runoff attributable to urban development and to provide for the higher levels of flood protection that are required.

The surface water drains in Medan also carry large quantities of wastewater which create hazards to public health, especially during times of flooding.

The non-availability of stream flow data precludes a definitive analysis of the capacity of existing channels in relation to the frequency of occurrence of flooding events.

SOLID WASTES

A municipal solid wastes collection and disposal service is provided to only part of the heavily urbanized portions of the study area.

Service to households and business establishments is carried out using handcarts and, in some instances, trucks. Approximately 25 percent of the total solid wastes generated are collected with service provided to only about 23 percent of Medan's households.

Solid wastes collected by handcarts are transported to a pool site where the solid wastes are stored and loaded into trucks for transport to the municipal disposal site. Unsatisfactory environmental conditions exist at most pool sites.

When solid wastes are not collected households dispose of their wastes as follows:

Household Disposal Method	Percent of Households
Burning	56
Burial	8
Disposal to ditch or stream	12
Other	1
Total	77

The threat to public health, property damage due to flooding and the general nuisance created by the resulting accumulation of solid wastes in the drains and throughout the city greatly detract from the quality of life in Medan.

WATER AND WASTE QUANTITIES

Future water and waste quantities have been projected on the basis of population, income and density for each kampung and upon industrial, commercial and institutional land use projections. Unit rates of water demand and waste production are summarized in Table 1. together with the pertinent population and land use data. Total projected water and waste quantities are shown in Figure 4. Storm runoff quantities within the study areas were determined using the rational method. The rainfall frequency intensity duration data used in the calculations are also illustrated in Figure 4. Existing and potential water supply sources are shown in Figure 5.

HEALTH

The general standard of health in Medan is low. The most commonly reported diseases in Medan seem to be increasing, while basic disease patterns have hardly changed during Repelita II. The development of new health facilities has been slow as has the effective employment and utilization of available trained manpower. Health manpower education has not been linked to health manpower needs, particularly for lower-level health workers. The high costs of services, shortage of facilities, low awareness among the people concerning health, traditional beliefs, and the lack of accessibility are among the causes of underutlization of existing facilities. A major problem in constructing the required essential health facilities is the difficulty in locating land. In many cases the availability of land and not priority needs dictates health policy.

EDUCATION

The number of primary schools in Medan almost doubled between 1971 and 1978 and attendance reached over 90 percent. Significantly, at the secondary level, the growth in the number of pupils outstripped the corresponding increases in facilities by as much as 100 percent. Attendance was only about 42 percent in junior high schools and about 25 percent at the senior level. Beyond problems such as the critical shortage of text books, libraries, and teachers, the difficulties in getting land for school sties has started to be the determining factor in implementing educational policy. Maintenance of already constructed facilities is not systematically budgeted.

Attendance at technical and other specialized schools has dropped due to the lack of guaranteed employment, insufficient or obsolete equipment, and a general lack of both instructors and textbooks. Despite their importance to Medan's future development, these schools have now been combined with secondary education facilities.

TABLE 1

SERVICE AREA AND UNIT RATES OF WATER SUPPLY AND WASTE PRODUCTION

I. WATER SUPPLY

Year	Population Served (persons)	Commercial Industrial Area (ha)	Unit Water Use Rates: Domestic (l/c.d) Average	High Income	Medium Income	Low Income	Commercial Industrial cu m/ha
1980	301,000	761	160	265	215 145 HD	145 LD 100 MD 35 HD	40
1990	1,150,000	1148	140	275	200 175 HD	175 LD 125 MD 35 HD	40
2000	1,562,000	1557	163	300	260 200 HD	200 LD 150 MD 35 HD	40

II. WASTEWATER

Year	Population Served (persons)	Area Served (ha)	Unit Wastewater Production* (l/c.d)
1980	-	-	-
1990	117,000	705	184
2000	461,000	2140	142

TABLE 1--Continued

III. SOLID WASTES

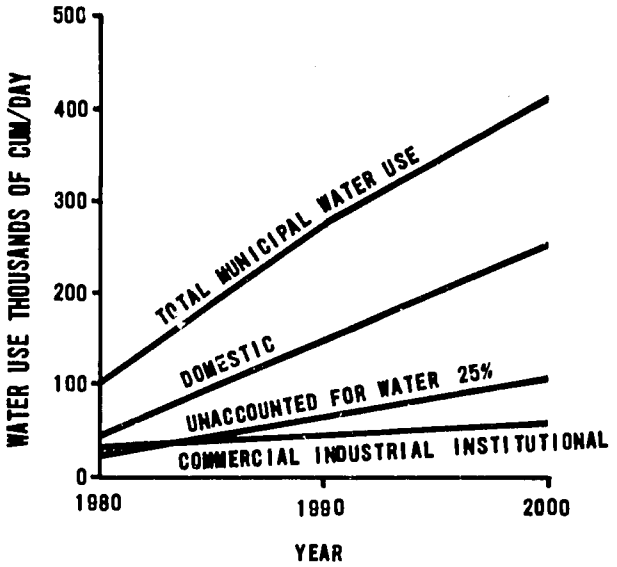
Year	Population Served (persons)	Commercial Industrial, Institutional Area (ha)	Unit Production Rates		Markets and Parks Tonnes/d
			Domestic kg/c.d	Commercial Industrial, Institutional Tonnes/ha.d	
1980	459,000	1112	0.51	0.2	91
1990	1,282,000	1432	0.62	0.2	131
2000	1,733,000	1844	0.75	0.2	196

Notes: LD = Low density
MD = Medium density
HD = High density

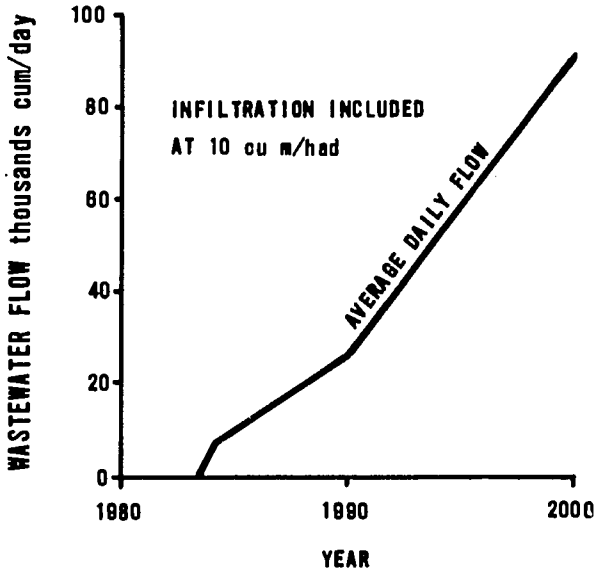
* Aggregate community wastewater unit quantity based upon water supply return factors of 0.7 for different domestic income density groups and of 0.8 for commercial industrial, institutional users.

FIGURE 4

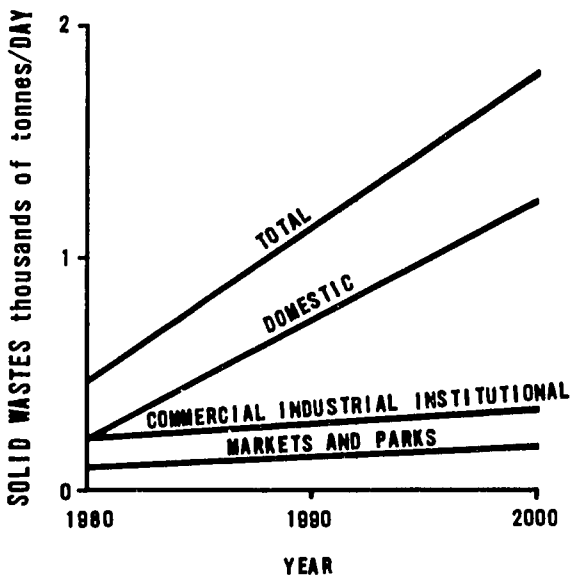
PROJECTED WATER AND WASTE QUANTITIES



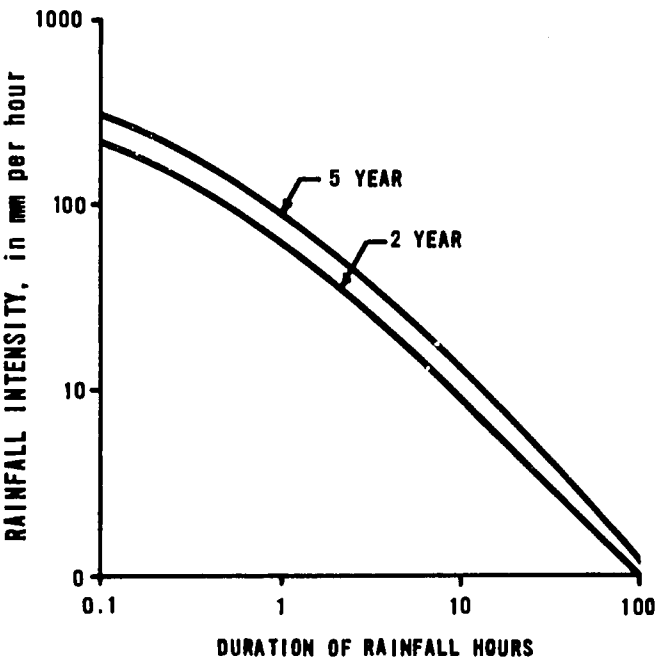
MUNICIPAL WATER USE



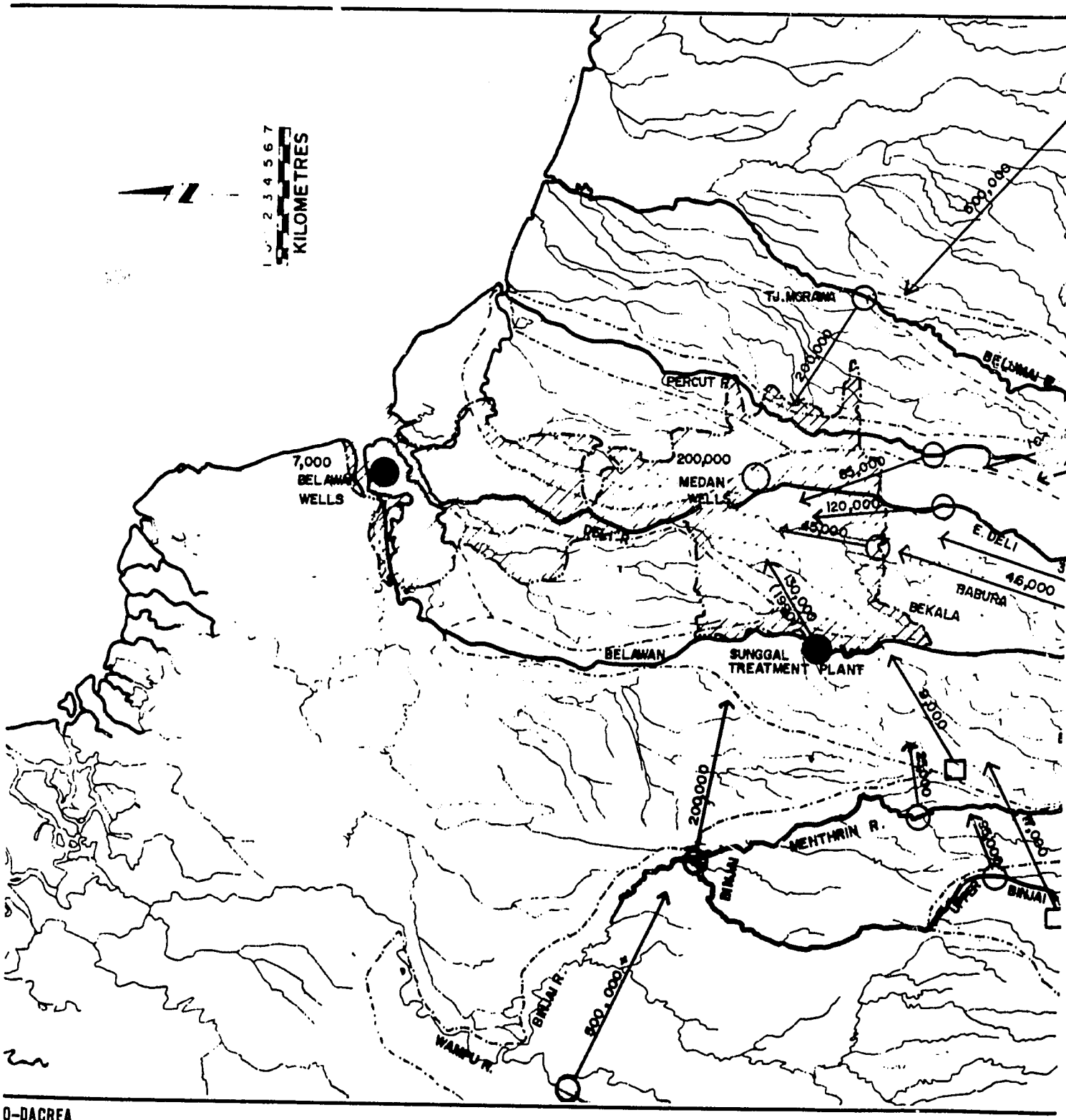
WASTEWATER COLLECTED



SOLID WASTES COLLECTED



RAINFALL FREQUENCY
INTENSITY DURATION

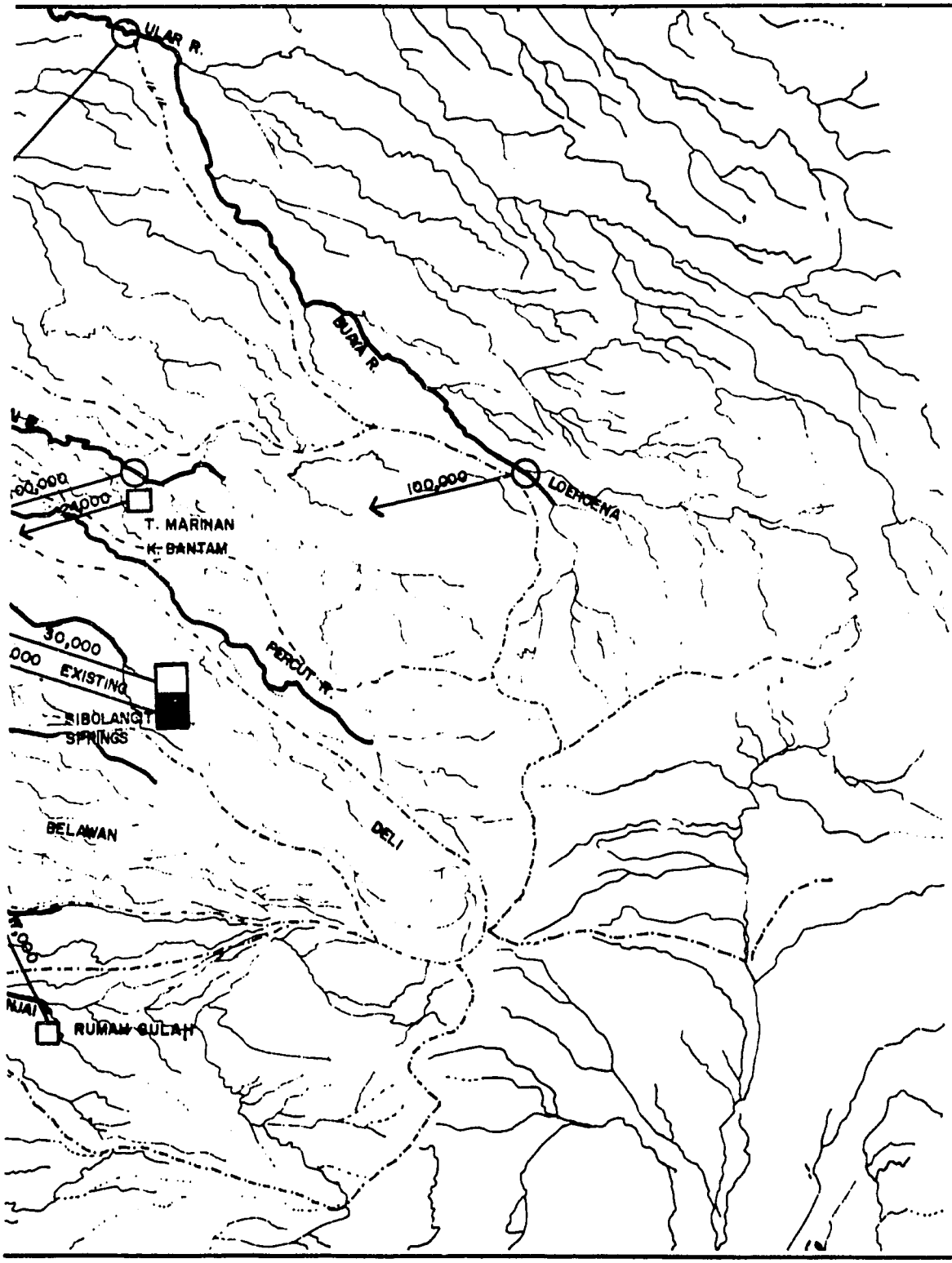


O-DACREA

21

21

FIGURE



EXISTING AND POTENTIAL WATER SUPPLY SOURCES

LEGEND

EXISTING SOURCES RIVERS, SPRINGS

POTENTIAL SOURCES RIVERS, SPRINGS

20,000 PROJECTED PRODUCTION IN CUBIC METERS/DAY

ENGINEERING-SCIENCE - SINOTE

The costs of education continue to be a problem at all levels, even at elementary level where "unauthorized payments" to teachers are often made to assure matriculation despite a decision in 1977/78 to eliminate fees for the first six grades of primary school.

The problem of drop-outs is also critical. The impact of the nationally heralded PENMAS program has been limited by small financial resources. To date this program has not been able to establish effective linkages between its training courses and the real opportunities for increases in income and employment which are required by Medan's low income population.

A key part of the total problem is the fragmented educational planning and programming system at the Medan level. National policies do not reflect local realities and no local educational policy exists to guide actions. Decision making is strongly centralized with minimal linkage and coordiantion with other sectors.

TRANSPORTATION

Medan is a centre of transportation in North Sumatra due to its seaport, airport and land transportation facilities which serve the province.

Generally, the road network and the bridges in the greater Medan area were constructed before World War II, and are not adequate to meet the growing traffic demands. There is not a distinct hierarchy of roads with different functions such as arterial roads, secondary roads and access roads established in the network. Because Medan is a focus of the regional road system, many of the existing roads serve multiple functions as arterials for through traffic,collectors/distributors for intra-urban traffice, and as access roads. Many of the main roads are cut directly by the secondary and tertiary roads so that there are many intersections within short distances. The combination of these conditions, along with the restricted road widths, roadside activities, increasing use of motor vehicles and insufficient parking areas precludes smooth traffic flow on the main roads.

The growth rate of all types of vehicles has been extremely high in recent years and shows no signs of diminishing. Clearly, the existing road network with a few main roads in Medan is not sufficient to serve either the current or the future needs of the city and its surrounding area.

The majority of roads are in a bad state of repair, the result of low levels of upkeep which in turn reflects inadequate budget allocations to road maintenance.

Traffic signs are poorly provided at the intersections of main roads and very few traffic markings exist. Traffic signal control sytems are similarly scarce and as they are often not operating correctly, tend to confuse rather than assist traffic flow.

THE RECOMMENDED MASTER PLAN

OBJECTIVES

The recommended plan proposed for the city of Medan is based on the priority social and economic objectives of national development. The national objectives for Repelita III place primary emphasis on social equity within the context of continued growth and stability.

The means of achieving social equity are increased services and facilities to meet basic essential consumption needs, greater distribution of income, enhanced employment and business opportunities, greater popular participation in development activities, regional legislation, and equal justice under the law.

The regional development objectives, as identified for Repelita III, have designated Medan as the growth center for Region I which encompasses South Sumatra, West Sumatra, Aceh and Riau Provinces. The level of economic output achieveable through metropolitan and regional development is is of concern in the proposed development strategy. Greater equity in Medan will be of little consequence if overall levels of development are very low, but some economic output may have to be sacrificed in the short run in order to achieve greater equity. Because of Medan's significance in national and regional/provincial development and because the proposed strategy reflects a national policy in which equity is of prime concern, the specific target groups upon which the long-term strategy would focus include the metropolitan and regional populations. Medan may support them in various ways by more efficiently fulfilling its regional functions.

Sizeable new investments will be required during Repelita III to provide improved and expanded basic urban development capacities for urban and regional growth. Given the current and projected budget constraints, a priority task will be the more effective mobilization, integration, and coordination of the existing national, provincial and local resources (human, institutional, legislative and financial).

ECONOMIC DEVELOPMENT

National and provincial policies encouraging growth outside of Jakarta should include support for business services, the elimination of "bottlenecks" and unauthorized levies, improvement in the quality and coverage of investment banking services, and other functions necessary to attract industries to existing regional centres and subcentres. National and provincial policies would continue to support agricultural development actively as proposed in Repelita III, such as support for intensive agriculture linked with both urban and export markets.

Significant changes in the structure of Medan's economy are not anticipated. Rather, major efforts need to be taken to assist and stimulate new investment and expansion through: (1) the provision of adequate basic urban infrastructure and services at reasonable charges, (2) the development of a more efficient transportation system for the movement of both goods and services and passengers and (3) the identification of tax and business incentives to stimulate economic growth. A major effort should be made to use unutilized or underutilized capacity — including labor, capital equipment and land (particularly underutilized land in already existing industrial areas). The rate of labor-intensive manufacturing growth and its regional distribution will be key factors in determining the rate and quality of future employment growth. Labor intensive methods in construction and major attempts to utilize indigeneous materials rather than imports are indicated. Support should be provided for resource conserving innovations in the design of structures.

LAND ACQUISITION AND DEVELOPMENT

The continuing inability of the government to easily acquire the land it needs for public purposes, as well as the inadequate mechanisms by which the government may capture a part of the increased land values resulting from public investments, are major constraints on the planning and implementation of orderly urban growth patterns.

Effective implementation of the recommended plan would require action at the national and provincial levels to develop more effective legislation, regulations and procedures to both control land speculation and facilitate its acquisition for public purposes. It also assumes that the Basic Agrarian Reform Law of 1960 requiring that the rights to land be registered in order to be valid will be implemented.

To ensure that orderly development occurs, land supply should be available when it is required. Therefore, several immediate actions are needed in Repelita III. Among the most urgent is to initiate a comprehensive study of land resources, land prices, development controls affecting the supply of land and development cost, and the agencies involved in land use and development in Medan and its surrounding region. This analysis would delineate specific legislation, local and national actions required to improve land use and development, methods of increasing the supply of low cost land, and necessary corresponding changes in the agencies which administer land use and development controls.

A major effort would be made to achieve a better balance between the location of jobs and the location of residences. Segregation by income and/or ethnic characteristics would be reduced as much as possible. To the extent it is consistent with a better balance between job opportunities and places of residence, inner areas of Medan that are not yet utilized would be brought into development. Average densities would be considerably higher than present densities due to budget constraints and the desire to increase accessibility to both jobs and services.

Investment in physical facilities would be directed to priority needs which cannot be met through the more intensive utilization of existing facilities, such as implementation of double shifts or the multiple use of other existing facilities, in order to utilize capital more fully and conserve basic resources. Norms and standards for the space requirements of physical facilities would be revised and brought more in line with realistic resource levels.

HOUSING

Since its organization in 1975, Perumnas has launched a large scale effort to meet the housing needs of the low-income population, especially government workers. However, several key problems still need to be resolved as quickly as possible, such as: (1) the development of a uniform mortgage instrument, (2) the generation of sources of housing finance, (3) the development of effective methods for repossessing property delinquent in mortgage payments, (4) the effective coordination of the housing programs with the development of basic essential urban services and facilities and (5) the elimination of all external subsidies.

Current efforts by Perumnas and other public and private institutions to provide a basis for adequate housing for all the population would be expanded with emphasis placed on eliminating subsidies through solutions directly related to ability to pay and cross subsidies from middle and upper income groups.

Given resource limitations, the Kampung Improvement Program will be focussed on providing a basis for better housing, rather than housing per se. Norms and standards for the construction of housing and residential land uses would be revised and brought more in conformance with the affordability levels of the Medan population.

WATER SUPPLY AND SANITATION

At least minimum essential services for water, sewerage, solid wastes, and drainage would be extended to as many of Medan's households as possible, beginning with those that are least well served at the present. The combination and standards of services installed will be related to the ability to pay and be consistent with the densities at which development is currently taking place.

Water Supply

The population served by the municipal water system should be increased from the present 25 percent of the study area population to 60 percent by 1985 and 80 percent by the year 2000.

The long-term master plan program to achieve this has been staged as follows:

Stage I - Repelita III

- Expand the Sunggal water treatment plant from its planned 98,000 cu m/d capacity to 104,000 cu m/d
- Implement a groundwater exploration program to delineate the extent to which less expensive groundwater can be substituted for surface water supplies. Install 53 new wells
- Establish flow monitoring stations at recommended points on the Sunggal and Deli rivers to enable more accurate estimates of the possible safe yields. Establish the magnitude of existing water rights on the Sunggal and Deli rivers downstream from Medan
- Reinforce and expand the existing distribution system to include construction of 290 km of major mains, 890 km of minor mains, 108,000 cu m of reservoir capacity, and pump stations with a peak capacity of 2,855 l/s
- Expand and upgrade the public standpipe system by adding 1200 standpipes
- Provide an additional 21,000 house service connections
- Improve sanitary conditions of 10,000 shallow wells.

Stage II (1984/85 to 1990)

- Continuation of the well drilling and groundwater exploration program
- Continue laying feeder mains
- Installing standpipes and service connections within existing built up area
- Construction of two reservoirs and booster station in kampungs Sei. Kera Hulu and Polonia
- Extension of the major distribution network and feeder mains outside the existing built up area but within the year 2000 development boundary

- Construction of Stage III of the Sunggal augmentation from 104,000 to 130,000 cu m/d

- Construction and commissioning of the first stage of the Deli Tua Plant.

Stage III (1990 and beyond)

- Increasing the capacity of the four reservoirs and booster stations

- Construction of two reservoirs and booster station in Kampungs Pulau Brayan Kota and Tanjung Sari

- Laying of additional trunk mains to meet the year 2000 demand

- Continuation of the groundwater and surface water monitoring program

- Laying of additional feeder mains and providing service connections

- Construction of the second stage of the Deli Tua Plant, and if necessary the third stage, increasing the total daily production to 120,000 cu m/d.

Wastewater

The master plan studies have identified an optimum long-term program for the improvement of wastewater management which was selected to meet sanitation objectives on the basis of public health benefits, program costs and financial constraints.

The strategy for improving wastewater management in Medan is the implementation of a time phased program which envisages the improvement of present methods of disposal,(rather than their immediate abandonment) in addition to the construction of a separate sanitary sewerage system to serve areas inhabited by low income groups and high density central commercial areas.

The selected master plan program has the following elements:

- A separate system of sanitary sewers and treatment facilities providing complete service to the central urban area and most of the low-income priority area and kampungs by year 2000

- An interim latrine improvement program in the area where the sewerage system will be constructed, to relieve existing problems before the sewerage system becomes operational

- A long-term latrine program to improve waste disposal facilities in medium and low density areas where it is not economically feasible to install sanitary sewers

- An MCK (a public sanitation unit incorporating clothes washing, bathing and toilet facilities) program for very high density areas where individual or family latrines are not practical because of space limitation

- A septic tank clean-out service.

Drainage

The major elements of the recommended drainage management system are as follows:

- Kera Basin

  Staged implementation of major improvements in the Kera Basin which are to be initiated immediately and are to be completed by 1990 with the objective of providing a moderate level of flood protection.

- Urban Area

  Throughout the program period to year 2000, carry out a continuous program of channel clearing, cleaning, and dredging in the urban area and other areas subject to flooding with the objective of ensuring that the flood control potential of existing channels is achieved.

- Monitoring

  Monitor drainage system operation after initial channel cleaning and throughout the program period to provide basic designs and performance evaluation data and to establish priorities for future channel improvements.

- Downstream Channel Clearing, Cleaning, and Dredging

  After initial monitoring data has been evaluated, initiate long-term program for drainage in downstream reaches of major rivers and drains, primarily the lower Deli river and Kera river.

- Channel Improvements

  Immediately initiate and continuously execute a channel improvement and new channel construction program. The program to be coordinated with:

  - the flood monitoring program
  - road improvement and construction program
  - implementation of the sanitary sewerage program and other utility programs.

- A program for providing flood warning and emergency assistance and relief for flood victims.

- Control of urban development (land use, site development and building construction).

- Training and technical assistance.

Solid Wastes

The major elements of the recommended solid wastes management system are as follows:

- Priorities and Staging

  1980 - Immediate Action : Upgrade service to provide for all wastes generated in the primary area.

  By 1985 - First Stage : Extend service to include all of the primary and secondary areas, the corridors of regional roads and selected satelite residential developments within the tertiary area.

  By 1990 - Second Stage : Extend service to the entire area of Kotamadya Medan except in low density rural areas which can continue to employ household disposal methods effectively.

  By 2000 - Third Stage : Expand service to keep pace with urban development.

- Collection Service

  Apply collection systems throughout the service areas described above in accordance with the following schedule:

SERVICE GROUP	SERVICE LEVEL	DESCRIPTION
Domestic		
High Income	1	Daily - house tc house - truck
Medium Income	2	Every second day - house to house - truck
	3	Daily - house to house - handcart
Low Income	4	Every second day - house to house - handcart
	5	Every second day - curbside - handcart
	6	Twice weekly - curbside
	7	Daily - communal
Commercial, Industrial, Institutional		
	C1	Daily - house to house - truck
	C2	Daily - curbside - truck
	C3	Daily - curbside - handcart
Markets and parks		Transportation only

- Transfer Stations

  Major transfer facilities are not recommended as elements of the Medan solid wastes management system. When haul distances to disposal sites exceed 10 km, vehicles with a minimum payload of 3 tonnes should be used.

  Smaller, secondary transfer facilities or "loading stations" are required within the collection system to facilitate the transfer of handcart loads to trucks.

- Disposal

  It is assumed that the existing commercially operated composting plant will continue to act as an element of the solid wastes disposal system, at least in the short-term. Sanitary landfill is proposed for the disposal of the rest of the municipal solid wastes.

HEALTH AND EDUCATION

The recommended plan for health and education, while recognizing the major expansion of the facilities and physical infrastructure under INPRES, places a much greater emphasis on expansion of services with or without physical facilities. Key problems such as nutrition and water borne diseases suggest the need to complement increased levels of employment and basic water supply and sanitation with integrated pilot education programs in functional environmental health and nutrition. The training and more effective utilization of existing manpower resources such as students and the military would need to be given a high priority in both national and provincial programs.

To make it possible to achieve greater equity, improved health and education services would be delivered to the population as soon as possible. In health, the emphasis would be on preventive medicine and the development of the Puskesmas, Puskesmas Pembantu and the Pos Kesehatan neighborhood service centres. Extensive programs of environmental health education will be developed to complement water and saniation investments. A major effort would be made to increase technical skills on a widespread basis in order to increase both income and employment. Programs of this type should begin with the poorest and most under privileged segments of Medan's population.

TRANSPORTATION

The emphasis under the recommended plan would be on mass transportation and an extension of improved transportation services and facilities to all segments of the population. Effective urban/metropolitan rail transit will not be possible before 1985, but would be introduced soon afterwards. The use of private automobiles or other private transportation that is inefficient from a social point of view would be actively discouraged. Overall

transportation costs would be kept as low as possible — in terms of both direct costs and travel time — and all segments of the population would have access to similar levels of transportation service. Investment in the road system would be kept as low as possible consistent with the need to bring major and secondary roads up to minimum standards to facilitate the movement of both regional as well as local goods and services. Better traffic management and control is basic for both short and long-term progress.

PRIORITY OBJECTIVES FOR REPELITA III

The Recommended Plan has established a series of specific priority objectives and goals to be achieved over Repelita III. These objectives and goals identify those priority actions required over the next five years in the sectors focussed on by the MUDS Study. Their implementation in an integrated way will be the initial step in establishing a planning and programming process which is linked at the provincial and national levels.

The specific priority objectives and goals are:

ECONOMIC DEVELOPMENT

Basic Objective

To provide the Kotamadya Medan with Technical Assistance in identifying and eliminating the impediments to economic growth.

Goals for Repelita III

The primary goals include the development of action programs to eliminate existing impediments as rapidly as possible through adjustments in procedures, the introduction of necessary legislation, and the simultaneous implementation of special programs to stimulate the development of medium and small-scale enterprises.

MUNICIPAL PLANNING AND FINANCIAL PROGRAMMING

Basic Objective

To provide the Kotamadya Medan with technical assistance in developing and implementing an integrated annual planning, programming, budgeting and monitoring system which could effectively select development projects and programs, assure their early and full funding, and monitor their physical and financial performance.

Goals for Repelita III

The primary goals of the program would be to increase the levels of municipal finance which are available for providing the urban services being recommended under the MUDS proposals. In addition, the technical assistance team would assist Kotamadya and national governments through:

- Analyzing and developing improved taxation procedures which would be based on progressive ability-to-pay principles

- Assisting the Kotamadya government in developing and passing appropriate tax enforcement procedures

- Analyzing and advising Kotamadya, provincial and central governments on means of assuring earlier and more regular sanctioning of high-level government loans and grants

- Analyzing the full financial implications of the proposed accelerated Medan Urban Development program and devising a means to handle the initial and subsequent city contributions within the newly devised budget and tax system.

HOUSING

Basic Objective

To provide better access for lower income groups to the total pool of capital and management resources allocated to housing in order to achieve rapid upgrading in their standards of living.

Goals for Repelita III

- Provide upgraded physical infrastructure, roads, footpaths, bridges, water supply and sanitation services, and improved opportunities for basic health and education services for 80,000 residents of priority kampungs selected for KIP

- Acquire a 160 ha site on the Brastagi Road for Perumnas III housing project

- Develop approximately 8,400 SSCH/LCH units on plot sizes ranging from 60 to 300 metres for and estimated population of 50,000 people Provide a full complement of education, health and social facilities as required

- Carry out a comprehensive study of land resources, land prices and development controls to determine specific legislation and local and national actions necessary to increase the supply of land at reasonable costs. Also determine the changes required at the institutional level necessary to administer land use and development controls.

WATER SUPPLY AND SANITATION

Basic Objective

To provide minimum water and sanitation services to as many of Medan households as possible at affordable costs. The recommended water supply and sanitation systems for Repelita III are illustrated in Figures 6 through 9. In Figure 10, these programs are shown together with the KIP and SS/LCH programs.

Goals for Repelita III

Water Supply

The major objective is to achieve the GOI's specific target for major towns in Repelita III of: (1) an average domestic consumption of 60 l/c.d for 60 percent of the population and (2) an overall ratio of 1:1 for those served by house connections to those served by standpipes. The Repelita III program has therefore being divided into two phases: Phase I which is devoted to achieving the above objective and Phase II which will further augment and extend the public water supply service.

Phase I (1980/81 - 1981/82). This is the most important and urgent phase, the primary objective of which is to provide a supply of potable, pipe-borne water to at least 60 percent of the total population of Kotamadya Medan by the end of 1981/82. This will be achieved by laying emphasis on an intensive program of work in East-Medan:

- The laying of the major and minor distribution mains to serve East Medan will be mainly done under the Netherlands Aid program. The additional water requirements will be provided by the first stage augmentation of the Sunggal plant from 52,000 cu m/d to 78,000 cu m/d and the construction of 13 deep wells

- An intensive program for standpipe coverage of the area. An additional 1200 standpipes will be installed

- Commencement of the surface water monitoring program.

Phase II (1982/83 - 1983/84). This will consist of:

- Laying of the remainder of the major distributuon mains in the existing built up area

- Construction of the two reservoirs and booster-stations in Kampungs Titi Kuning and Babura Sunggal

- Continuation of laying feeder mains

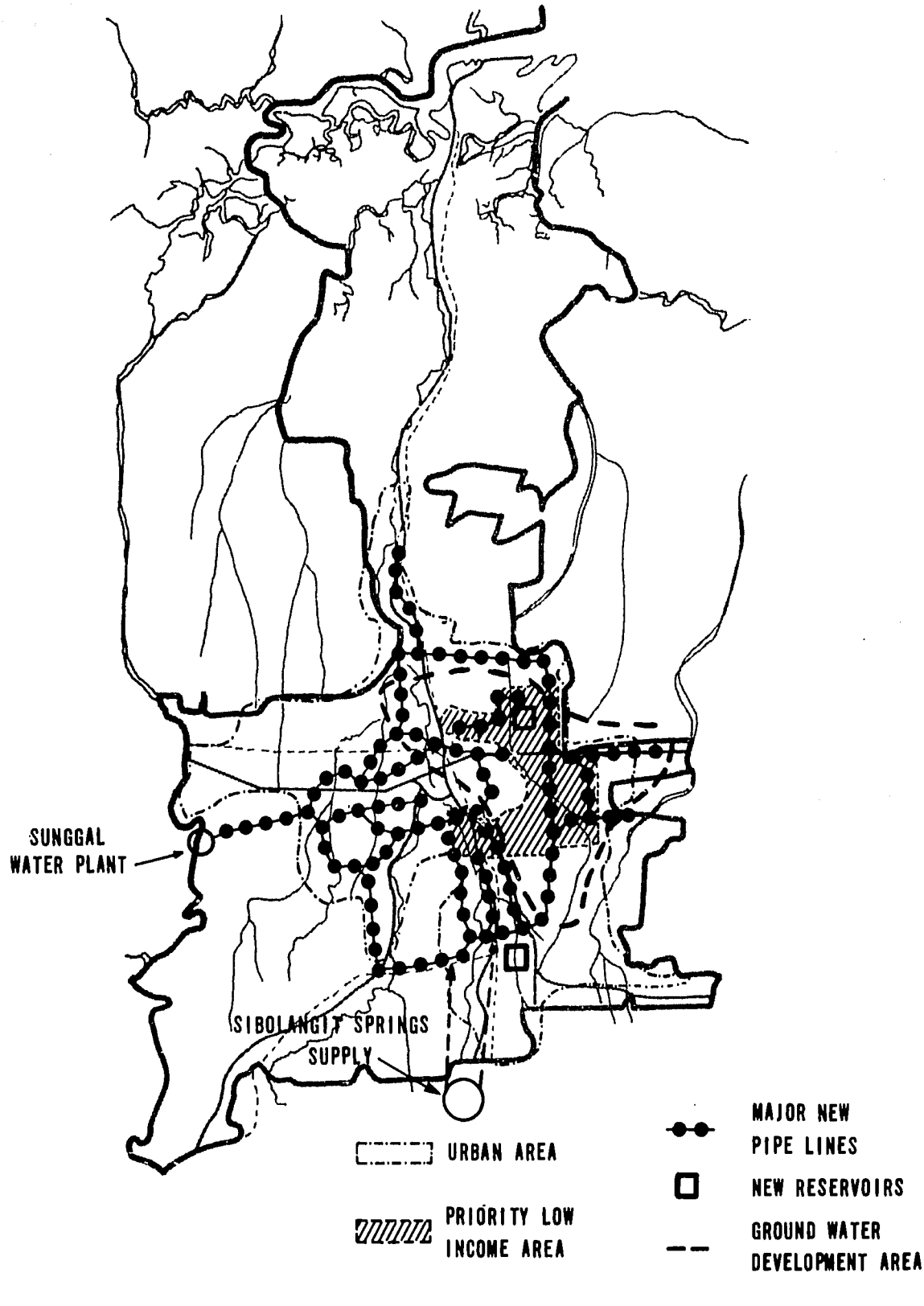
- Construction of Stage II of the Sunggal augmentation, from 78,000 to 104,000 cu m/d

- Intensification of shallow well improvement program

FIGURE 6

FIRST STAGE PROGRAM

FOR WATER SUPPLY



FIRST STAGE PROGRAM FOR SEWERAGE

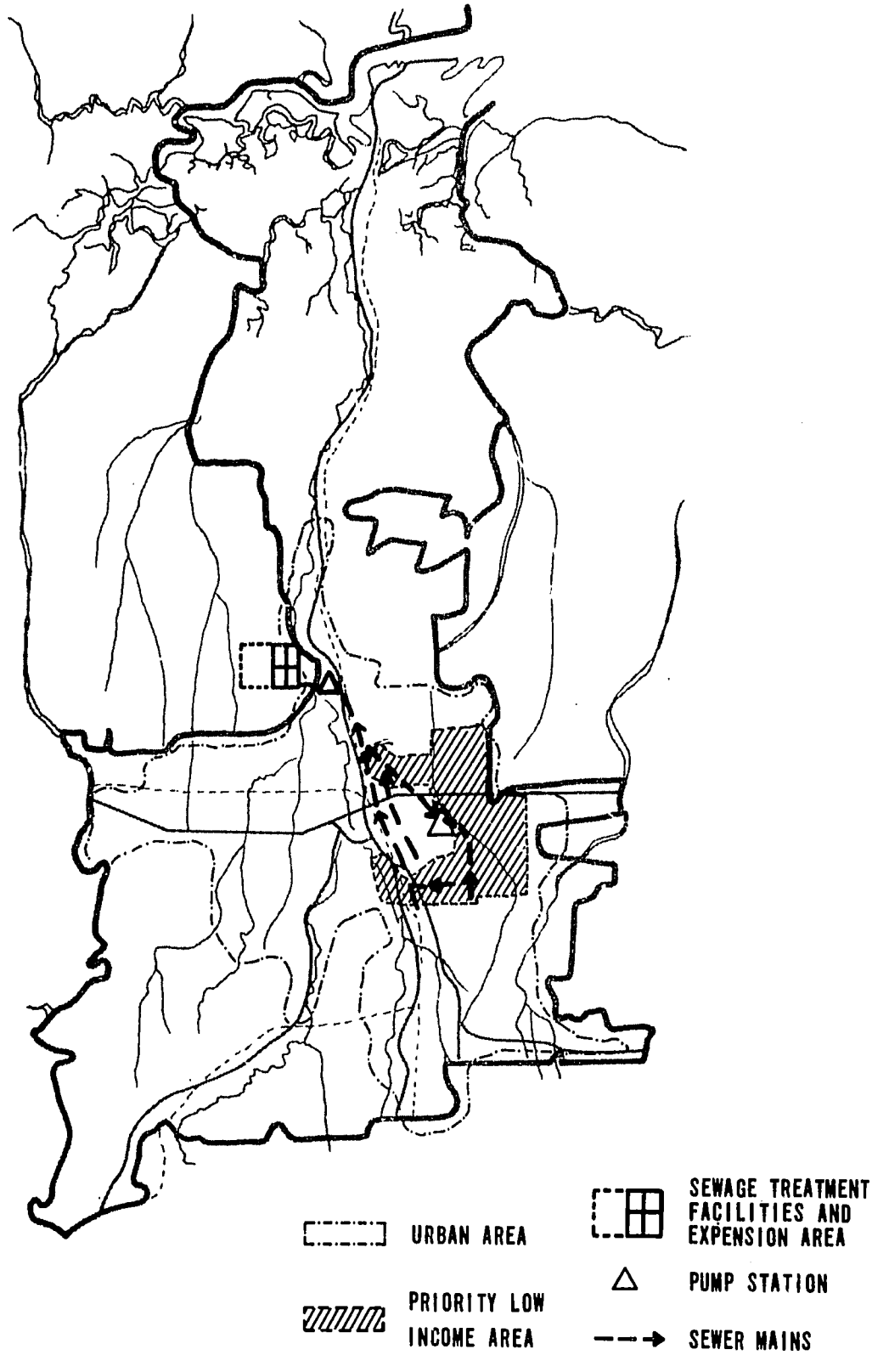
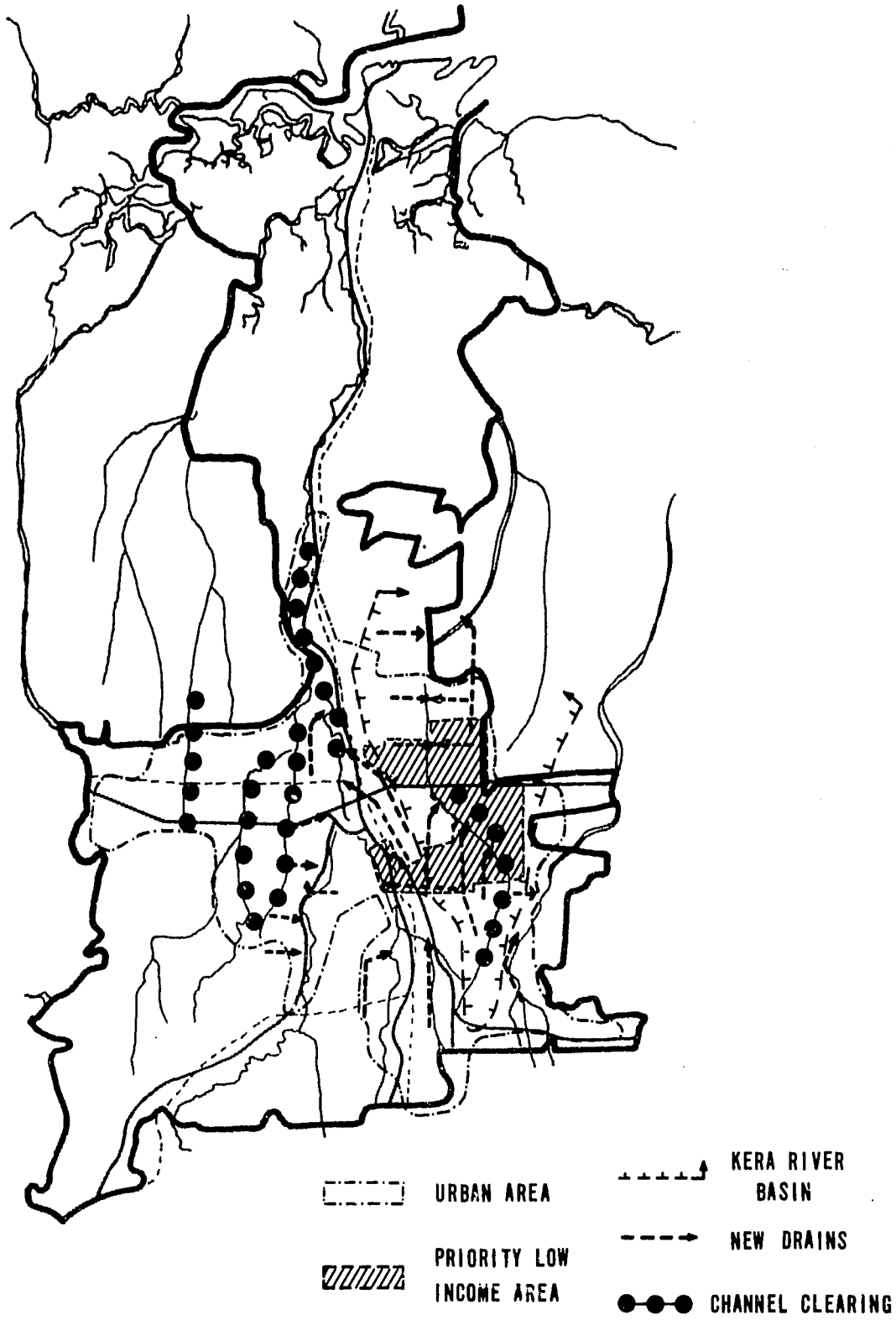


FIGURE 8

FIRST STAGE PROGRAM FOR DRAINAGE



FIRST STAGE PROGRAM FOR SEWERAGE

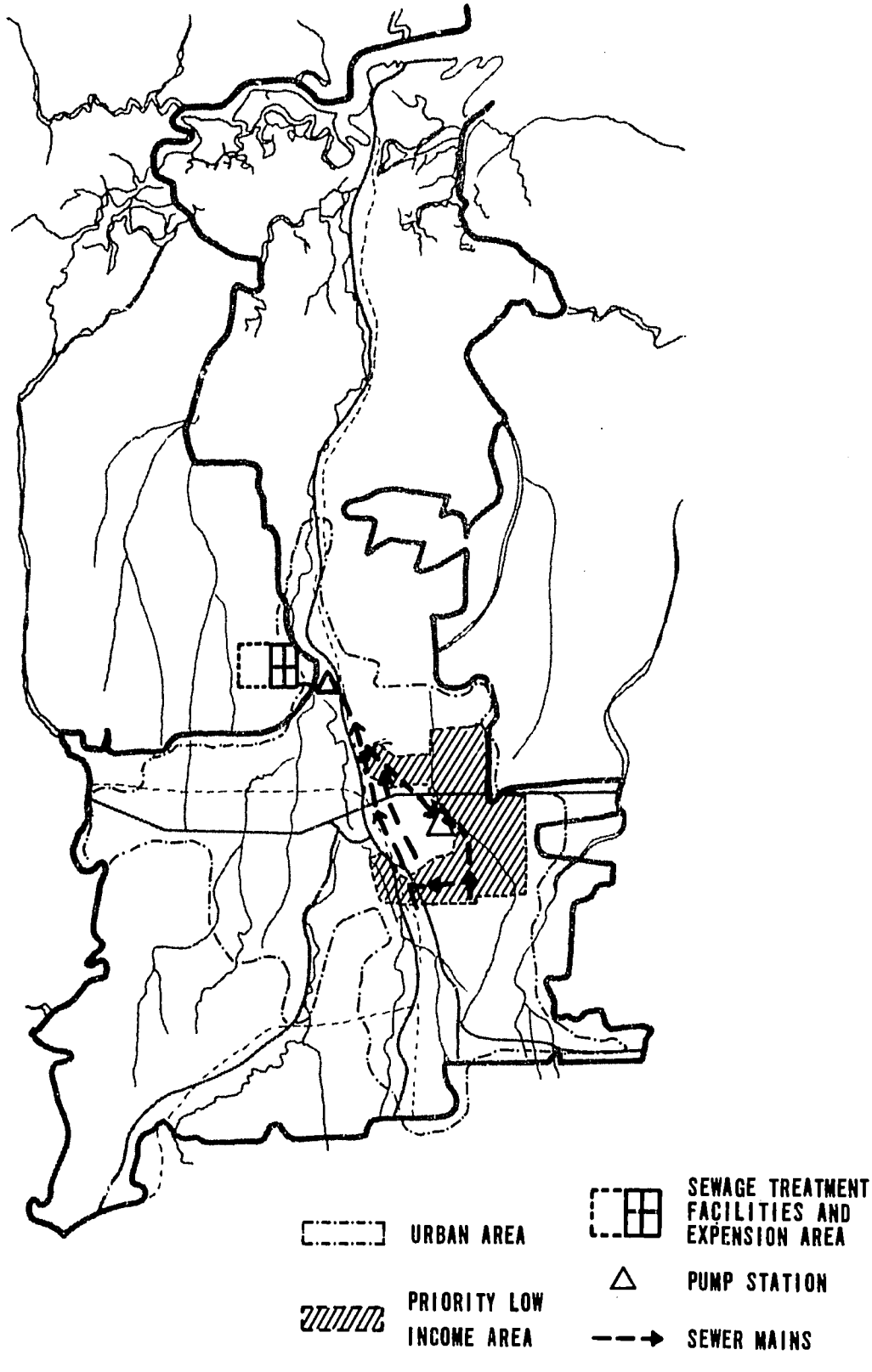
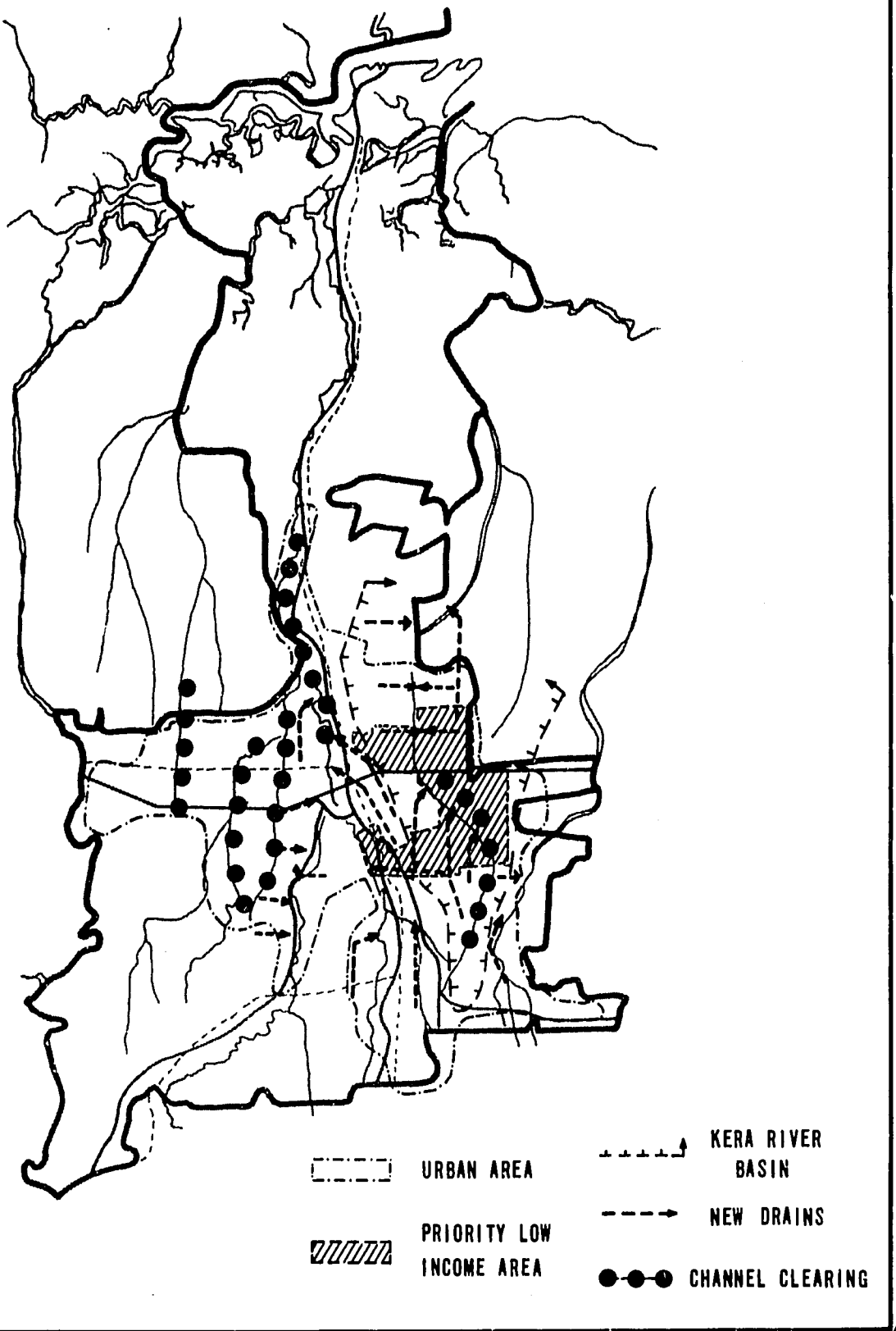
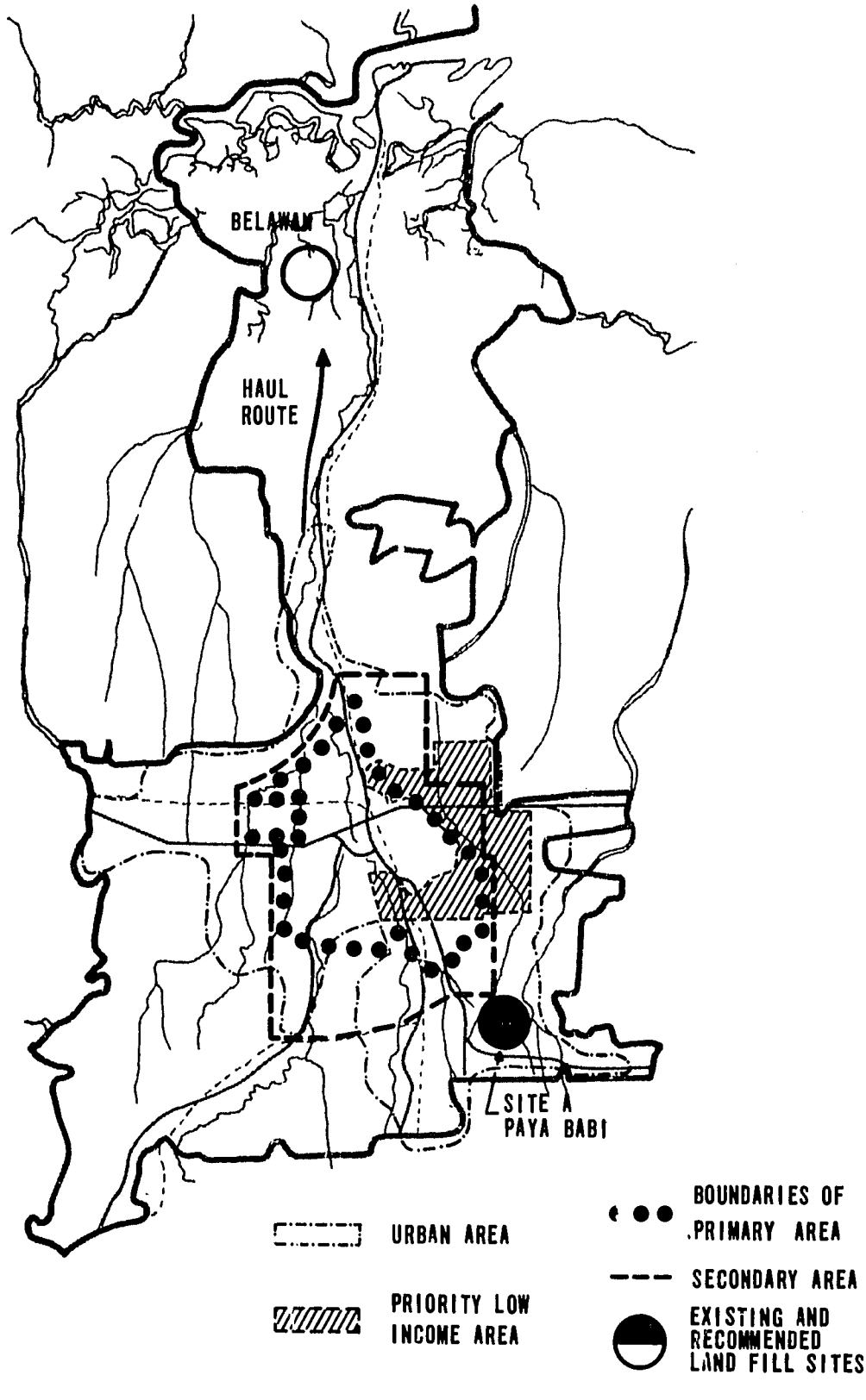


FIGURE 8

FIRST STAGE PROGRAM FOR DRAINAGE



FIRST STAGE PROGRAM FOR SOLID WASTES



- Construction of an additional 40 wells
- Provision of an additional 15,000 house connections.

A summary of the population served and per capita consumption levels is given in Table 2.

TABLE 2

POPULATION SERVED AND PER CAPITA CONSUMPTION
1980/81 - 1983/84

Population Served		1980/81	1981/82	1982/83	1983/84
Private Domestic Connection[a]	('000)	309	337	393	448
Public Standpipes[b]	('000)	162	384	399	414
Total Served[c]	('000)	471	721	792	862
Total Population	('000)	1204	1236	1267	1299
Percent Served[d]		39	58	62	66
House Connection/Standpipe Ratio		1 : 0.52	1 : 1.14	1 : 1.01	1 : 0.92
Domestic Consumption 000 cu m/y		18,880	21,820	23,560	27,460
Average Consumption	l/c.d	110	83	82	87

a Assumes that 8 people on average obtain water from a private connection.
b Assumes each standpipe serves 300 people with an average per capita consumption of 35 l/c.d. This is a maximum estimate.
c Excludes people who obtain water from social/religious sources for domestic/private purposes.
d As consumption from social/religious sources is excluded, this percentage understates the total population served. This would certainly increase to 60 percent in 1981/82 with inclusion of this consumption.

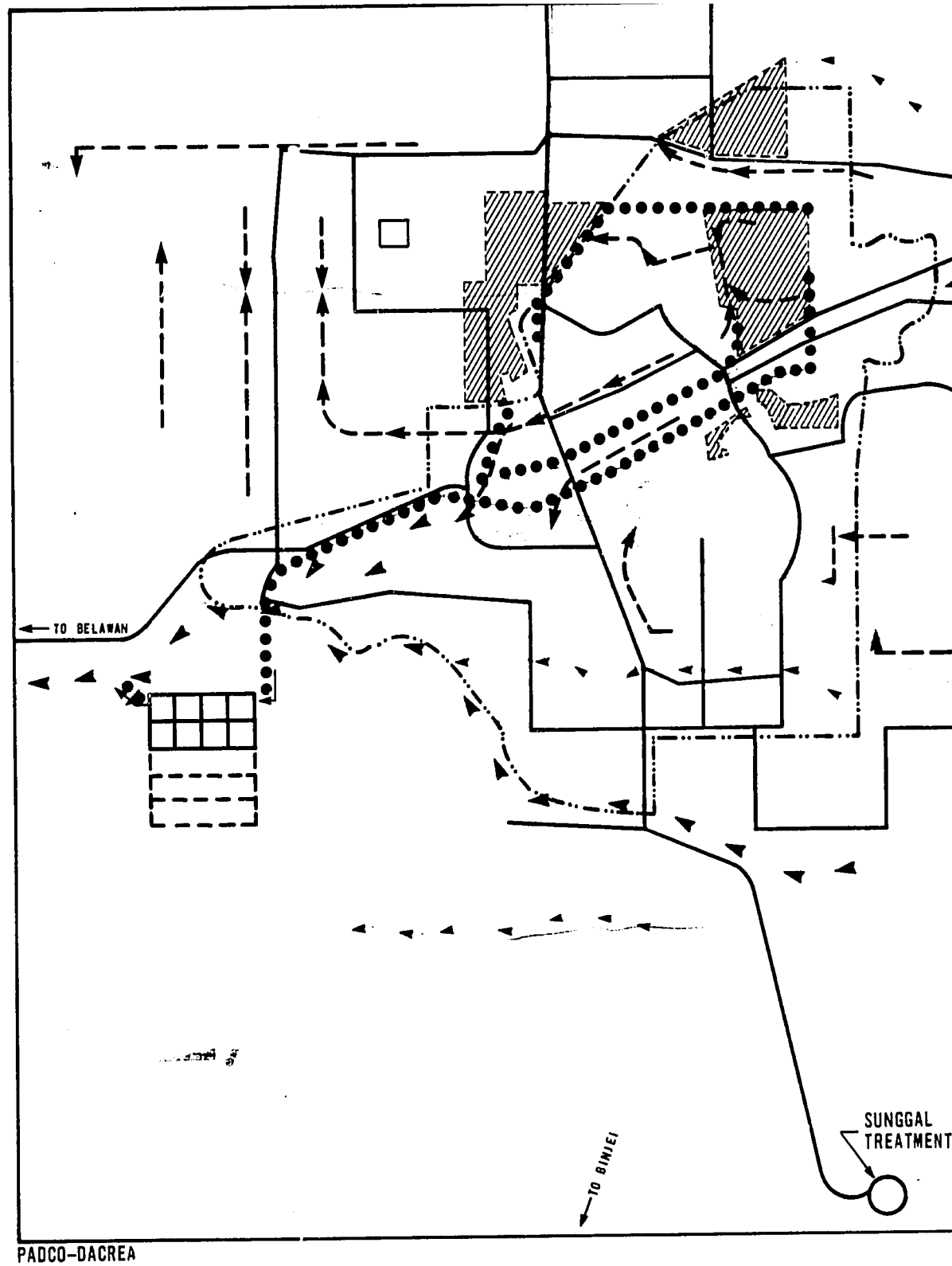


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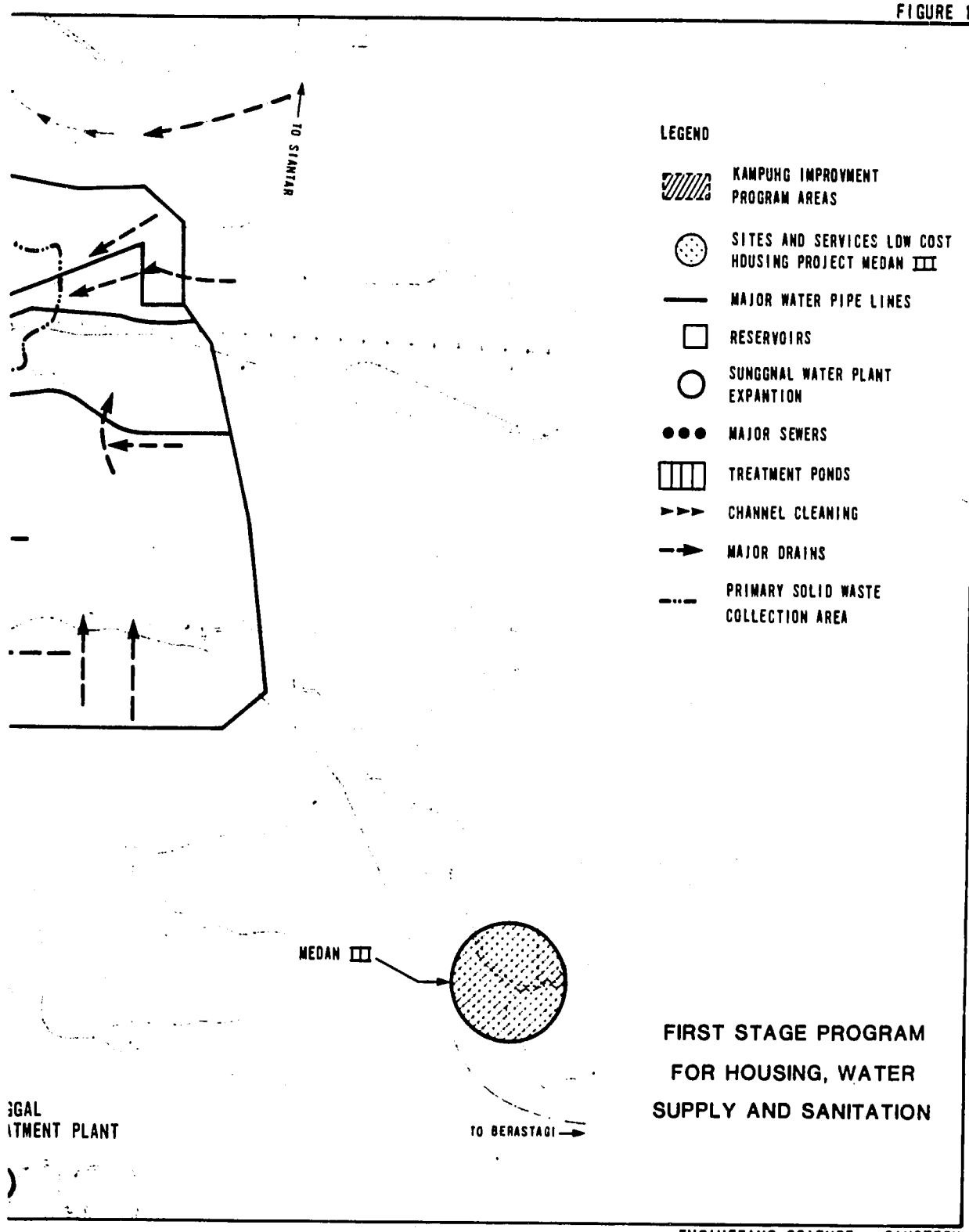
FIGURE 10



FIRST STAGE PROGRAM FOR HOUSING, WATER SUPPLY AND SANITATION

ENGINEEING-SCIENCE - SINOTECH

Wastewater

The major objective is to install the nucleus of a sanitary sewer system in the densely populated downtown area of Medan. The major works proposed are:

- Construct 36.85 km of collector sewers to serve 705 hectares of high density and low income portions of the central urban core area
- Construct 9.85 km of trunk sewers, two sewage pump stations, and 2.05 km of force mains to deliver wastewater to a waste stabilization ponds having a total surface are of about 50 hectares
- Provide around 10,000 service connections
- Provide 100 MCK's to serve high density, low income population in the study area
- Accelerate the existing private latrine improvement program from the present 1,000 water-seal latrine slabs per year to 5,000 per year.

A summary of the population served is shown in Table 3.

TABLE 3

POPULATION SERVED
1983/84

Item	No.	Population Served				
		Total		Low Income	Medium Income	High Income
		No.	Percent			
Municipal Sewerage System Connections	9,700	77,600	5.9	3.0	2.0	0.9
MCK's	100	24,000	1.7	1.7	-	-
Private Latrines	15,000	120,000	9.2	9.2	-	-
Total		221,600	16.8	13.9	2.0	0.9

Drainage

The strategy for the staged improvement of the existing drainage system, developed under the master plan investigations, provides for the immediate implementation of new drainage works in areas where current flooding problems are critical and the clearing, cleaning and dredging of existing channels to maximize their flood control potential. Once channels are cleared, flood flows will be monitored to provide a basis for the detailed planning of future major drainage works.

- Kera Basin: Clear , clean and dredge existing channels except where major improvements are to be carried out in the first stage.

  Make improvements to submain drains, based upon the requirements of other programs, such as KIP and road improvement projects.

- Urban Area: Clear, clean and dredge the lower Deli river channel to alleviate the flooding currently associated with this area.

- Submain drains: Clear, clean and dredge channels outside the Kera Basin but where population densities are still high.

- Monitoring: A monitoring program is urgently required to provide basic flood flow data to enable a more vigorous evaluation of flooding problems, especially for the lower Deli River.

Solid Wastes

The strategy for improving the solid wastes management system developed under the master plan provides for the staged expansion of the collection system. Initially services will be concentrated in the high density urban areas.

- Improve and extend collection services through the purchase of 139 new collection trucks and 1400 handcarts.

- Improve disposal methods by constructing 69 loading stations and purchasing 100 hectare landfill site and landfill equipment.

- Construct two operations centres.

- Increase service coverage to all industrial, commercial and market establishments by the end of Repelita III. Increase coverage of households to 110,000.

- Increase the volume of solid wastes collected from the existing level of around 150 tonnes per day to 675 tonnes per day by the end of Repelita III.

HEALTH

Basic Objective

To provide easy access to minimum health services for all segments of the population, provide free or minimal cost medi-care and to develop an extensive program of preventive medicine.

Goals for Repelita III

- Provide decentralized neighborhood health services to approximately 420,000 persons through the construction and staffing of 14 Puskesmas and 28 policlinics.

- Recruit and train 54 community workers, integrating them within the intensive health efforts directed at high priority kampungs as part of the overall KIP community development/participation program.

EDUCATION

Basic Objective

To provide access to minimum levels of educational services for all segments of the population, with emphasis on the development of environmental health literacy and technical skills.

Goals for Repelita III

Basic Education:

- Construct and staff and maintain 140 SD, 4 SMP, and 4 SMA.

- Extend the double shift program throughout the school system (elementary and secondary levels) in every area where sufficient demand exists

- Eliminate unauthorized costs frequently being paid by parents to matriculate and maintain their children in public elementary schools.

Specialized Education:

- Provide environmental and community education and skills training to 4,000 elementary school dropouts and 2,000 secondary school dropouts through an amplified PENMAS program directed at increasing employment and incomes. Recruit and train 500 tutors and 100 lurahs for participation in the program in priority KIP areas, and throughout the city.

- Develop and implement and annual work experience study curriculum and program for 1000 university students in the fields of medicine, social sciences, and engineering, linking these resources with DISP efforts in water and sanitation, and environmental health, and skills training programs.

KEY COMPONENTS OF FIRST STAGE PROGRAM

The major physical facility improvement projects to be implemented are summarized in Table 4. A summary of the increased coverage provided by the proposed programs is given in Table 5.

TECHNICAL ASSISTANCE

For the successful achievement of the Repelita III objective, technical assistance will be essential. The priority areas for such assitance are summarized below.

Financial Planning and Budgeting Assistance to Kotamadya Medan

If the contribution expected from the Kotamadya to the Repelita III investments is to be achieved, a marked improvement is required in the municipality's fiscal and accounting procedures. Consultants would be required to:

- Assist the Kotamadya in developing and implementing a more effective urban revenue program which could yield significantly increased near and long-term taxes and other receipts, based on progressive ability-to-pay taxation principles.

- Assist the Kotamadya, with central government approval, in preparing and passing appropriate tax enforcement laws and procedures.

- Analyze and advise the Kotamadya on ways of expanding the tax-base for local revenue purposes, revising tax-rates, methods of assessment and collection in order to increase receipts to the Kotamadya. At present, these are determined by higher level governments which constrains city revenues and the scope of its activities.

- Analyze and advise the Kotamadya as well as central and provincial governments on means of assuring earlier and more regular sanctioning of higher-level government loans and grants.

- Analyze the full financial implications of the proposed accelerated Medan Urban Development Program and devise means to handle initial and subsequent city contributions within the new revised budget and tax systems.

Program for Promoting Economic Development

The objective of this project is to identify constraints to growth in the local economy and recommend a program for overcoming them. This would be a broad ranging review and would include:

- Review sectors of activity impeded in growth, namely industry and manufacturing. A survey should be carried out to determine just what problems industrial enterprises suffer.

TABLE 4

RECOMMENDED PHYSICAL FACILITY IMPROVEMENTS FOR MEDAN
REPELITA III

Sector	* Immediate Action Items Recommended Improvement
HOUSING	* MUDS KIP (Total program) * MUDS SSCH/LCH Project (Total program)
WATER SUPPLY	* Netherlands Program, East Medan * Completion of first stage Sunggal treatment expansion * 13 deep wells, East Medan * 1200 Public Standpipes * Surface water monitoring • Major mains, built-up area • Two reservoirs and booster stations • Minor distribution mains • Further augment Sunggal Treatment Plant • Transmission mains • 40 additional deep wells • 150 additional standpipes • 15000 additional service connections • Shallow wells imporvements • Land acquisition
WASTEWATER	* 5,000 Watersealed Latrine Slabs * 30 MCK's • Collector sewers 37 km • Trunk sewers 10 km • Two pumping stations • Treatment plant • Additional MCK's • 5,000 latrine slabs per year • 9700 service connections • Land acquisition
DRAINAGE	* Kera Basin for KIP Areas * Drain Cleaning * Monitoring * Other Drains for KIP Areas • Additional drains, Kera and other • Drain cleaning • Monitoring • Land and vehicles

TABLE 4--Continued

Sector	Recommended Improvement
SOLID WASTES	* 57 Collection trucks * 306 Handcarts * 32 Loading stations * Landfill equipment * Landfill and loading station sites • 82 collection trucks • 1,094 handcarts • 37 loading stations • 2 operations centres • Landfill and loading station sites
HEALTH	* Augment KIP Health Programs - Selfhelp • Strengthen city health office - communications, rural services
EDUCATION	• Expand PENMAS program - non-formal education
TRANSPORTATION	* Improve existing roads * Develop public transport • Improve traffic control • Develop new roads

TABLE 5

SUMMARY OF FIRST STAGE PHYSICAL PROGRAM : COVERAGE AND COSTS

Sector	Capital Cost:1980 Prices*		Population Served ('000)		Area Covered/ha		Population/ha		Cost/ha Rp x 10^6	Per Capita Cost
	Rp x 10^6	%	Total	Increment	Total	Increment	Total	Increment	Increment	Increment
Water Supply	16043	36	862	562	11,190	11,190	77	50	1.43	Rp. 28,546 $ 46
Wastewater	4735	11	222	222	705	705	315	315	6.72	Rp. 21,329 $ 34
Solid Wastes	3628	8	660	618	11,190	11,190	59	55	0.32	Rp. 5,871 $ 9
Drainage	8223	18	1300	1300	23,200	23,200	57	-	0.35	Rp. 6,325 $ 10
Kampung Improvement	2850	6	120	80	350	244	343	329	11.68	Rp. 35,625 $ 57
Sites & Services/ LCH	9544	21	123	50	360	160	342	313	59.65	Rp.190,880 $ 305
Total	45023	100								

* Includes allowances for engineering services and physical contingencies. Excludes price contingencies.

- Carry out a stratified sample survey of firms of all sizes from large through to small scale enterprises, and follow up with selected in-depth interviews.

- Set minimum standards of infrastructure and transport system required by business men.

- Consider any institutions or organizations which should be set up to promote growth as a result of gaps identified. Under this head, the possibility of setting up the following offices might be considered: business promotion office to help new investors; an export promotion office a tourist promotion board; a small economic data collection and analysis unit.

- Consider training requirements for skilled employees and ways of increasing employment opportunities. This should include technical and clerical requirements for factories and offices. Recommend on-the-job training programs. Further, the relevance of university training and curricula should be examined to ensure that suitable graduates with necessary skills are being trained in the fields of engineering, municipal finance, management and applied economics.

- Consider needs of medium and small enterprises, including access to credit etc. This should lead to formulation of a program for technical and financial assistance to medium and small-scale enterprises.

Land Resources Development

The objective of this study is to increase the supply of equitably priced land for public and private uses and halt the land speculation which is hampering Medan's development. The program would also seek to improve land tenure and registration for low income groups. The main program components would be:

- Analyze the existing urban land resources in Medan and North Sumatra by examining land use, market trends regarding land prices, and participants in the land market.

- Analyze national, provincial and Kotamadya legislation and regulations pertaining to land use planning and development controls, zoning and building regulations to determine the impact these have on Medan's development.

- Analyze the agencies and insitutions involved in land registration, development controls and land acquisition.

- Develop measures for improving the performance of the land market such as legislation, development controls and regulations and develop implementation procedures for city government to apply.

Groundwater Resources Development

The development of groundwater resources is a major recommendation of the master plan and first stage program studies. It is vital that a groundwater exploration, extraction and monitoring program is implemented, covering the following major activites:

- Assist PAM Tirtanadi to develop a monitoring program and a periodic testing program of all municipal wells and any available private wells.
- Coordinate levelling surveys and well water quality in Belawan and Medan cities and the correlations of water levels.
- Inspect and supervise well drilling, collect and summarize well logs and test results and prepare data acquisition systems for well data.
- Train Tirtanadi employees in well drilling, supervision and data acquisition and analyses.
- During completion of first stage program, analyze and summarize well data and prepare projections of basin safe yield and optimal distribution of wells for long-term production.

Summary

Foreign assistance would predominate in all these programs, as indicated below:

	Cost (Rp. Million)		
Technical Assistance	Local	Foreign	Total
Municipal Finance	11	105	116
Economic Development	10	162	172
Land Resources	60	177	237
Groundwater Program	44	176	220
Total	125	620	745

There are many other areas where technical assistance could be of benefit to Medan and will be necessary in the long run if Medan is to fulfil its potential. Only priority technical assistance requirements have been included here; a full program of assistance is contained in report Volume III.

FINANCIAL FEATURES OF PROPOSED FIRST STAGE PROGRAM

PROGRAM COSTS

The proposed first stage capital investments in water supply, sanitation and housing are given in Table 6.

TABLE 6

FIRST STAGE PROGRAM CAPITAL COSTS
(Rp. in Millions)

Sector	Local	Foreign	Total
Water Supply	6958	6994	13952
Wastewater	2033	2085	4118
Drainage	3024	4128	7152
Solid Wastes	1706	1449	3155
KIP	2172	316	2488
Sites and Services/LCH	6924	1575	8499
Technical Assistance	125	620	745
Sub-Total	22942	17167	40109
Physical Contingency	3232	2427	5659
Price Contingency	9676	4349	14025
Total	35850	23943	59793

These are the programs for which international funding assistance will be sought. Base costs are expressed in January 1980 prices and include an allowance for engineering services. Physical contingencies at 15 percent of total capital costs and price contingencies based on guidelines provided by the Asian Development Bank have been incorporated into the estimates. The total program cost of Rp.59,793 million ($ 96 million) also includes provision for priority Technical Assistance.

PROGRAM FUNDING

The projected program funding is based on specific guidelines provided by GOI for each sector. A general requirement is that, as far as feasible, Kotamadya Medan should contribute to the investments from its own resources. A detailed analysis of Medan's financial position, existing and potential, was therefore undertaken. This revealed that the Kotamadya's financial position is extremely constrained. While considerable potential exists for improving municipal receipts, this requires a major change in financial practices, particularly in respect of tax assessments, collections and budgetary procedures. The municipal funding contribution summarized in Table 7 assumes that some such improvements will be made in the next few years with the help of foreign technical assistance. Because of the limited funds available, only in the case of the solid wastes and KIP programs is a municipal contribution to front-end investment anticipated.

The following brief review of sector funding concentrates on internal funding arrangements. The GOI intends, however, to seek a loan from an international funding agency. Such a loan could be expected to cover approximately half the project costs.

Water Supply

In the case of water supply, specific funding guidelines have been laid down by GOI. The Repelita III target for major towns is an average domestic consumption of 60 l/c.d with service provided to 60 percent of the population. GOI will provide grant finance to attain this level of service. Above this minimum standard, GOI will provide concessionary loan finance for consumption up to an average of 120 l/c.d. The 60 l/c.d / 60% coverage target will be reached after two years and grant finance is assumed for this period; concessionary loan finance is assumed thereafter.

An additional financial objective for the water utility is that a reasonable part of investment capital should be met from its own resources, thereby reducing the need for subsidized GOI capital. This objective has similarly been taken into account in determining the funding mix summarized in Table 8.

TABLE 8

FUNDING OF WATER SUPPLY INVESTMENTS (Rp. in Millions)

Source of Funds	Phase I		Phase II		Total	%
	80/81	81/82	82/83	83/84	80/81-83/84	
Grant/Equity*	1793	2207	-	-	4000	19
Loan	-	-	5200	6500	11700	56
Internal Contribution	-	1016	2241	1827	5084	25
Total	1793	3223	7441	8327	20784	100

* The terms grant and equity are used interchangeably.

TABLE 7

PROJECTION OF KOTAMADYA MEDAN'S CONTRIBUTION TO MUDS PROGRAMS
(Rp. in Millions)

	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89
Current Account Surplus[a]								
Constant 1978 Prices	762	651	512	754	944	1284	1563	1882
Current Prices[b]	1189	1107	957	1538	2067	3005	3923	5044
Allocations to MUDS Program								
1. Wastewater								
Cash Operating Costs	-	56	121	533	573	615	657	704
Debt Service	-	-	-	-	-	282	282	282
2. Drainage								
Cash Operating Costs	85	160	191	225	260	277	297	318
Debt Service	-	-	-	-	-	585	585	585
3. Solid Wastes								
'Own' Capital Investment	300	300	200	-	-	-	-	-
Working Capital	350	150	-	-	-	-	-	-
Debt Service[c]	-	-	-	-	-	-	-	-
4. KIP[d]								
'Own' Capital Investment	200	350	300	-	-	-	-	-
Total Allocated	935	1016	812	758	833	1759	1821	1889

a Source: Table 21.9, Section 21, Vol. III
b Converted to current prices using local inflation factors provided by ADB
c Solid wastes debt service and operating costs will be paid from solid waste revenue generation. The cash surplus resulting from solid waste operations has not been added back into the resources available for investment as these will be required for vehicle replacement and expansion of solid waste service coverage
d Some operating costs will be necessary for KIP, but these will come substantially from sectoral programs.

Wastewater

As a sanitary wastewater collection and treatment system will be new to Medan, the GOI is willing to consider assisting with grant finance the funding of essential core works. These works account for approximately half the total investments and therefore that proportion of grant finance has been assumed.

The balance of the project finance has assumed to be concessionary GOI loan funds as no local government contribution can realistically be expected. The loan finance will provide funds for the secondary sewers and collection network. The terms of the loan have been given as 25 years (including 5-year grace) at 9 percent interest.

Drainage

As with wastewater, funding for drainage has assumed to be a mixture of loan and grant finance, the proportion of loan finance being determined by the ability of the Kotamadya to handle the debt service commitment involved. Based on the loan terms and conditions provided by GOI, 50 percent loan finance was considered the realistic maximum. If the balancing grant finance is not available, a reduction in the program size would need to be considered as local government (provincial or municipal) contributions are unlikely to be available.

Solid Wastes

The general requirement that Kotamadya Medan should contribute from its own resources to the MUDS sectoral investments was given particular emphasis by GOI officials in respect of the solid wastes program. As noted, the front-end contribution which can be afforded by the municipality is strictly limited but the resources which will be available have been allocated to solid wastes and KIP. The solid wastes contribution is projected as Rp.800 million (17 percent of total costs). The balance of finance is assumed to be a GOI loan, on the same concessionary terms as for wastewater and drainage.

In addition to the capital investment contribution, the Kotamadya will need to provide an additional Rp.500 million as working capital during Repelita III.

KIP

The proposed KIP funding arrangements reflect the most recent GOI thinking on this somewhat volatile area.

The major assumptions are:

- Cipta Karya (GOI) is willing to provide half the funds (as grant finance) against an investment target of Rp.6.0 million per hectare. Local government (municipal and/or provincial) is required to provide the remaining half

- To the extent that Rp.6.0 million per hectare is inadequate to cover the costs of the proposed program, contributions from the city-wide sectoral programs should be sought

- When the KIP contains complementary programs (e.g. in health and education), GOI funds (Inpres) or departmental budgets should be allocated as appropriate.

This results in the funding pattern summarized in Table 9.

Table 9

POSTULATED KIP FUNDING

Program	Original* Source	Distributing Agency	Distributed as	Rp.Million
A. Nationally Sponsored (Rp.6.0m/ha)	GOI funds ADB funds Local funds Provincial funds	Cipta Karya Kotamadya Medan Provincial Government	DIP	976 850 126
B. Sectoral	ADB funds	GOI to Kotamadya Medan Government Departments	INPRES or LOAN	824
C. Complementary	ADB funds	GOI to Kotamadya Medan or Government Departments	INPRES	1024
Total				3800

* It is assumed that ADB would lend to GOI half the total KIP costs.

Sites and Services/L H

The funding of the low cost housing program is assumed to be a mixture of loan finance and government equity. The latter would be for site acquisition and the education and community components. Loan funds would be made available from GOI to Perumnas on terms virtually identical to those for the sanitation programs.

PROGRAM REVENUE

The principle of applying user charges for services provided has been followed wherever possible. Thus in the case of water supply, solid wastes and the low cost housing programs direct charges have been applied. Charges have been recommended in these sectors which will result in a satisfactory financial performance but not to the detriment of the ability of people to pay. In the case of water supply, the proposed domestic charges will not exceed 3 percent of income; for solid wastes, the proportion is 1 percent and for housing 15 percent. These are all reasonable levels. In all cases, care has been taken to ensure that the poorer people are not burdened and cross-subsidization of the poor by better-off consumers has been built into the proposals.

The KIP, wastewater and drainage programs have not been considered suitable services for cost recovery through direct charges. Allocations from municipal resources will be necessary for these programs. When the wastewater system has been established and its benefits perceived, user charges should be introduced — preferably a surcharge on the water bill.

PROGRAM FINANCIAL EVALUATION

Detailed financial projections were undertaken for each of the sectors. The financial performance would appear satisfactory in all cases. For water supply, a rate of return of 6-9 percent on average net fixed assets is achieved from project completion through the rest of the decade. The sanitation sectors all achieve the minimum ADB requirement of either generating, or being the recipients of, sufficient income to cover operating costs and depreciation or debt service, whichever is the higher. The Perumnas housing project should show a small surplus; it has an internal financial rate of return of 1.9 percent and while this is not a viable commercial return, it would enable the project to be replicated.

A summary of the financing plan for each individual sector and in total for the first stage program is shown in Table 10.

TABLE 10

FIRST STAGE PROGRAM FINANCING PLAN
(Rp. in Millions)

	Water Supply	Waste-water	Drainage	Solid Wastes	KIP	SS/LCH	Total
Application of Funds							
Project Cost	20,784	6,123	10,687	4,623	3,800	13,670	59,687
Other Costs	905	-	-	-	-	-	905
Working Capital	282	2	253	959	-	14,123	15,619
Total	21,971	6,125	10,940	5,582	3,800	27,793	76,211
Source of Funds							
GOI Loan*	11,700	2,571	5,344	3,823	-	6,414	29,852
GOI Grant*	4,000	3,062	5,343	-	2,824	6,617	21,846
Local Government Grant	-	-	-	1,300	976	-	2,276
Internal Cash Generation	6,050	107	253	459	-	14,762	21,631
Consumer Contribution	221	385	-	-	-	-	606
Total	21,971	6,125	10,940	5,582	3,800	27,793	76,211

* It is anticipated that a substantial proportion of loan and grant funds made available by GOI will be the on-lending of loans from international funding agencies.

ORGANIZATION AND PLANNING

The recommended plan will be effective only if it is possible to inaugurate a development process in Medan which not only implements high priority action projects but which incorporates the staged institutionalization of a realistic urban development planning, programming and financing system. It will be necessary for the Government to identify the organizational mechanisms necessary to plan, coordinate and implement the interrelated aspects of water supply, sewerage, drainage, and solid wastes especially with social and other community programs (kampung improvement and sites and services programs) and to integrate the work on urban economic development and planning and sector development projects and studies (land registration, traffic management and roads development, land resources etc.).

THE STEERING COMMITTEE

A Steering Committee should be established and made responsible for implementation of the first stage action program and policy guidance for the long-term development of the Medan Metropolitan Region. Representatives should be appointed from Cipta Karya; the Directorate General of Public Administration and Regional Antonomy (PUDD), under the Ministry of Home Affairs; the North Sumatra Provincial Government; Kotamadya Medan; and Deli Serdang and Langkat Regencies.

The Steering Commitee would be responsible for finalizing recommendations concerning the establishment of both provisional as well as permanent institutional mechanisms which are deemed adequate to undertake and coordinate the functions and responsibilities of the long-term development program in Medan and its metropolitan region.

THE PROGRAM MANAGEMENT UNIT

A Program Management Unit (PMU) should be established to provide the immediate day to day guidance, supervision, monitoring and evaluation of the program. This unit would be responsible for providing the centralized follow-up surveys and studies recommended for the various sectors. The PMU would coordinate with the executing agencies responsible for specific sectoral components and liaise with the provincial and national governments.

All consultant services will be officially centralized in the PMU in order to provide the most effective control and marshalling of resources. In actual implementation, it is anticipated that those consultants assigned tasks within specific components or sectors would work shoulder-to-shoulder with their respective executing agencies, on a daily basis, thereby facilitating both formal and informal on-the-job training.

THE EXECUTING AGENCIES

Cipta Karya should provide the overall technical supervision and coordinating functions for implementation of the first stage program through the Project Management Unit and PUOD. The Ministry of Home Affairs will exercise general supervisory functions with respect to those project components relating to the Kotamadya government.

The KIP, solid wastes, drainage and wastewater components will be carried out by the Kotamadya under the technical supervision of Cipta Karya. The wate supply project will be implemented by PAM Tirtanadi with the technical supervision of Cipta Karya on behalf of, and with the integral involvement of, the Kotamadya. The SSCH/LCH component will be implemented by Perumnas. Advisory technical assistance (staff consultants) in planning, budgeting and finance provided to the Kotamadya Medan will be managed by the Kotamadya under the supervision of PUOD. Other technical assistance provided to the Kotamadya in the areas of solid wastes, drainage and KIP will be managed by the Kotamadya under the supervision of Cipta Karya. Preparation of the specific studies recommended will be carried out by consultants under the supervision of Cipta Karya and the PMU.

In respect of KIP, it is recommended that a special unit within the Kotamadya is established to take full responsibility for all aspects of these programs.

KOTAMADYA MEDAN

It is recommended that the reorganization of the planning and financial offices of the Kotamadya is seriously considered so as to centralize responsibility and implementation for these functions under one or two senior officers of Deputy Mayor rank, with appropriate provision for staffing, equipment and other requirements. These offices would be solely responsible to the Mayor. The proposed reorganization would be carried out under the guidance and direction of PUOD.

Although the formal establishment of such an institutional framework within the Kotamadya may require a significant period of review before adoption by the central government, it is recommended that an informal reorganization take place before the initiation of the implementation program for Repelita III. Only in this way can the current bottlenecks in the local urban administration be sufficiently eliminated and a satisfactory

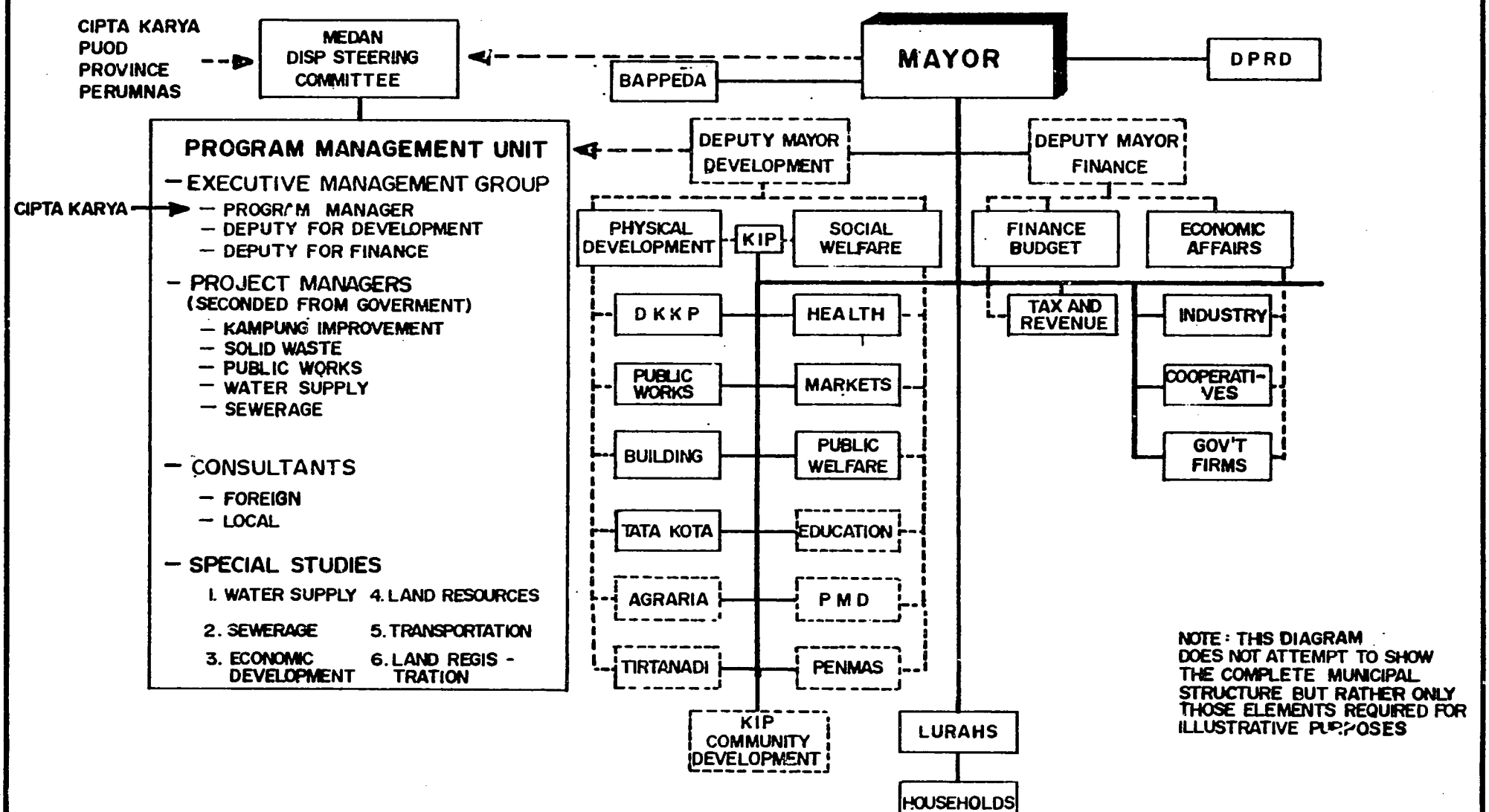
base provided for the effective participation of the Kotamadya and its ci city departments and directorates. Under the proposed reorganization (see Figure 11), the current city Dinases and Directorates involved in physical and social welfare activities would report directly to the Deputy Mayor for Development. They would be directly responsible to him for the preparation of annual operative plans, programs and budgets which reflect development priorities as well as the budgetary and financial structures set jointly by the Deputy for Development and the Deputy for Finance. The achievement of such an annual planning, programming and budgeting system is one of the major institutional goals to be achieved during Repelita III. It will facilitate the adequate implementation of the projects which are the Kotamadya's responsibility and their effective maintenance and operation on a continuing basis. It would provide dramatic gains to future development by energizing and strengthening Medan's urban planning implementation and policy structure.

The proposed Deputy for Finance would be responsible for the earliest possible preparation, adoption and implementation of a more effective program of financial planning, budgeting and urban revenues directed at significantly increasing both near and long-term tax and other receipts along progressive lines and the effective use of such resources. Alternatives methods for financing development would be explored and recommended in order to ensure a more effective and realistic annual expenditure plan.

Both the Deputy for Development and the Deputy for Finance would form part of an Executive Policy Management Group of the PMU, thus providing the maximum opportunity to take full advantage of the potential provided to stimulate and accelerate Kotamadya institutional development.

The proposed organizational arrangements are summarized in Figure 11.

PROPOSED ORGANIZATION FOR IMPLEMENTATION OF DISP ACTION PROGRAM



ACTIONS REQUIRED FOR IMPLEMENTATION

The recommended Repelita III first stage program includes all of those projects recommended for implementation through fiscal 1984/85. This program consists of two phases: (1) The immediate action program (Phase I) which will assist the lower level urban poor and (2) Phase II activities which will extend minimum standards of service to the bulk of the remaining urban population.

For the proposed Repelita III program to become a reality certain essential steps are required, namely:

1. Preliminary

- Decision by Government confirming the works which are to be included in the first stage program

- Decision by Government on the source of financing for the first stage program. This is probably the priority decision and will effect the size of the investment program. In particular the Government must decide whether it will make avaiable as proposed:
  - Rp.5344 million of grant finance to the drainage program
  - Rp.3823 million of loan finance to the solid waste program
  - Rp.3062 million of grant finance to the wastewater program.

  For the complicated funding pattern of KIP, it will be necessary to obtain the cooperation and commitment of many different agencies at the outset.

  A further major requirement is the agreement of Kotamadya Medan to make the financial contribution proposed from its own resources.

- Application to proposed financing agency for formal appraisal of the project

- Project appraisal and preliminary approval by financing agency

- In liason with the regional and municipal governments the central government must set up a suitable organizational structure to ensure the satisfactory execution of the proposed program.

2. Design and Construction of Works / Technical Assistance

- Arrange for preparation of final designs and tender documents
- Call tenders and evaluate offers
- Obtain approval of financing agency
- Award construction contracts
- Supervise construction contracts and commissioning of completed works
- Arrange for priority technical assistance for municipal finance, economic planning, land resource development and groundwater resources management.

APPENDIX A

INTERNATIONAL AND COUNTERPART PROJECT STAFF
MEDAN URBAN DEVELOPMENT HOUSING WATER SUPPLY AND SANITATION PROJECT

ES, SINOTECH, PADCO, and DACREA wish to acknowledge the cooperation and efforts of the following organizations and personnel without whose support the completion of this series of investigations would not have been possible:

AGENCY OFFICIALS ASSOCIATED WITH THE PROJECT

Directorate General of Housing Planning and Urban Development

1.	Ir. Radinal Mochtar	: Director General
2.	Ir. Ruslan Diwiryo	: Director of City and Regional Planning
3.	Ir. Susanto Mertodiningrat	: Director of Sanitary Engineering
4.	Ir. Sunaryo	: Head Sub-Directorate Town Planning
5.	Ir. Darmawan Saleh	: Sanitary Engineer

City of Medan

1.	Mr. Saleh Arifin	: Mayor of Medan City
2.	Ir. Fachrudin	: Kepala Bappeda Kotamadya Medan
3.	Ir. Fachry Mudadalam	: Kepala Subdit Pembangunan Kotamadya Medan
4.	Ir. Nazarudin Nasution	: Kepala Dinas Tata Kota Medan (lama)
5.	Ir. Badia Ginting	: Kepala Dinas Tata Kota Sumatra Utara
6.	Ir. Darwin Nasution BAP	: Kepala Dinas Kebersihan Keindahan dan Pertamanan Kotamadya Medan
7.	Ir. Yahya Harahap	: Kepala Dinas Pekerjaan Umum Kotamadya Medan
8.	Ir. Machmudin M	: Kepala Dinas Pekerjaan Umum Sumatra Utara
9.	Achmad Purba	: Kepala Dinas Pendapatan Daerah Kotamadya Medan
10.	Dr. Masroel Siregar	: Kepala Dinas Kesehatan Kotamadya Medan
11.	Dr. A. Hakim Hidayat	: Wakil Kepala Dinas Kesehatan Kotamadya Medan
12.	Yusuf Damiri BAE	: Kepala Dinas Bangun-Bangunan Kotamadya Medan (lama)

13.	Ir. Abdul Manan Lubis	: Pjs. Direktur PAM Tirtanadi
14.	Ir. Kumala Siregar	: Kepala Bagian Perencanaan PAM Tirtanadi
15.	Ir. Budi Prabowo	: Kepala Perumnas Helvetia Medan
16.	Th. Suprono	: Kepala Kantor Sensus dan Statistik Daerah Tingkat I, Sumatra Utara
17.	Imran B.Sc.	: Kepala Kantor Sensus dan Statistik Kotamadya Medan
18.	Dr. Mangasa Siregar	: Kepala Dinas Kesehatan Daerah Tingkat I, Sumatra Utara
19.	Dr. H.J.H. Syahlan SKM	: Sekretaris Dinas Kesehatan Daerah Tingkat I, Sumatra Utara

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

1.	Mr. Paul B. Thorn	: Project Officer
2.	Mr. Robert E. Davis	: Project Engineer
3.	Mr. Alex H. Sumaraw	: Program Assistant

ASIAN DEVELOPMENT BANK

1.	Mr. Chua Peng Chye	: Project Engineer
2.	Mr. Javier M. Gomez	: Project Engineer
3.	Mr. Nils A. Bruzelius	: Project Economist

CONSULTANT STAFF

Engineering-Science, Inc.

1.	P.N. Storrs	: Senior Vice President
2.	H. Fennerty	: Project Director
3.	J.M. McGill	: Project Representative
4.	L.H. McGill	: Chief Engineer
5.	J.D.E. Perera	: Sanitary Engineer
6.	Roy Monier	: Sanitary Engineer
7.	C.T. Williams	: Environmental Analyst
8.	C.L. Senn	: Public Health Specialist
9.	R.B. Porter	: Financial Analyst
10.	Y. Gordon	: Special Consultant
11.	T.G. Arulambalam	: System Sanitary Engineer
12.	R. Fox	: Hydrogeologist

Sinotech Engineering Consultants, Inc.

1.	Dr. C.Y. Huang	: Deputy Project Representative
2.	Y.T. Hsueh	: Sanitary Engineer
3.	C.F. Wu	: Civil Sanitary Engineer
4.	C.H. Wang	: Urban Planner
5.	H.S. Shyu	: Transportation Engineer

Padco

1.	A.P. Van Huyck	: Padco President
2.	J.E. Arington	: Senior Planner
3.	Lee Baker	: Housing Planner
4.	E.T. Ames	: Chief Planner
5.	M. Jan Ames	: Urban Planner
6.	M. Grossman	: Senior Economist
7.	D. Stout	: Housing Planner
8.	E. Slingsby	: Urban Planner
9.	M. Hadfield	: Economist

P.T. Dacrea

1.	S.P. Limasalle	: Dacrea Director
2.	Hendrata	: Principal
3.	Nizar	: Coordinator
4.	Mariam Darus	: Legal Specialist
5.	Ismail R. Yusuf	: Economist
6.	Abraar	: Socio Economist
7.	Victor The	: Economist
8.	M. Juwono	: Socio Economist
9.	Widjono	: Urban Planner
10.	Bambang Sudarpo	: Urban Planner
11.	Surachman Argadinata	: Transportation/Highway Engineer
12.	Ariyani Hartanto	: Cost Engineer
13.	P. Widiyanto	: Senior Civil Engineer
14.	Prawoto	: Senior Sanitary Engineer
15.	Lily Tan	: Senior Sanitary Engineer
16.	Prayitno	: Hydrogeologist
17.	Fachmi R.	: Hydrogeologist
18.	Jayadi P.	: Sanitary Engineer
19.	Djoko Soejatmiko	: Hydraulic/Materials Engineer
20.	M. Dishmar	: Architect/Site Planner
21.	Sahusilawane	: Electrical Engineer
22.	Gardjito	: Architect
23.	Buchari Adlis	: Utility Engineer
24.	Sintha Tobing	: Architect