JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
MINISTRY OF PUBLIC WORKS
AND
JAKARTA WATER SUPPLY ENTERPRISE

THE STUDY ON THE REVISE OF JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

FINAL REPORT

Volume 2

MAIN REPORT

MAY 1997

NIHON SUIDO CONSULTANTS CO., LTD.
NIPPON KOEI CO., LTD

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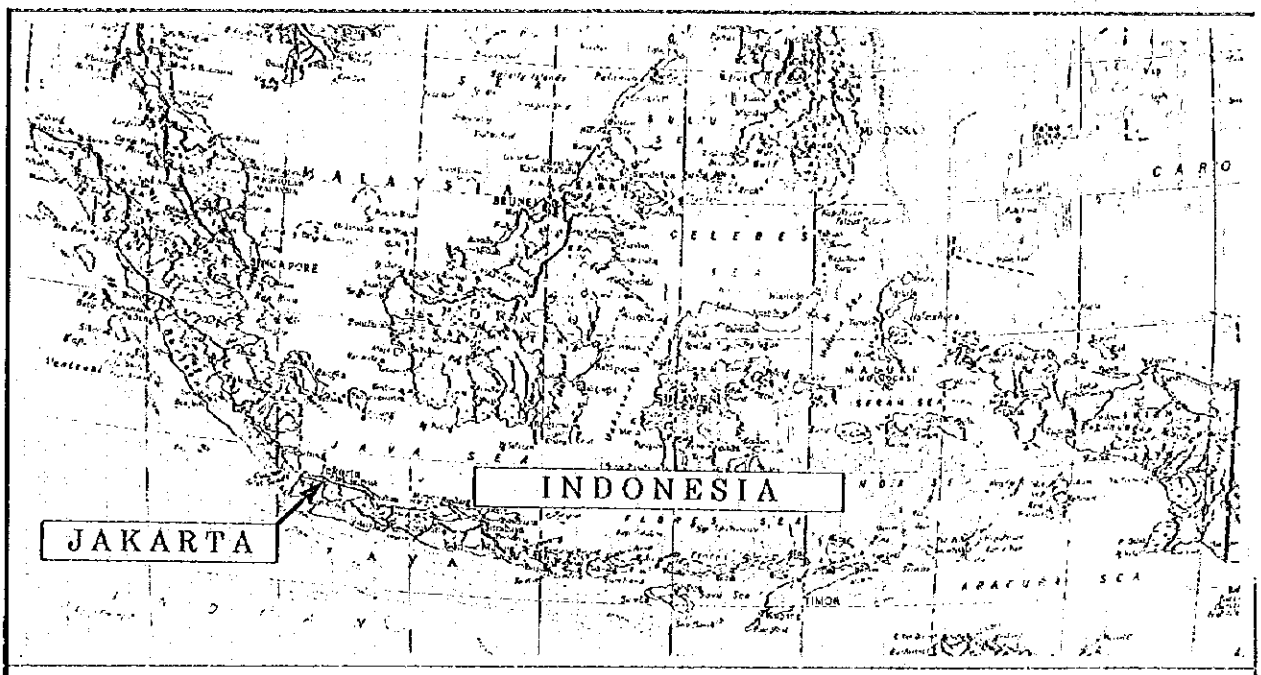

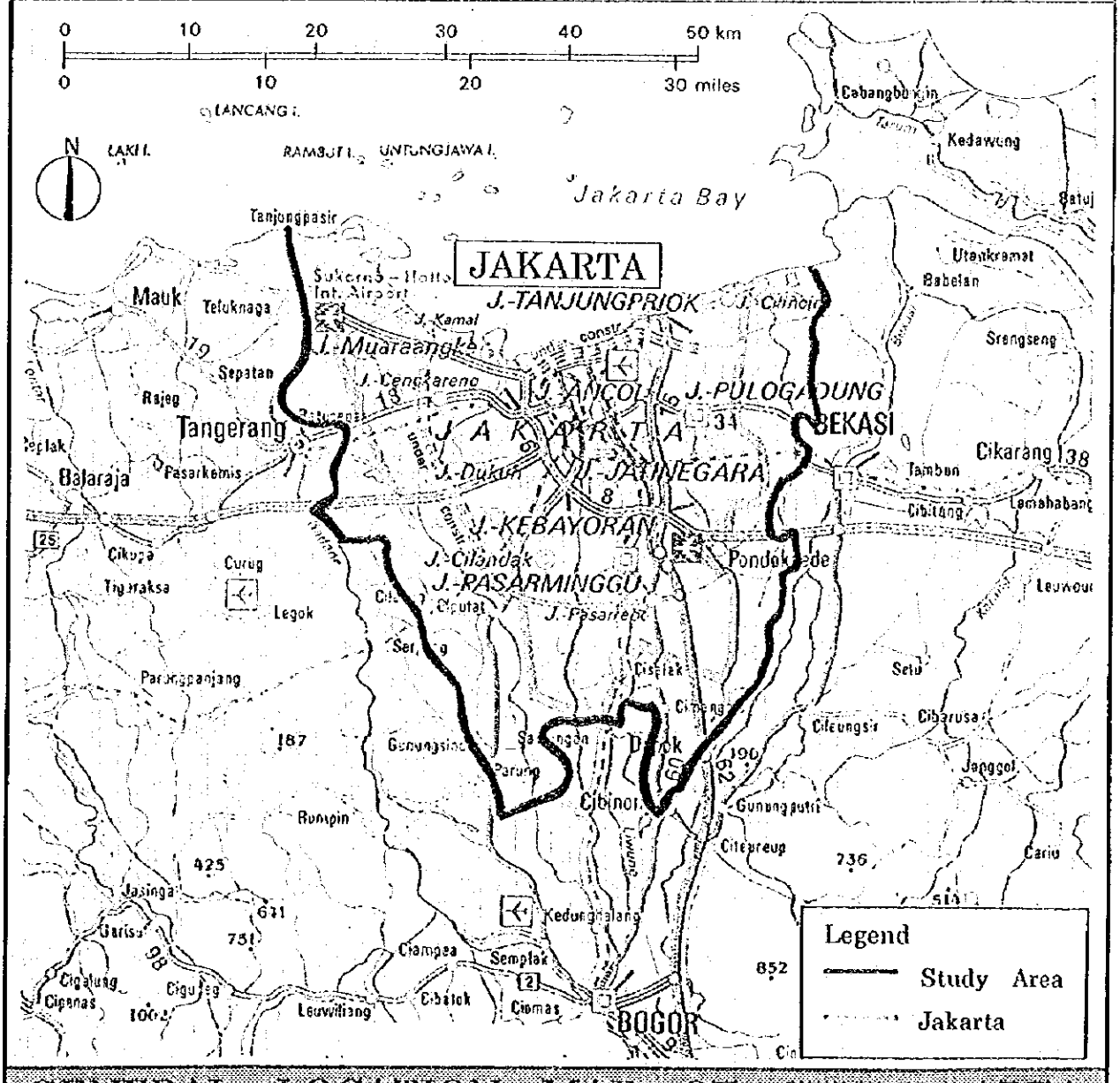

GENERAL LOCATION MAP OF STUDY AREA

PREFACE

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Study on the Revise of Jakarta Water Supply Development Project in the Republic of Indonesia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team headed by Mr. Koichi Iwasaki, Nihon Suido Consultants Co., Ltd. associated with Nippon Koei Co., Ltd., six times between July 1995 to November 1996.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the team.

May, 1997

Kimio Fujita
President
Japan International Cooperation Agency

May, 1997

Mr.Kimio Fujita
President
Japan International Cooperation Agency
Japan

Dear Mr. Fujita,

Letter of Transmittal

We are pleased to submit herewith the Final Report of the Study on The Revise of Jakarta Water Supply Development Project in Indonesia.

The Study was commenced in July 1995 and completed in May 1997 through the discussions with the officials of the Government of the Indonesia and the field investigation.

The Final Report consists of five volumes consolidating the two progress reports, interim report, and the draft final report; Volume I - Executive Summary Report succinctly describes the study and recommendations; Volume II - Main Report which covers not only physical development plans; the master plan and feasibility study of the priority project, but also institutional and financial strengthening plan for the water supply enterprise; Volume III/IV - Annex which includes detailed analysis and relevant information; and Volume V - Drawings covering drawings of preliminary design.

We hope that the implementation of the proposed projects would greatly contribute to the improvement of water supply condition in the study area.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, the Ministry of Health and Welfare and OECF. We also would like to show our appreciation to the officials of the Cipta Karya and PAM JAYA, the JICA Indonesia Office, and the Embassy of Japan in Indonesia for their kind cooperation and assistance throughout our study.

Very truly yours,

Koichi Iwasaki
Team Leader for the Study on
The Revise of
Jakarta Water Supply
Development Project in
Indonesia

DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
MINISTRY OF PUBLIC WORKS
AND
JAKARTA WATER SUPPLY ENTERPRISE

FINAL REPORT

OF
THE STUDY ON
THE REVISE OF
JAKARTA WATER SUPPLY DEVELOPMENT PROJECT

Vol. 2 MAIN REPORT

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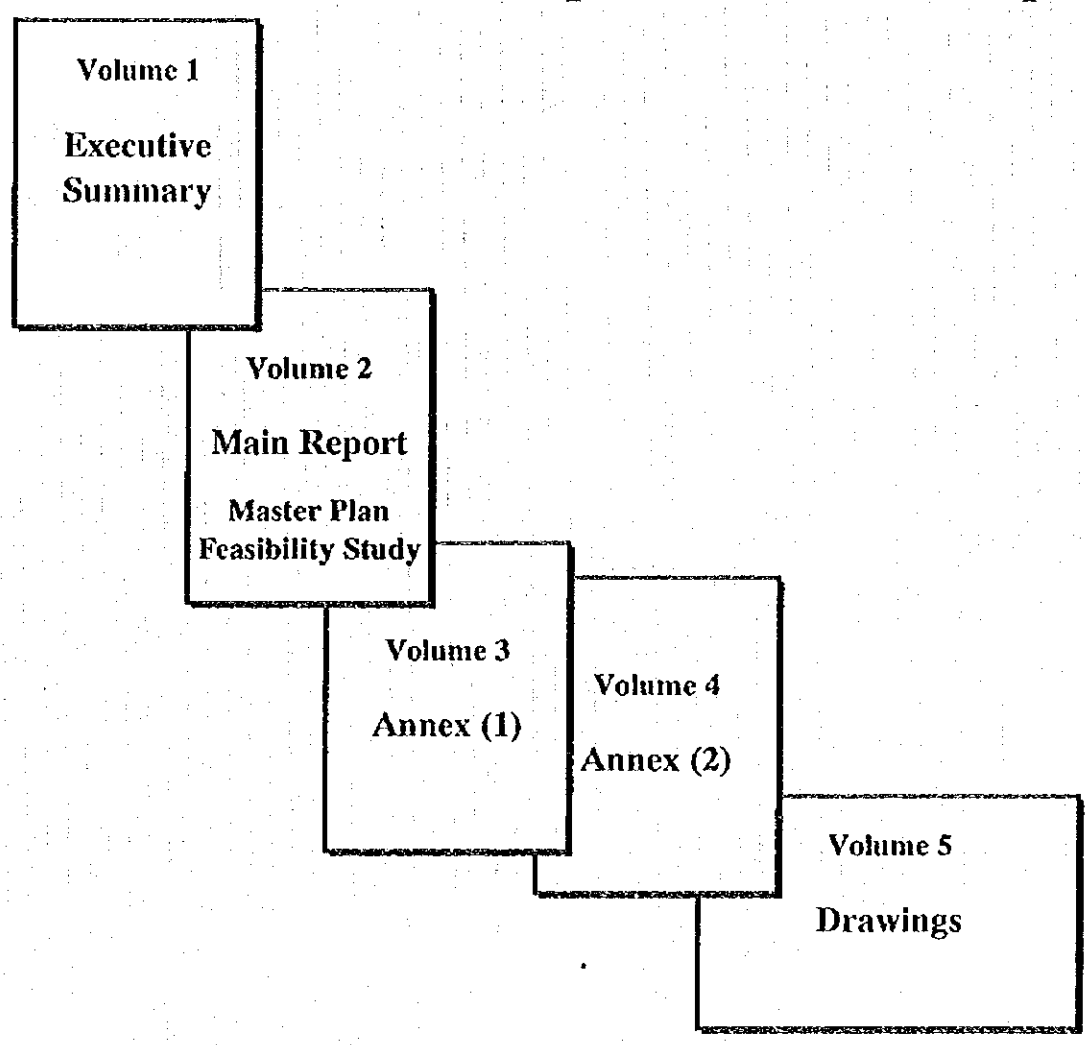
ABBREVIATIONS

BAPEDAL	Badan Pengendalian Dampak Lingkungan Environmental Impact Management Agency
BAPPENAS	Badan Perencanaan Pembangunan Nasional National Development Planning Board
BOOT	Build Own Operate Transfer
BOTABEK	BOgor, TAngerang and BEKasi
Cabang	Branch (of an organization)
Cipta Karya	Directorate General of Human Settlements, MPW
Daerah	A region
DGWRD	Directorate General of Water Resources Development (within MPW)
DJCK, DGHS	Direktorat Jenderal Cipta Karya Directorate General of Human Settlements (within MPW)
DKI	Daerah Khusus Ibu Kota Indonesia City of Jakarta(Special Capital District of Jakarta)
EIA	Environmental Impact Assessment
GOI	Government of Indonesia
GOJ	Government of Japan
GRDP	Gross Regional Domestic Product
HRD	Human Resources Development
IBRD	International Bank for Reconstruction and Development(The World Bank)
IEE	Initial Environmental Examination
JABOTABEK	JAkarta, BOgor, TAngerang and BEKasi
JICA	Japan International Cooperation Agency
JMDPR	JABOTABEK Metropolitan Development Plan Review
JUDP	JABOTABEK Urban Development Project
JWRMS	JABOTABEK Water Resources Management Study
JWSDP-MP	Jakarta Water Supply Development Project (Master Plan)
JWSSP	Jakarta Water Supply Sector Project
Kabupaten	District-administrative subdivision of a province
Kecamatan	District-administrative subdivision of a kabupaten
Kelurahan	District-administrative subdivision of a kecamatan
KEPPRES	Keputusan Presiden, Presidential Degree
MOF	Ministry of Finance
MOH	Ministry of Health
MOHA	Ministry of Home Affairs
MOU	Memorandum of Understanding
MPW	Ministry of Public Works
NRW	Non-Revenue Water
NWSSP	National Water Supply Sector Project
OECF	Overseas Economic Cooperation Fund, Japan
PAM JAYA	Jakarta Water Supply Enterprise
PC	Primary Cell (Water Distribution Network)
PDAM	Perusahaan Daerah Air Minum, Local Government Water Enterprise

PDM	Primary Distribution Main (Water Distribution Network)
PERUMNAS	Perumahan Nasional, National Housing Authority
PIU	Project Implementation Unit
PJSIP	PAM JAYA System Improvement Project
POJ	Perum Otorita Jatiluhur
PSP	Private Sector Participation
S/W	Scope of Works
TOR	Terms of Reference
UFW	Unaccounted-For Water
USAID	US Agency for International Development
Wilayah	Area or region
WTC	West Tarum Canal
WTP	Water Treatment Plant

The Study on the Revise of
Jakarta Water Supply Development Project

Compilation of the Report



INTRODUCTION

1. BACKGROUND OF THE STUDY

From 1983 to 1985, Master Plan and Feasibility Study for Jakarta Water Supply Development Project was conducted by Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan (GOJ). Based on the results of the Master Plan and Feasibility Study, water supply facilities have been expanded to meet not only domestic but also industrial and commercial water demand, and such expansion works were expected to significantly improve water supply conditions and thereby support the continuous development of the capital city Jakarta.

Against such expectation, however, water supply conditions in Jakarta have not been satisfactorily improved, and the problem of water shortage has still remained as a serious hindrance to the sustainable development of Jakarta. The existing constraints in water supply are considered to have resulted from the delay in the implementation of planned projects such as construction of new treatment plants and raw water transmission mains, and the unexpected increase of water demand due primarily to rapid urbanization, change of living standards and industrial structures.

Under the circumstances, the Government of Indonesia (GOI) requested GOJ to conduct the Study on the Revise of Jakarta Water Supply Development Project to review the 1985 Master Plan. In response to the request, GOJ had decided to conduct the Study, and JICA dispatched a Preparatory Study Team to Indonesia in February, 1995. The Team and GOI agreed and confirmed the purpose of the study, study area, and scope of works as shown in **Annex-M/M**.

JICA appointed and dispatched the Study Team for execution of the above Study in July, 1995. The Study Team prepared Inception Report describing study purpose, study area, scope of works, work schedule, work assignments, manning schedule, reporting and undertakings of GOI with full understanding of the Scope of Works. The Inception Report was discussed for a mutual understanding between the Study Team and GOI during the inception meeting held at the start of the study period.

The Report was approved except for these two points as described below, which are shown in the

Minutes of Meeting as attached in Annex-M/M.

- Expansion of Study Area to include fringe area of DKI Jakarta
- Consideration of concept on Private Sector Participation

JICA agreed the requests of GOI to include the above two points into the Scope of Works.

During the first mission to Indonesia from July to November, 1995, the Study Team collected and analysed various information and held many meetings and discussions with Indonesian side on various topics. In August and September, the Study Team discussed the Basic Concept of the Study with JICA Advisory Committee, the Cipta Karya and PAM JAYA.

At the end of the first mission, the Study Team submitted the Progress Report No. 1 which included team activities during the first mission and preliminary results of the Study. During the discussion about the contents of the Progress Report No. 1, Indonesian side, Steering Committee, JICA Advisory Committee and the JICA Study Team agreed and confirmed the basic concept for the Study, future service area which included eight Kecamatans from the fringe area in the Study Area, future population in the Study Area, and future total water demand in the Service Area. The Minutes of the Meeting are attached in Annex-M/M.

According to the study schedule included in the Inception Report, the Study Team would submit the Interim Report in March 1996. However, the Study Team intended to postpone the finalization of the Interim Report through consultation with JICA Head Office and JICA Advisory Committee in order to include very important and latest information on water resource development and private sector participation and instead, prepared Draft Interim Report.

At the beginning of the second mission in March, 1996, the Study Team submitted the Draft Interim Report and the Study Team explained the plan and had comments through the discussion with the Technical Committee of the Indonesian Side. The Minutes of the Meeting with the Technical Committee on the Draft Interim Report are attached in Annex-M/M.

To finalize the Interim Report which contains Master Plan, the Study Team collected latest information from Jatiluhur Water Resources Management Project Study, Pre-feasibility Study on

Conveyance-2 System, and Feasibility Study by two consortia. These information were indispensable for the preparation of the Master Plan.

After finalization of the Interim Report incorporating and reflecting the latest information and the results of the discussion with the Technical Committee in March, 1996, the Interim Report was discussed at the Steering Committee Meeting which was held on May 22, 1996 during the fourth mission to Indonesia.

The Steering Committee agreed and accepted the contents of the Interim Report with comments that were raised during the meeting as stated in the Minuets of Meeting on Interim Report as attached in **Annex-M/M**.

Among the comments, there was a comment on the water resource for future water supply system. The JICA Study Team proposed that the Jakarta water supply system should rely on not only water resources from eastern side which is Jatiluhur Dam but also from western side of Jakarta. Based on this principle, the JICA Study Team proposed to utilize raw water from the western side, Karian Dam through KSCS System, for the Part Two, Second Phase of the Second Stage.

Against the proposal from the JICA Study Team, the Steering Committee commented that the possibility of implementation of Karian Dam development plan has become low because of resettlement problems. For the substitution of the raw water from the Karian Dam, the committee confirmed to allocate additional 5 m3/sec and further 5 m3/sec, totally 10 m3/sec, of raw water from the West Tarum Canal (WTC) to the Jakarta Water Supply System.

Upon confirmation by the Steering Committee on the 10 m3/sec from the WTC, the JICA Study Team started to revise the proposed water supply system which was shown in the Interim Report.

For the revision of the proposed water supply system, the JICA Study Team conducted alternative studies based on the revised water resources development scheme, and the results of the alternative studies are included in the Progress Report No. 2 which was submitted in August 1996, at the end of the fourth mission.

There was also comments on the Private Sector Participation (PSP) during the meeting with the

Steering Committee. The JICA Study Team had been conducted careful studies about PSP from the various aspects, and the Team proposed that the role of the government sector and the role of private sector as follows.

Role of Government Sector :

1) Implementation of projects for raw water intake facilities, treatment plants, treated water transmission pipelines, and distribution centers.
2) Overall implementation supervision of all the projects involved from the standpoint of coordinated development of the total system of Jakarta Water Supply.
3) Institutional strengthening including legal and organizational development to support effective operation of the water supply system toward its social goal.
4) Tariff determination
5) Monitoring of the private sector performance in accordance with the predetermined targets.

Role of Private Sector :

1) Fund raising and construction of the water distribution pipelines.
2) Management, operation and maintenance of the whole system of Jakarta Water Supply after the raw water intake.
3) Effort toward achievement of the predetermined performance targets.

Role of each sector was proposed based on the basic policy for preparation of the Master Plan which aims at the maximization of social benefit, especially to maintain future water tariff in people's affordable level.

However, strong policy of the Government of Indonesia, that all activities including investment, construction, operation, maintenance, and management concerning with water supply should be executed by the private sector, has been introduced and the Committee requested to revise the proposal of the JICA Study Team accordingly.

Following the Policy of the Government of Indonesia, the Team reviewed its proposal on PSP and details were explained in the Progress Report No. 2.

In the Progress Report No.2, revision of the Master Plan mentioned above and preliminary results of the Feasibility Study were included. The Progress Report No.2 was discussed at the Steering Committee which was held on August 22, 1996, and the Minutes of Meeting of the Committee are shown in Annex-M/M.

All results of the Study starting from July 1995 including all precious comments from the Indonesian side are compiled in the Draft Final Report. The Draft Final Report was submitted in November 1996 and the contents of the Report was discussed at the Steering Committee which was held on November 14, 1996 and the Minutes of Meeting of the Committee are shown in **Annex-M/M**.

As described in the Minutes of Meeting on the Draft Final Report, the Study Team agreed to revise the Report and prepared the Revised Draft Final Report according to the comments. The Revised Draft Final Report was submitted to JICA Tokyo Headquarters in January 1997.

From the end of December 1996, Environmental Impact Assessment had been conducted by the Indonesian Consultant and the Assessment was completed in March 1997. Upon completion of the Assessment, the Revised Draft Final Report was finalized as this Final Report by incorporating the results of the Assessment.

2. PURPOSE OF THE STUDY AND STUDY AREA

2.1 PURPOSE OF THE STUDY

The purpose of the Study are:

1) To formulate a master plan on the development of water supply for the City of Jakarta (DKI Jakarta) to the year 2019, through the review of the progress after the Master Plan of 1985, the analysis of the new requirements for water supply, the assessment of the managerial situation of Jakarta Water Supply Enterprise (hereinafter referred to as "PAM JAYA"), and the assessment of the possibility of private sector involvement.

2) To conduct a feasibility study for the priority project(s) identified in the master plan, and

3) To transfer technology on planing methods and skills to the counterpart personnel of PAM JAYA as well as Directorate General of Human Settlements, Ministry of Public Works (hereinafter referred to as "Cipta Karya") through daily study activities.

2.2 STUDY AREA

Original Study Area was only DKI Jakarta, however, during the Inception Meeting, expansion of the Study Area was requested. As agreed in the Minutes attached in **Annex-M/M**, the Cipta Karya submitted official request letter for the expansion to JICA Indonesia Office and JICA approved such expansion. The official request letter from the Cipta Karya to JICA Indonesia Office is attached in the **Annex-M/M**. The Study Area was finally concluded to include Kecamatans from fringe area of DKI Jakarta listed below:

Tangerang	Bekasi	Bogor
1. Kosambi	9. Jakasampurna	14. Limo
2. Teluknaga	10. Jatiasih	15. Beji
3. Batuceper	11. Pondok Gede	16. Cimanggis
4. Cipondoh	12. Bekasi Barat	17. Sawangan
5. Ciledug	13. Tarumajaya	
6. Ponduk Aren		
7. Ciputat		
8. Pamulang		

The Study Area including 17 Kecamatans from its fringe area are shown on the **Figure-I.1** and **Figure-I.2** except for water source (surface water) study.

3. SCOPE OF WORKS

Original Scope of Works for the Study on the Revise of Jakarta Water Supply Development Project which was agreed between the JICA Preparatory Study Team and GOI on February 10, 1995 are shown in **Annex-M/M**.

As mentioned in the previous sections, the original Scope of Works had been modified to expand the Study Area including fringe area of DKI Jakarta and to consider Indonesian side's plan of Private Sector Participation to the Water Supply Sector.

Before proceeding to the Feasibility Study stage, Indonesian side and JICA reviewed the Scope of

Works taking the results of the Master Plan Study into account and both sides agreed the Terms of Reference for the Feasibility Study as shown on the Minutes of Meeting signed on August 1, 1996 attached in **Annex-M/M**.

4. BASIC APPROACH TO THE STUDY

[Bumi, air dan kekayaan alam yang terkandung di dalamnya dikuasai oleh Negara dan dipergunakan untuk sebesar-besar kemakmuran rakyat. (Earth, water and natural riches contained in it are controlled by the Government and used for the prosperity of people as great as possible.)] is said in Chapter 33(3) article 14 "Social Welfare" of the Constitution of Indonesia. Basic requirement for water supply service is to supply clean and sufficient water at a reasonable price, and this is considered the same principle as the Constitution says.

On the other hand, the government policy set forth in Pelita VI is to eliminate the burden of the government funding for public investment. For instance, the Book IV says [Dalam penyediaan dan pengelolaan air bersih perkotaan, peluang dan iklim bagi peran serta usaha swasta dan masyarakat akan dikembangkan (Opportunity for participation of public and private sectors will be developed in order to supply and manage water in city areas.) in Chapter 38 "Perumahan dan pemukiman (Residence and Housing)".

In line with the government policy, PSP, Private Sector Participation, is planned to be adopted by Jakarta water supply system. In general, participation of private sectors in a water supply business reduces government funding, accelerates project implementation and improve efficiency of management. On the contrary, it tends to force the business to seek for profit rather than to seek for public welfare.

Considering the policies defined in the Constitution and Pelita VI and the current trend of PSP, the basic policy is defined in the study as **"to prepare a most appropriate plan which will, on a sustainable basis, realize the maximum prosperity of Jakarta citizens from the standpoint of water supply"**. Or, it can also be expressed as **"to contribute to the improvement of public health and welfare to the extent possible through water supply service in Jakarta"**.

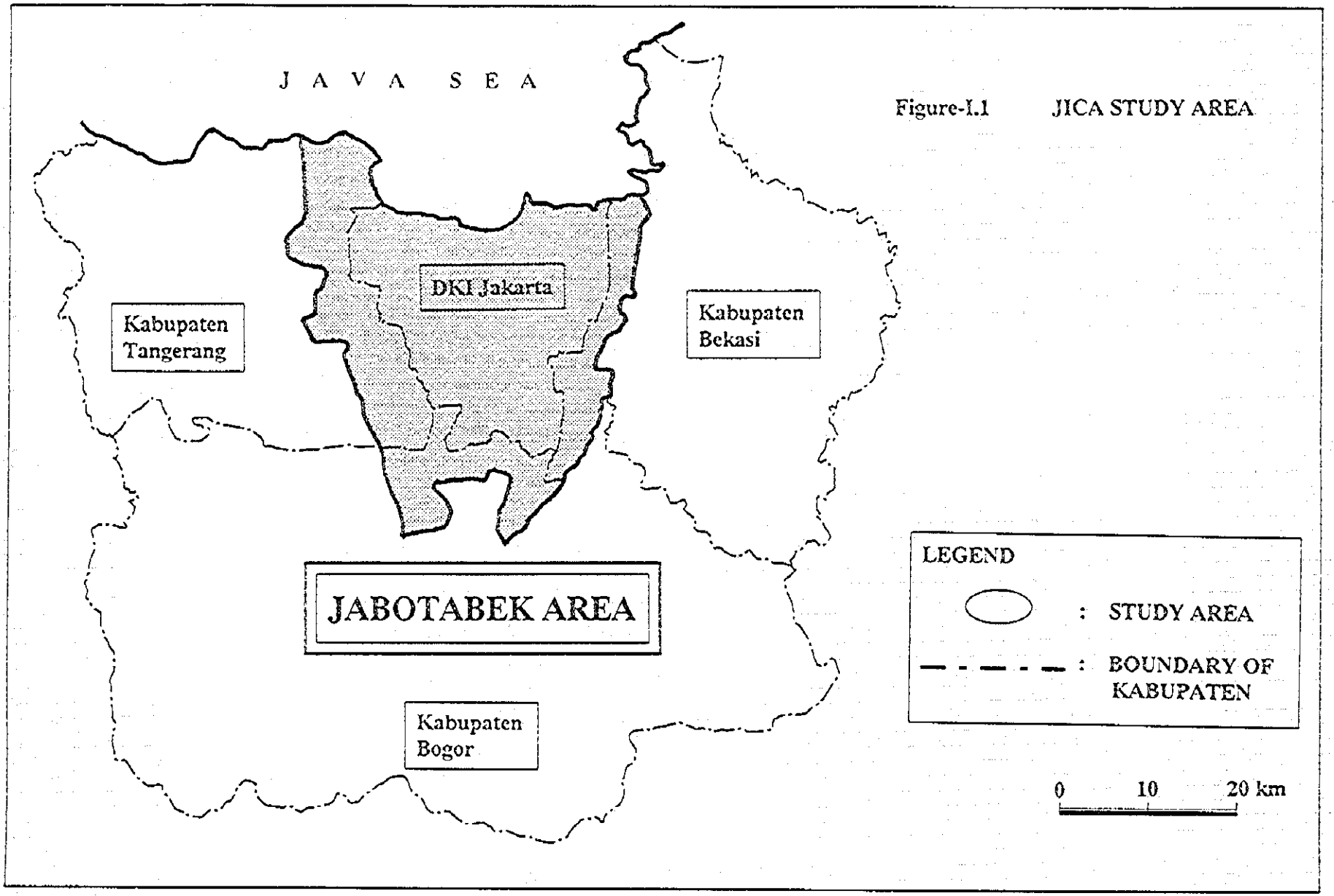
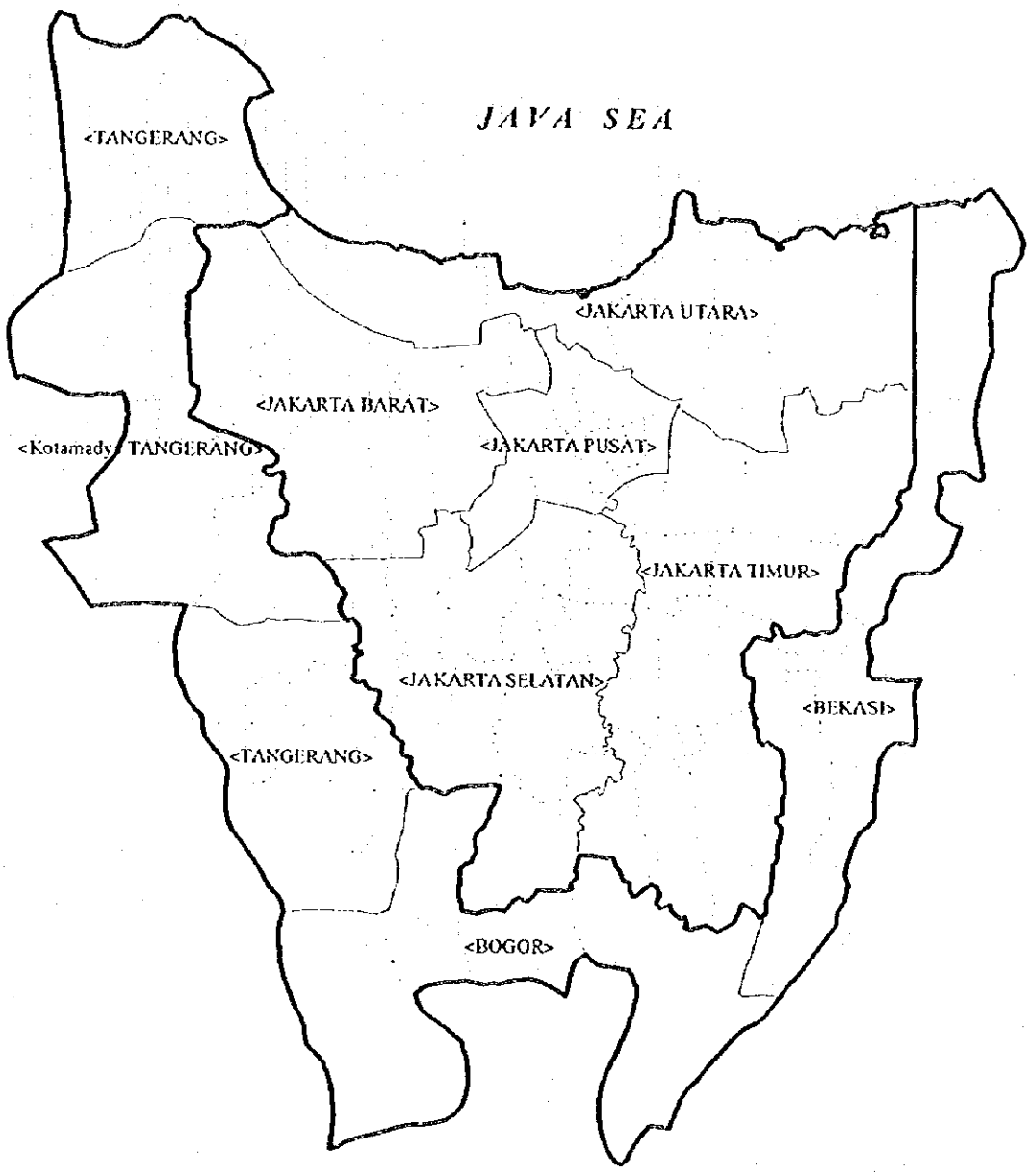


Figure-I.1 JICA STUDY AREA

Figure-I.2 JICA STUDY AREA



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CHAPTER 1

GENERAL CONDITION OF STUDY AREA

CHAPTER 1 GENERAL CONDITION OF STUDY AREA

1.1 NATURAL CONDITIONS

The Study Area includes the city of Jakarta and 17 Kecamatans from Botabek area (Bogor, Tangeran and Bekasi), and it lies in the West Java province on the western part of the island of Java, Republic of Indonesia.

1.1.1 Climate

The Study area belongs to typical humid tropical zone and weather patterns are characterized by the monsoons. The wet season is defined from November to April and the dry season from May to October in general. Precipitation and temperature in this area varies considerably in the north-south direction due to the topographic conditions, which varies from the coastal plain to the rugged mountainous zone in the south. The meteorological data measured at a Jakarta station of 2.368 m altitude are summarized in **Table-111.1**.

Table-111.1 CLIMATE OF JAKARTA (Tanjung Priok, 1993)
Altitude : 2.368 m

MONTH	MAXIMUM/MINIMUM TEMPERATURE (°C)	AVERAGE RELATIVE HUMIDITY (%)	RAINFALL (mm)	WIND VELOCITY (KNOT)
January	29.8/24.3	81	14.9	27.0
February	30.4/24.3	79	13.6	35.0
March	32.6/24.5	75	5.7	30.0
April	33.4/25.0	76	3.8	28.0
May	34.6/25.4	74	1.2	27.1
June	34.6/25.2	74	0.0	28.1
July	33.1/24.7	72	1.8	24.7
August	33.6/24.7	74	3.5	25.0
September	-	-	-	-
October	34.2/25.1	70	0.8	26.3
November	33.8/25.1	74	2.5	25.0
December	31.9/25.1	77	4.9	29.0

Source : BIRO PUSAT STATISTIC JAKARTA; Statistical Yearbook of Indonesia 1994

The temperature fluctuates slightly throughout the year. The monthly temperature variation is larger in June with the fluctuation between 25.2° C and 34.6° C and smaller in January with the fluctuation between 24.3° C and 29.8° C.

The monthly average of relative humidity fluctuates between 70 and 81%.

Precipitation of the area is characterized by significant seasonal variations in each year. The annual precipitation varies from 5,500 mm to 1,500 mm in the coastal plain. About 70 % of the annual precipitation is concentrated in the wet months from November to April. In the remaining period from May to October, the monthly precipitation is below 100 mm and often almost zero. In Bogor where is hilly and mountainous area, wet season start from August and rainfall is bigger than the other area. Precipitation data are shown in **Table-111.2** and **Figure-111.1.**

The monthly average wind velocity varies imperceptibly between 24.7 and 30.0 Knot.

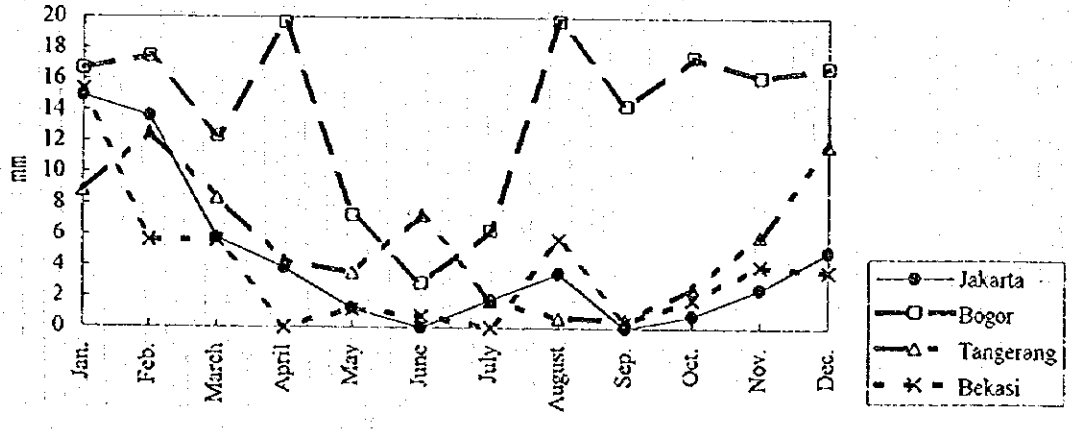
Table-111.2 RAINFALL OF ADJACENT AREA(1993)

Unit : mm

Area	Jan.	Feb.	March	April	May	June	July	August	Sep.	Oct.	Nov.	Dec.
Bogor	16.7	17.5	12.3	19.6	7.3	2.9	6.3	19.8	14.3	17.5	16.2	16.8
Tangerang	8.8	12.5	8.4	4.3	3.5	7.2	1.7	0.6	0.6	2.6	6.0	11.8
Bekasi	15.4	5.6	5.6	0.0	1.2	0.7	0.0	5.7	0.4	1.8	4.0	3.6

Source : JAWA BARAT DALAM ANGKA 1993

Figure-111.1 RAINFALL OF JAKARTA AND ADJACENT AREA(1993)



1.1.2 Topography

In topographic features, the region of the Jabotabek, the Cimanuk river basin and river basins in the western area is divided into the following three (3) areas as shown on **Figure-1I2.1**.

1) Jakarta coastal flat plain area
2) Bogor hilly slope area
3) Southern mountain area

(1) Jakarta coastal flat plain area

The detail plain of 0 m to 50 m above sea level lies along the coastal line of the city of Jakarta. This area is very flat and swampy. The width of this coastal lowlands ranges from 5 to 10 km; its elevation is less than 10 m; and the topographic gradient hardly exceeds 1.0 m/km. These plain slopes extend from the sea of Java southward to the inland mountains.

(2) Bogor hilly slope area

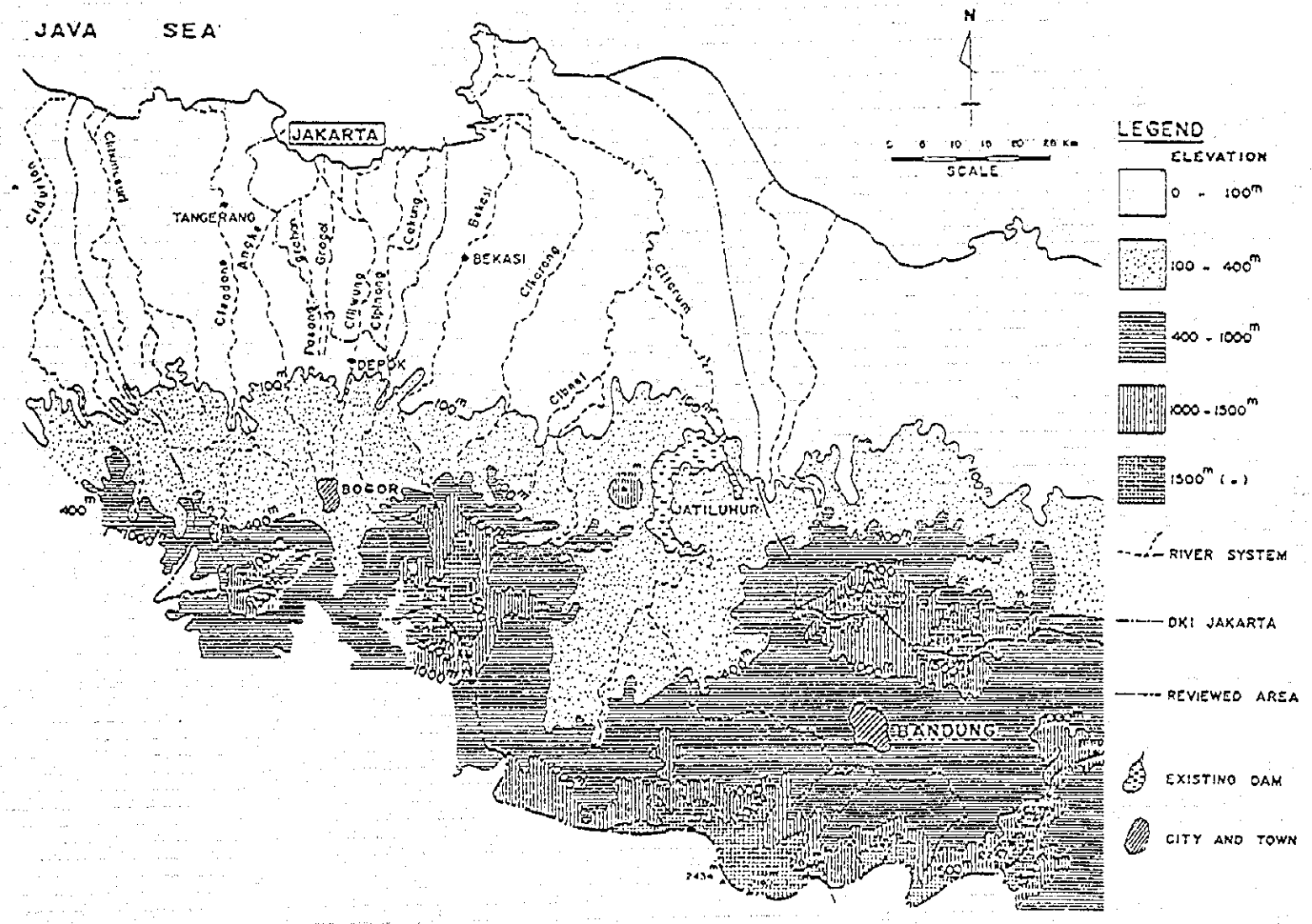
The hilly area of Bogor spreads out between the southern mountains and the coastal plain. The elevation of this area ranges from 100 to 400 m above sea level.

(3) Southern mountain area

The southern mountainous area extends inland for approximately 50 km with the altitude of more than 1,000 m above the sea level. This area is dotted with a few volcanoes such as Pangrango (3,019 m) and Salak (2,211 m).

The area is drained by many north flowing river, originating in the southern mountain area and flowing to the Java Sea. The main ones are the Cimanuk, Cisadane, Ciliwung and Bekasi rives.

Figure-112.1 TOPOGRAPHIC CONDITION AND RIVER SYSTEM



SOURCE : JAKARTA WATER SUPPLY DEVELOPMENT PROJECT, MASTER PLAN AND FEASIBILITY STUDY, JICA, 1985

1.1.3 Geology

In Figure-113.1 , the geological conditions of Jakarta and the Citarum river basin are explained. In the eastern and southern mountains of the area, sediments of Oligocene, Eocene, Miocene and Pliocene ages form the bedrock. However, the Oligocene-Eocene formations sporadically crop out in the mountain areas and appear to underlie the Java Sea. The southern part of the area at the foot of Mt. Salak and Mt. Pangrango is covered by Quarterly volcanic deposits. The coastal plain, alluvial fan and terrace occupying the greater part of the area consists of Pleistocene and Holocene deposits. The surface geology in the area is divided into the following six (6) systems, ascending order :

1) Jatiluhur Formation (Miocene)
2) Bojongmanik Formation (Miocene)
3) Genteng Formation (Pliocene)
4) Old Volcanic Sequence (Pleistocene)
5) Young Volcanic Sequence (Pleistocene)
6) Alluvial Sediments (Holocene)

The DKI Jakarta is covered by thick Quaternary sediments, ranging from 100 m to 300 m in thick and the sediments are mainly deltaic faces. The lowlands and swampy area of the coastal plain are mantled with Holocene (Recent) sediments consisting of clay, silt, sand, gravel and pebbles which are mostly of volcanic origin. The thickness is less than 30 m around the DKI Jakarta and its surrounding area. The said Quaternary sediments consist of alternating layers of clay, sand and gravel deposited under deltaic and marine environments. These Quaternary sediments were presumably derived from two sources such as from south and from north, as indicated by the presence of andesitic fragments and quartz grains respectively.

1.1.4 Hydrology

The hydrological characteristics of river discharge in the Study Area are analyzed from both rainfall and river system viewpoints.

(1) Rainfall

The mean annual rainfall of Jakarta and the Citurum catchment area is remarkably distinct from area to area. Along the northern coastal plain where the city of Jakarta is situated, the rainfall is less than 2,000 mm per year, while the southern mountain area receives annual rainfall of more than 4,000 mm. Near Bogor area, an especially heavy rainfall over 5,000 mm/year has been experienced.

(2) River System

The river systems functioning for the water supply to the city of Jakarta is shown in **Figure-1I4.1.**

In the Jabotabek and its surrounding areas, there are many river systems originating at the mountain ranges in the southern part. Out of them, the Cimanuk river system situated in the eastern area of the DKI Jakarta is the biggest one in the West Java with a catchment area of 6,700 km^2 , out of which 4,550 km^2 is shared at the Jatiluhur damsite having an average annual flow of about 517 billion m^3 or 179 m^3/sec of an average discharge. The Cisadane river located in the western area of the DKI Jakarta is another big river, having an average annual discharge of 97.9 m^3/sec and monthly minimum discharge of 62.3 m^3/sec at the Serpong gauging station with 1,074 km^2. In addition, the major river systems contributing to the water supply are the Ciujung and Cidurian river systems, which have an average annual discharge of 4.7 m^3/sec at the Pamayaran Weir with 1,451 km^2 catchment and 1.3 m^3/sec at the Rancasumur Weir with 376 km^2 catchment.

1.1.5 Hydrogeology

The Miocene to Pliocene sedimentary rocks consisting of green to gray marl, limestone and sandstone underlie the base of Jakarta artesian basin. These Tertiary rocks lie about 300 m in depth overlain by 200-300 m thick of Quaternary sediments. The subsurface conditions in

Jakarta area explained by means of the hydrogeological cross sections are shown in **Figure-115.1**.

The Quaternary sediments are deposited under deltaic and marine environments. These sediments consisting of alternating layers of clay, sand and gravel were presumably acquired from two sources such as from south and from north, as denoted by the existence of andesitic fragments and quartz grains, respectively.

The importance of the Quaternary aquifer is such that the Jakarta area has been counting on it as the main sources of domestic and industrial water. The sediments contain mostly freshwater, but occasionally contain saline water near the coast. The Study Area is hydrogeologically classified into the following two types of aquifer systems:

(1) Unconfined and Semi-confined Aquifer

The shallow aquifer is unconfined and situated at a shallower depth. This aquifer can be reached by shallow wells for domestic use in densely populated areas. Shallow groundwater is almost ubiquitous under the coastal plain. The thickness of this aquifer is mostly less than 20 m. The water level fluctuations between the wet and the dry seasons are indiscernible in some areas, while in other areas the levels may oscillate from 3 to 5 m.

(2) Confined Aquifer

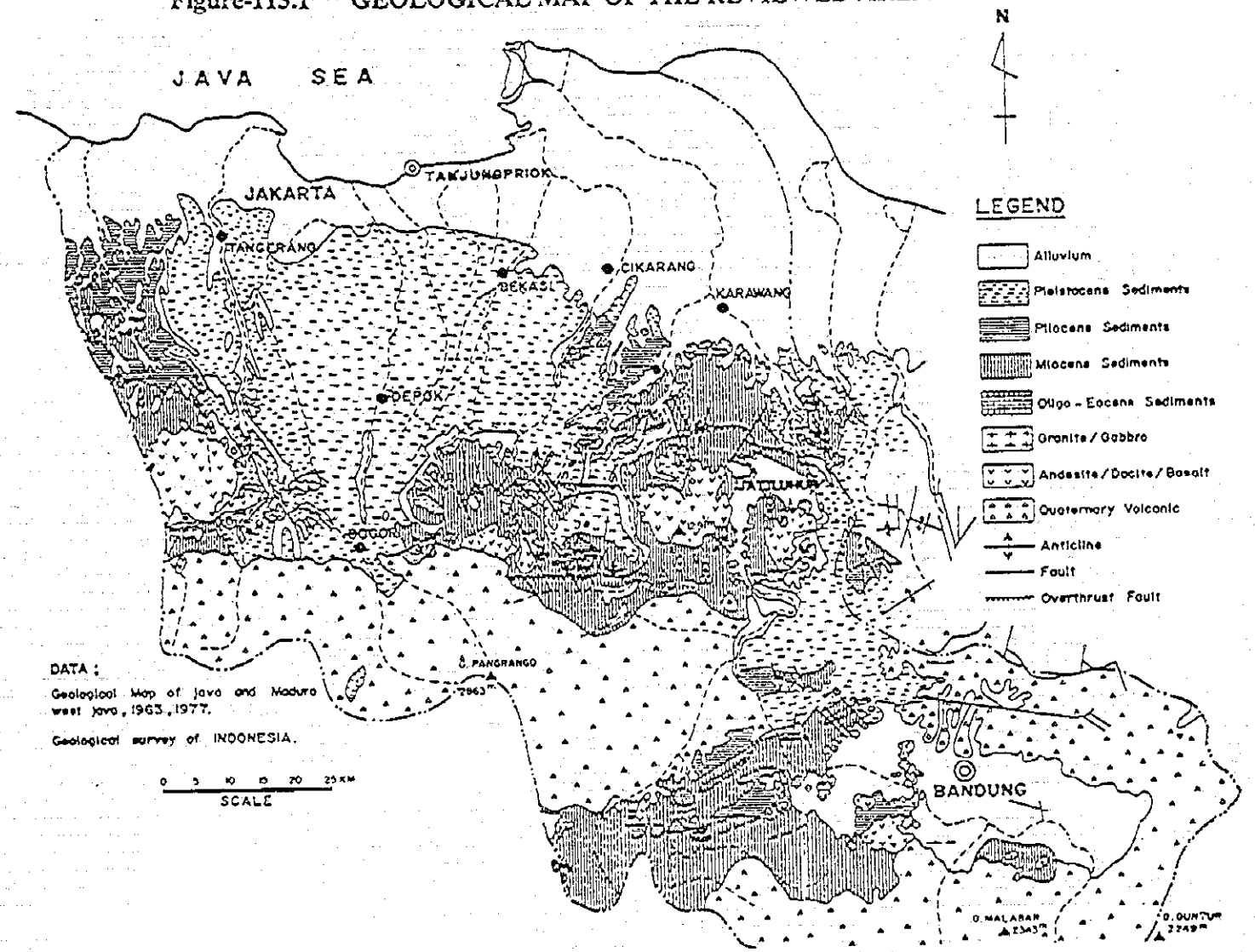
The aquifers is discontinuous for long distances and various zones of permeable layers are regularly present throughout the deposits underlying the city of Jakarta. Water bearing formations are also found at greater depth than 240 m. Nevertheless this deeper zones are not regarded as appropriate water sources due to the highly mineralized water ingredients. **Figure-115.1** shows the depth of the three water bearing zones. They range from 20 to 140 m, 140 to 240 m and 240 m below ground surface respectively.

Groundwater in the deep aquifer is confined in three principal systems ranging from 20 m to the maximum depth of 394 m. These zones are formed by a series of discontinuously interfingering permeable strata separated by layer of low permeable materials.

1.1.6 Natural Disaster

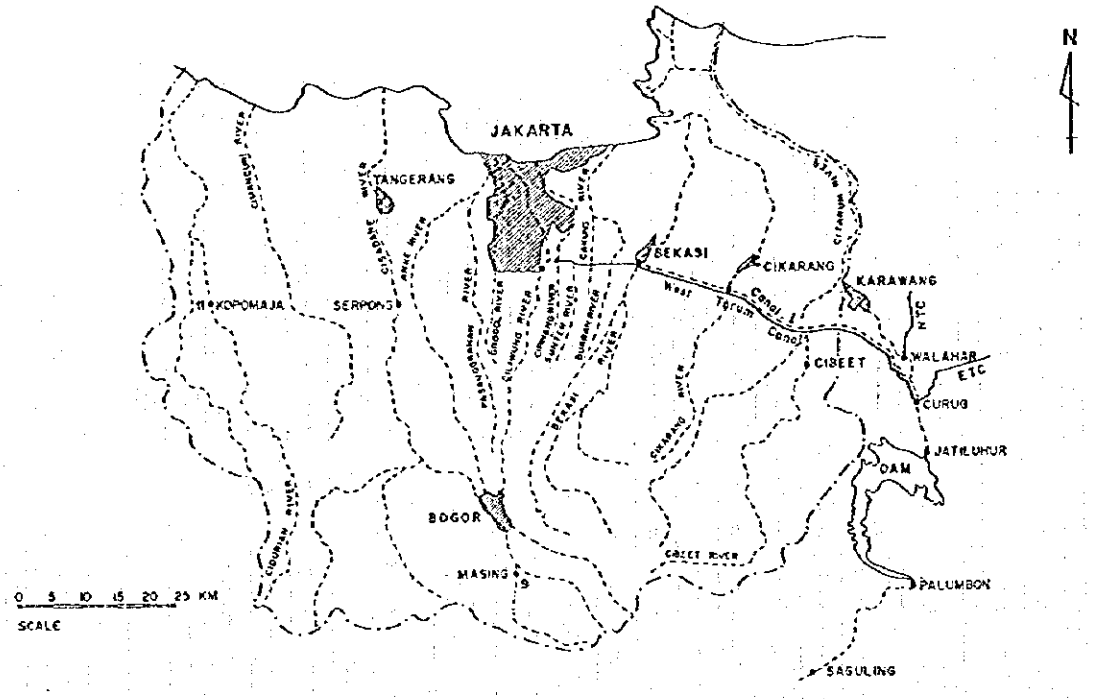
Natural disaster happened in 1993 in the adjacent area is shown in **Table-116.1** and **Figure-116.1**. The Table and Figure indicates that Bogor had less fire but much landslide than the other area.

Figure-113.1 GEOLOGICAL MAP OF THE REVIEWED AREA



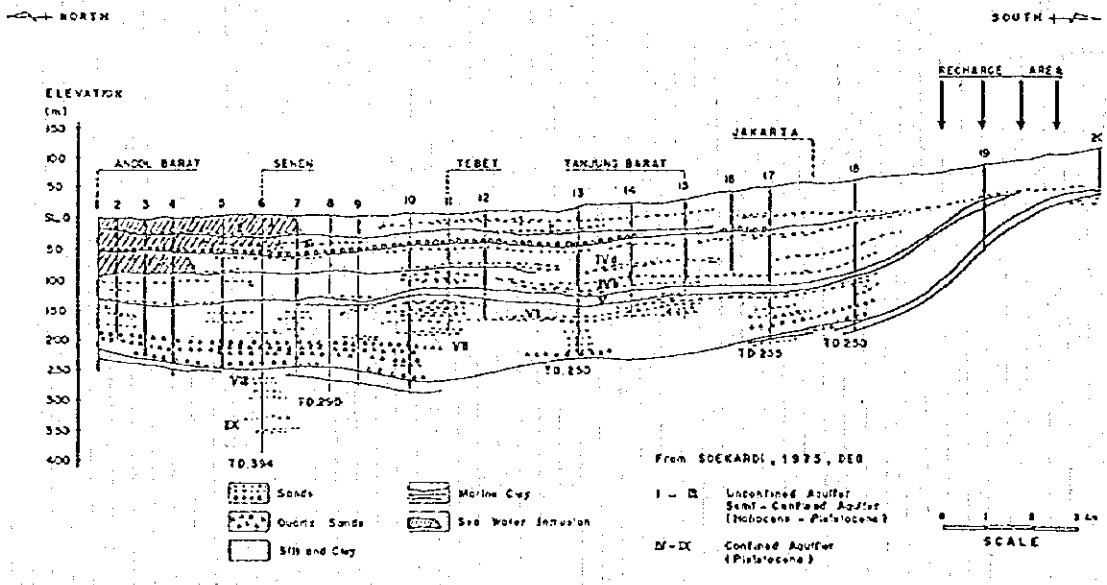
SOURCE : JAKARTA WATER SUPPLY DEVELOPMENT PROJECT, MASTER PLAN AND FEASIBILITY STUDY, JICA, 1985

Figure-114.1 RIVER SYSTEM



SOURCE : JAKARTA WATER SUPPLY DEVELOPMENT PROJECT, MASTER PLAN AND FEASIBILITY STUDY, JICA, 1955

Figure-115.1 HYDROGEOLOGICAL CROSS SECTION IN JAKARTA CITY



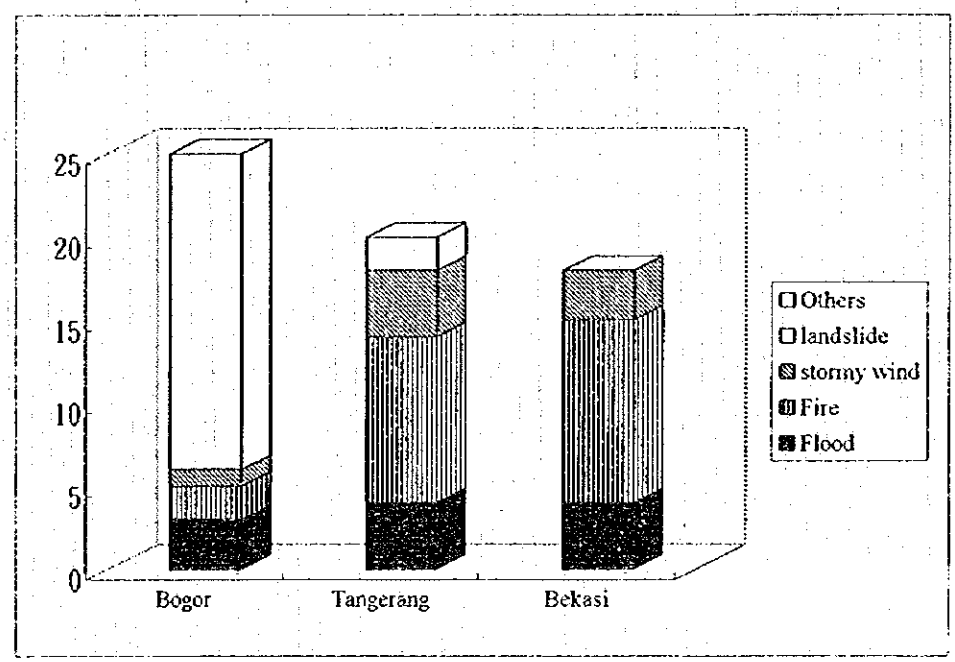
SOURCE : JAKARTA WATER SUPPLY DEVELOPMENT PROJECT, MASTER PLAN AND FEASIBILITY STUDY, JICA, 1955

Table-116.1 NATURAL DISASTER HAPPENED (1993)

Area	Flood	Fire	stormy wind	landslide	Others	Total
Bogor	3	2	1	19	0	25
Tangerang	4	10	4	-	2	20
Bekasi	4	11	3	-	0	18

Source : JAWA BARAT DALAM ANGKA 1993

Figure-116.1 NATURAL DISASTER HAPPENED (1993)



1.2 SOCIOECONOMIC CONDITION

1.2.1 Gross Domestic Product

Indonesia's economy which was dominated by agriculture at the beginning of 1970s, has been converted into an industrialized economy during last two decades. **Table-121.1** shows the gross regional domestic products in the Study Area. The Indonesian economy has achieved a high economic growth of approximately 7 % since 1989. The city of Jakarta and West Java even exceed Indonesia in GRDP growth. The manufacturing sector has most strongly contributed to the overall growth.

1.2.2 Prices

In 1993 and 1994, inflation rates in both Indonesia and the city of Jakarta are approximately 10 % **(Table-122.1)**. As shown in **Table-122.2**, the price index of housing cost rose more than other categories. On the other hand, wholesale price index for construction materials showed a moderate upward trend, whose average annual increasing rate in the last four years is around 6 %.

Table-122.1 INFLATION RATE

YEAR	JAKARTA	INDONESIA
1987	9.02	8.90
1988	4.44	5.47
1989	5.56	5.97
1990	11.26	9.53
1991	10.38	9.52
1992	5.46	4.94
1993	10.28	9.77
1994	10.56	9.24

*) April, 1988 - March, 1989 = 100
Source : BIRO PUSAT STATISTIC JAKARTA; Economic Indicator June 1995

Table-121.1 GROSS REGIONAL DOMESTIC PRODUCTS IN 1983 CONSTANT PRICE LEVEL IN JABOTABEK AREA

Industry Origin	Indonesia		West Java		DKI Jakarta		Kab Bogor		Kodya Bogor		Kab. Tangerang		Kab. Bekasi		Kab. Serang	
Year:	1993		1993		1993		1992		1991		1992		1992		1991	
	(Rp. Billion)	(%)	(Rp. Million)	(%)	(Rp. Million)	(%)	(Rp. Million)	(%)	(Rp. Million)	(%)	(Rp. Million)	(%)	(Rp. Million)	(%)	(Rp. Million)	(%)
Gross Regional Domestic Products																
1) Agriculture	24,569	17.6%	3,870,047	17.6%	97,086	0.6%	250,667	15.6%	2,499	1.3%	169,038	12.0%	145,718	13.8%	126,777	11.0%
2) Mining & quarrying	19,370	13.9%	2,512,203	11.4%	0	0.0%	10,992	0.7%	0	0.0%	507	0.0%	3,527	0.3%	5,964	0.5%
3) Manufacturing industries	29,484	21.1%	5,008,020	22.8%	4,500,336	25.9%	484,956	30.2%	14,585	7.6%	402,670	28.6%	456,578	43.3%	696,231	60.3%
4) Electricity, gas & water supply	1,022	0.7%	471,850	2.1%	772,994	4.5%	44,245	2.8%	9,692	5.1%	33,180	2.4%	23,178	2.2%	5,781	0.5%
5) Construction	9,223	6.6%	1,453,758	6.6%	1,821,946	10.5%	158,732	9.9%	29,426	15.4%	105,917	7.5%	96,126	9.1%	84,675	7.3%
6) Trade, restaurant and hotel	22,850	16.4%	4,582,276	20.9%	3,502,802	20.2%	389,934	24.3%	41,249	21.6%	290,749	20.6%	177,312	16.8%	127,416	11.0%
7) Transportation & communication	8,302	5.9%	1,241,942	5.7%	2,012,788	11.6%	89,225	5.6%	42,323	22.2%	288,946	20.5%	58,588	5.6%	33,495	2.9%
8) Banking and Financing	7,070	5.1%	525,667	2.4%	2,443,254	14.1%	2,485	0.2%	9,800	5.1%	9,235	0.7%	2,305	0.2%	7,068	0.6%
9) Ownership of dwelling	3,411	2.4%	318,952	1.5%	429,742	2.5%	22,756	1.4%	1,875	1.0%	14,261	1.0%	10,885	1.0%	8,461	0.7%
10) Public services and defence	9,509	6.8%	1,224,079	5.6%	585,166	3.4%	67,615	4.2%	31,529	16.5%	61,213	4.3%	41,961	4.0%	39,145	3.4%
11) Services	4,897	3.5%	746,774	3.4%	1,184,201	6.8%	82,482	5.1%	8,061	4.2%	34,032	2.4%	37,781	3.6%	19,780	1.7%
Total :	139,707	100.0%	21,955,568	100.0%	17,350,315	100.0%	1,604,089	100.0%	191,039	100.0%	1,409,748	100.0%	1,053,959	100.0%	1,154,793	100.0%

		Growth Rate		*Growth Rate*		*Growth Rate*		*Growth Rate*		*Growth Rate*		*Growth Rate*		*Growth Rate*		*Growth Rate*
1993	139,707	6.5%	21,955,568	6.9%	17,350,315	8.4%	-	-	-	-	-	-	-	-	-	-
1992	131,185	6.5%	20,540,754	7.0%	16,001,557	8.6%	1,604,089	8.0%	-	-	1,409,748	10.9%	1,053,959	15.8%	-	-
1991	123,225	7.0%	19,195,892	6.9%	14,730,349	7.8%	1,485,688	9.1%	191,039	8.3%	1,270,671	7.7%	909,889	12.5%	1,154,793	8.7%
1990	115,217	7.2%	17,959,098	9.4%	13,664,719	8.6%	1,361,966	9.2%	176,324	6.9%	1,179,445	8.1%	808,810	13.4%	1,062,366	-
1989	107,437	7.5%	16,409,083	8.2%	12,586,088	9.7%	1,247,098	7.4%	164,967	6.3%	1,091,071	7.4%	713,047	8.3%	-	-
1988	99,981	5.8%	15,167,864	8.3%	11,469,201	6.6%	1,161,429	11.2%	155,216	9.2%	1,016,116	9.1%	658,099	12.1%	923,631	6.9%
1987	94,518	4.9%	14,007,974	3.7%	10,757,764	5.8%	1,044,163	19.9%	142,159	4.2%	931,525	7.6%	587,162	4.0%	864,301	4.6%
1986	90,081	5.9%	13,504,535	6.6%	10,163,638	5.0%	870,977	8.6%	136,365	5.0%	865,648	8.1%	564,490	5.2%	826,148	22.8%
1985	85,082	2.5%	12,671,165	6.1%	9,678,677	5.1%	802,242	5.7%	129,905	11.8%	800,459	26.9%	536,730	8.7%	673,020	21.3%
1984	83,037	-	11,940,200	-	9,204,771	-	758,896	-	116,182	-	630,948	-	493,755	-	554,855	-

Source : 1. Pendapatan National Indonesia 1988 - 1993, Biro Pusat Statistik
2. Pendapatan Regional Bruto Propinsi - Propinsi di Indonesia Menurut Lapangan Usaha 1988 - 1993, Biro Pusat Statistic
3. Kab. Bogor Dalam Angka 1992, Kab. Tangerang Dalam Angka 1993, Kab. Bekasi Dalam Angka 1993
4. Study on Ciujung - Cidurian Integrated Water Resources in Indonesia, JICA

SOURCE : THE STUDY ON COMPREHENSIVE RIVER WATER MANAGEMENT PLAN IN JABOTABEK, PROGRESS REPORT (1), JICA, 1995

Table-122.2 PRICE INDEX AND INFLATION RATE

Year	Consumer Price Index (DKI Jakarta)					Wholesale Price Index	Inflation Rate (DKI Jakarta)	
	General	Foodstuffs	Housing	Clothing	Miscella-neous	Construction Materials General	Calender Year	Fiscal Year
Price Index								
1993						100.00		
1984	221.73	204.30	253.76	190.92	226.65	108.00	11.25%	4.17% (84/85)
1985	232.28	207.77	272.79	194.85	242.28	113.00	3.94%	5.44% (85/86)
1986	239.92	222.20	275.97	195.91	246.28	119.00	8.18%	6.24% (86/87)
1987	263.50	242.31	292.61	225.29	281.28	132.00	9.02%	8.08% (87/88)
1988	263.70	283.10	309.80	230.10	289.80	145.00	4.44%	5.99% (88/89)
1989	301.02	300.94	324.20	239.91	299.63	160.00	5.56%	4.97% (89/90)
	(100)	(100)	(100)	(100)	(100)			
1990	112.31	109.18	115.06	113.96	111.90	174.00	11.26%	10.29% (90/91)
1991	123.79	118.63	127.87	119.98	126.49	190.00	10.38%	10.75% (91/92)
1992	134.30	129.45	137.65	130.32	137.55	200.00	5.46%	11.50% (92/93)
1993	148.29	139.60	156.67	147.10	149.03	213.00	10.28%	7.29% (93/94)
1994	161.20	155.77	173.74	158.67	154.35	221.00	10.56%	9.47% (94/95)
Average annual increasing ratio								
1984 - 1994 (10 years)	8.22%	8.72%	8.38%	7.26%	7.48%	7.45%	8.79%	8.89%
1990 - 1994 (latest 4 years)	9.46%	9.30%	10.87%	8.66%	8.42%	6.18%	9.17%	9.75%

Sources :

Statistik Indonesia 1988, 1991, 1994, Biro Pusat Statistik

Indikator Ekonomi, January 1993, January 1994, January 1995 and May 1995

Note :

1. Consumer price index before 1990: April 1977 - March 1978 = 100
2. Consumer price index since 1990: April 1988 - March 1989 = 100
3. Wholesale price index: 1983 = 100
4. Consumer price index in 1994 is average indeces during 10 months
5. Wholesale price index in 1994 is average index during 8 months

SOURCE : THE STUDY ON COMPREHENSIVE RIVER WATER MANAGEMENT PLAN IN JABOTABEK, PROGRESS REPORT (1), JICA, 1995

1.2.3 Foreign Trade

Foreign trade of Indonesia achieved exports of US$ 36,504 million and imports of US$ 29,127 million in 1993/1994 **(Annex-12)**, which are the highest trade amounts in the past. In recent years, the trade balance of Indonesia has kept surplus every year. In 1993/1994, the surplus amounted to US$ 7,377 million.

In terms of the composition of traded commodities, in 1993, machinery and vehicles account for 42.92 % of total imports, being the most imported commodities. On the other hand, crude petroleum, petroleum and related products, and gas make the biggest contribution to the exports, their combined share amounting to 49.83% of total exports in 1993. Other heavy export commodities are ready-made cloths and plywood and similar laminated wood products.

1.2.4 Balance of Payments

Despite the external trade balance has shown surplus as mentioned above, current account in the balance of payments has been continuously negative due to imbalance of services account. The surplus of capital account compensates this current account deficit and even makes basic balance positive.

For further socioeconomic information, **Annex-12** "Socioeconomic data of Indonesia" is prepared.

1.2.5 Revenue and Expenditure in Botabek Area

Revenue and Expenditure in Botabek area are introduced in **Table-125.1** and **Figure-125.1**. All the area have similar tendency of expenditure even though expenditure for development purpose has larger share in Tangerang and less portion in Bogor.

Table-125.1

EXPENDITURE OF REGIONAL GOVERNMENT IN BOTABEK AREA

Unit : MRp.

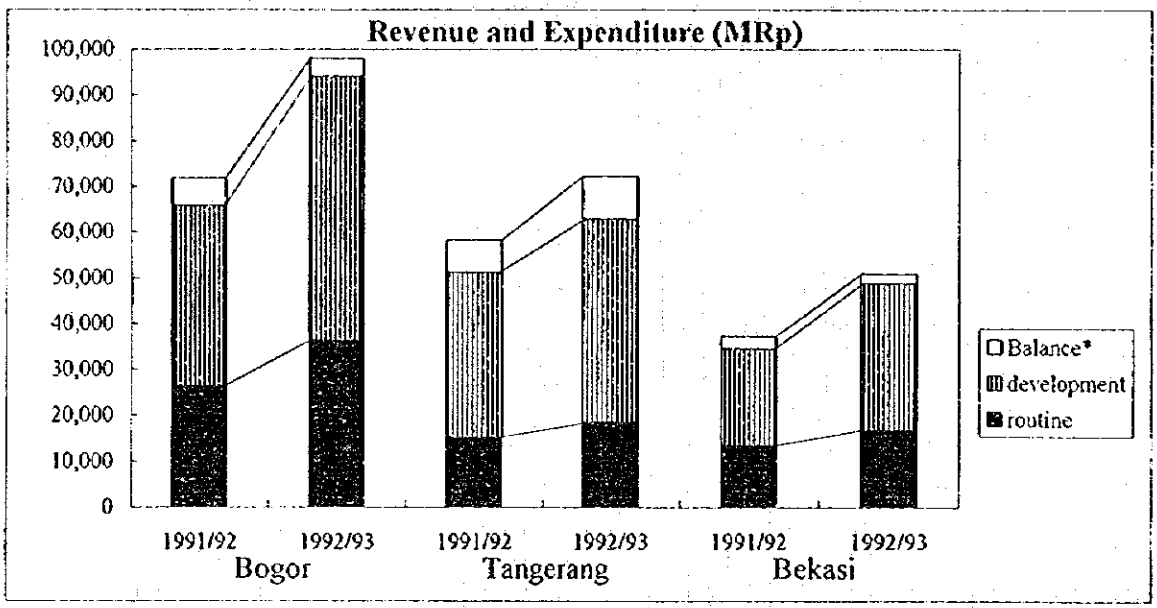
Area	Year	Type of Expenditure		Balance*
		routine	development	
Bogor	1991/92	26,301	39,479	6,053
	1992/93	36,308	57,725	3,994
Tangerang	1991/92	15,189	35,928	7,147
	1992/93	18,438	44,379	9,362
Bekasi	1991/92	13,399	21,074	2,857
	1992/93	16,693	32,022	2,212

Note : Balance * = Revenue - Expenditure

Source : JAWA BARAT DALAM ANGKA 1993

Figure-125.1

EXPENDITURE OF REGIONAL GOVERNMENT IN BOTABEK AREA



Note : Balance * = Revenue - Expenditure

1.3 POPULATION

1.3.1 Population

As shown in **Table-131.1** as of 1990, Indonesia has a population of 179,379 thousand persons, of which the city of Jakarta represent 8,259 thousand. The annual growth rate of population in the city of Jakarta is 2.42 %, which is higher than that of Indonesia. It is also observed that the average annual growth rates are declining from 1971 through 1990 both in the city of Jakarta and Indonesia. **Table-131.2** shows the number of households in each area. It is noted that the average household size in 1990 is already less than 5 persons/household both in the city of Jakarta and Indonesia. Population and household in Botabek area in 1993 is also summarized in **Table-131.3**. Population density in the Study Area by each Kecamatan is shown on **Figure-131.1**

Further analysis on the forecast of future population is presented in the **Section 3.3.**

Table-131.1 POPULATION

YEAR	POPULATION (000)			ANNUAL GROWTH RATE (%)		
	DKI JAKARTA	JAWA BARAT	INDONESIA	DKI JAKARTA	JAWA BARAT	INDONESIA
1961	2,974	17,614	97,085			
1971	4,579	21,624	119,208	4.46	2.09	2.10
1980	6,503	27,454	147,490	3.93	2.66	2.32
1990	8,259	35,384	179,379	2.42	2.57	1.98

Source : BIRO PUSAT STATISTIC JAKARTA; Welfare indicaters 1994

Table-131.2 HOUSEHOLD

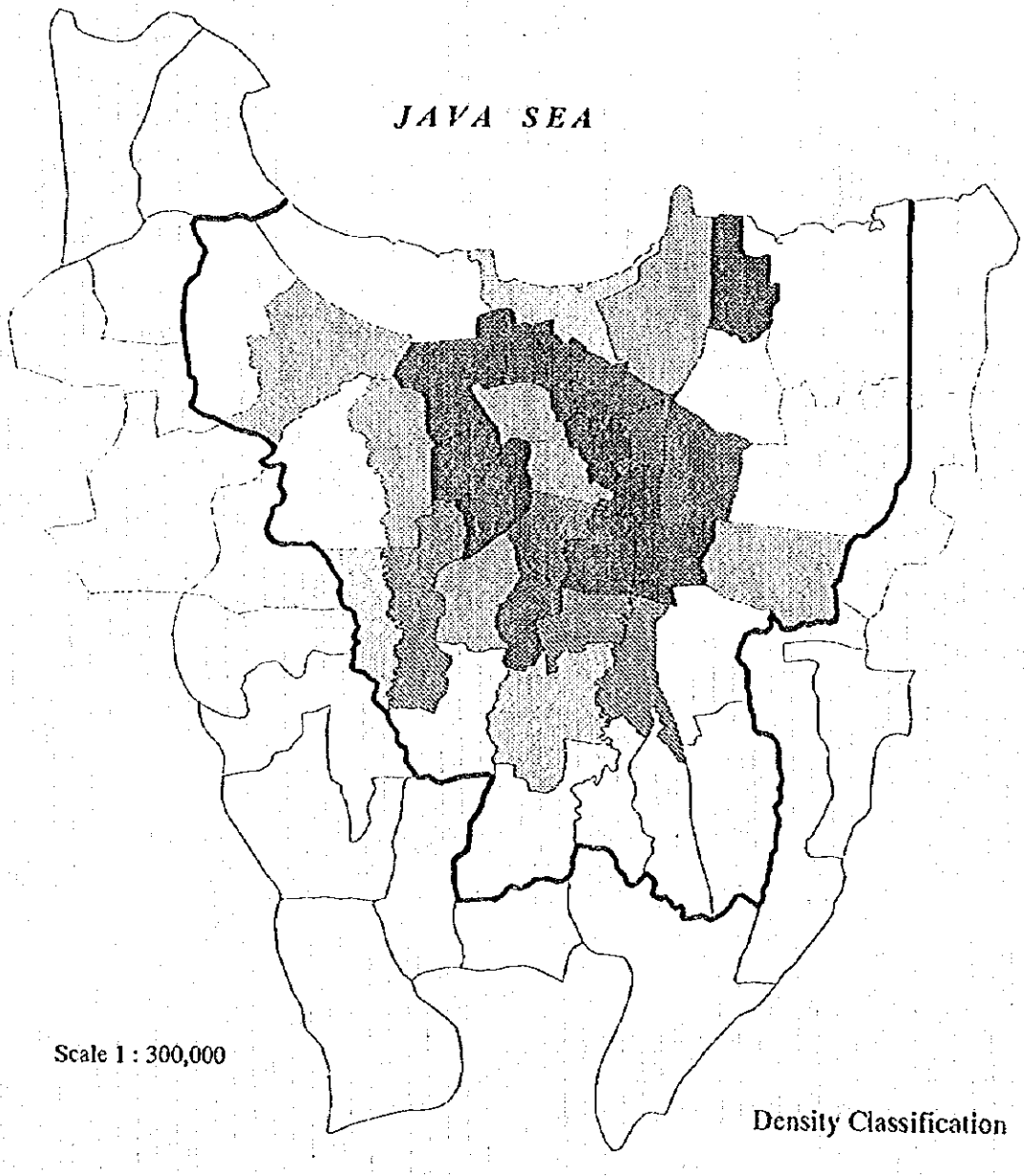
YEAR	HOUSEHOLD (000)			AVERAGE HOUSEHOLD SIZE		
	DKI JAKARTA	JAWA BARAT	INDONESIA	DKI JAKARTA	JAWA BARAT	INDONESIA
1980	1,164	6,101	30,372	5.6	4.5	4.9
1990	1,740	8,180	39,695	4.7	4.3	4.5

Source : BIRO PUSAT STATISTIC JAKARTA; Statistical Yearbook of Indonesia 1994
Note : Excluding persons with no pennanent residence

Table-131.3 POPULATION AND HOUSEHOLD IN BOTABEK AREA(1993)

Area	Area (km^2) a	Household b	Population c	Population Density c/a ($/km^2$)	Average H.H.size c/d
Bogor	3,382	850,626	3,935,455	1,164	4.63
Tangerang	1,044	507,517	2,394,142	2,292	4.72
Bekasi	1,281	481,332	2,177,838	1,696	4.52

Figure-131.1 POPULATION DENSITY IN THE STUDY AREA BY KECAMATAN (YEAR 1990)



1.3.2 Working Population

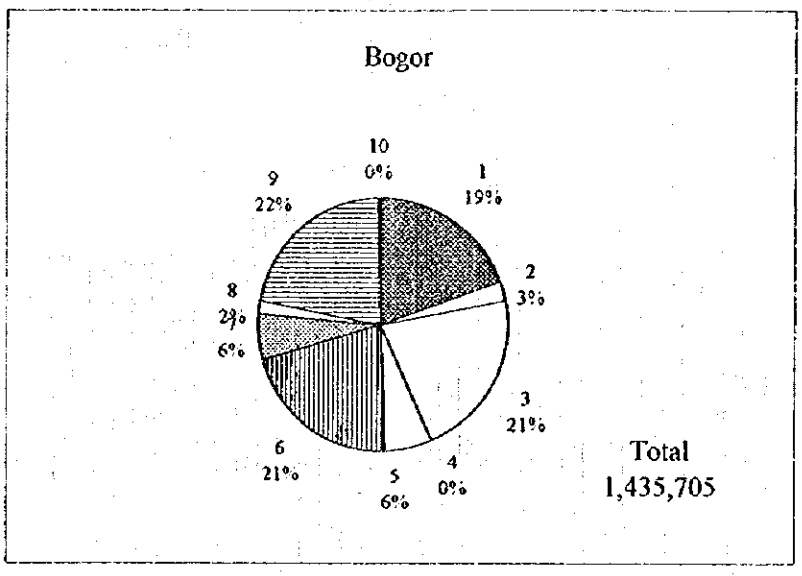
Working population by main sector in the adjacent area in 1993 is summarized in **Table-132.1** and **Figure-132.1**. The portion of agriculture was only 19% in Bogor and this was the largest portion of agriculture among the three Kabupatens. The portions of trade, hotel, restaurant, transportation and other services are large in Botabek area.

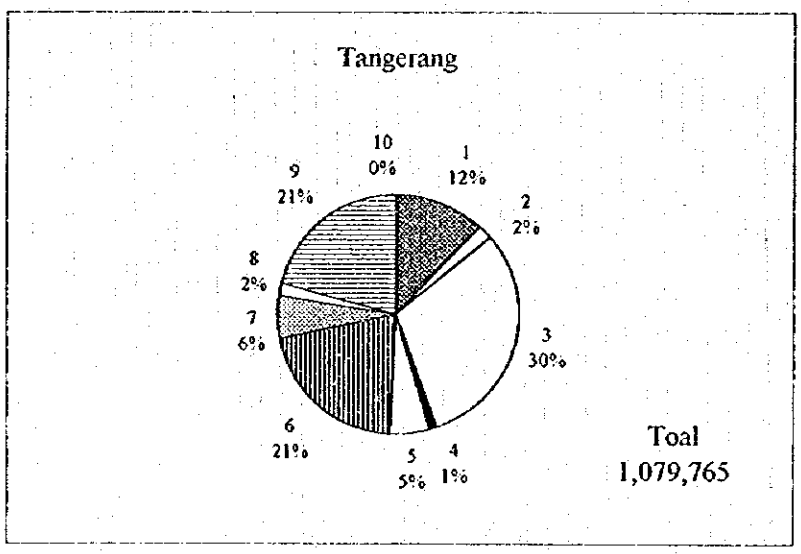
Table-132.1 WORKING POPULATION BY MAIN ECONOMIC SECTOR (1993)

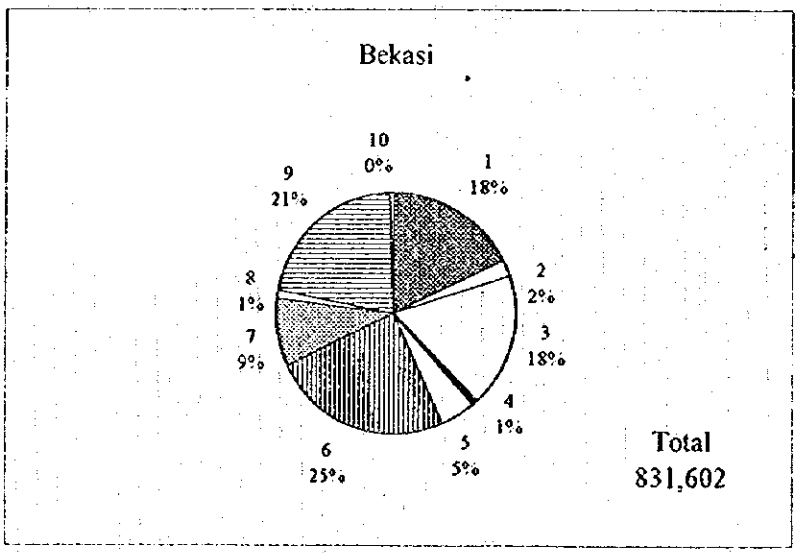
	Bogor	Tangerang	Bekasi
Agriculture	278,052	129,970	148,490
Mining and quarrying	37,074	19,867	17,372
Industry	305,183	331,210	149,402
Electricity, gas, water supply	3,018	9,952	6,392
Construction	85,570	58,773	38,046
Trade, hotel and restaurant	302,346	223,130	204,638
Transport	85,843	63,616	75,726
Financial intermedias(Bank etc)	24,718	17,427	9,542
Services	311,066	224,393	178,018
Others	2,835	1,427	3,976
Total	1,435,705	1,079,765	831,602

Source : JAWA BARAT DALAM ANGKA 1993

Figure-132.1 WORKING POPULATION BY MAIN ECONOMIC SECTOR (1993)







1. Agriculture
2. Mining and quarrying
3. Industry
4. Electricity, gas and water supply
5. Construction
6. Trade, hotel and restaurant
7. Transport
8. Bank and other financial inter-mediaries
9. Services
10. Others

1.4 LAND USE AND ROAD

1.4.1 Land Use

Present land use map in JABOTABEK area is shown on **Figure-141.1.** Land use planning map for the same area is shown on **Figure-141.2.** These land use maps are prepared under "The Study on Comprehensive River Water Management Plan in JABOTABEK, JICA, 1995."

(1) D.K.I. Jakarta

The area of D.K.I. Jakarta has approximately 662 km^2 which functions as the political and commercial center of Indonesia. Among industrial districts in D.K.I. Jakarta is Tanjung Priok Port area where the ship building industry is prosperous.

(2) Bogor

There are two irrigation systems in Bogor. They are located in Empang and Katulampa; Their total servicing area measures approximately 9,700 ha. An alluvial fan is formed by Cisdane, Ciliwung and Bekasi rivers; Land on this area is arable; Main crops in this region are vegetables. Bogor City is the main market of agricultural products in the region. The area is known for its comfortable climates and resorts whose historical sites are frequented by tourists. Cibinong City, the capital of Kabupaten Bogor has experienced the rapid urbanization and become the center of the cement and mining industry.

(3) Tangerang

Approximately 43,000 ha of land in Tangerang were irrigated by canals. Those locations are Prosida-Cisdane, Cidurian-Rancasumur, and Cincinta. Areas along highways, national roads and railway routes have been urbanized and industrialized. In Serpong, approximately 6,000 ha of area is amid development for housing, tourism and industrial purposes. There are fish

ponds in Keronjo, Manuk, Sepatan and Teluk Naga where tiger shrimps for export are cultivated in the total area of 4,000 ha approximately.

(4) Bekasi

The Prosijat irrigation area in Bekasi measures approximately 60,000 ha. The supply source of irrigation water is the Juanda dam constructed in the Citarum River through the West Tarum Canal whose length is approximately 50km. Areas along the highway, national roads and railway routes have been already urbanized and industrialized. Constructions of fish ponds are found along the coastal line in which tiger shrimps and milk fish for export are mainly produced.

Land use in the adjacent area, data of which are obtained from BIRO PUSAT STATISTIK (BSP : Central Bureau of Statistics), are shown in **Table-141.1** and **Figure-141.3.**

Table-141.1 LAND USE IN THE ADJACENT AREA(1993)

(Unit : ha)

	Irrigation	House Compound	Dry Field	Pond/ Swamps	Temporary Fallow land	Private Woods	Estate
Bogor	52,185	50,196	72,936	1,327	1,986	36,863	36,000
Tangerang	30,234	34,616	29,571	4,608	1,086	935	790
Bekasi	59,921	31,709	21,737	7,181	663	1,357	4

Source : JAWA BARAT DALAM ANGKA 1993

Figure-141.3 LANDUSE IN THE ADJACENT AREA (1993)
Lnad Utilization in 1993 (ha)

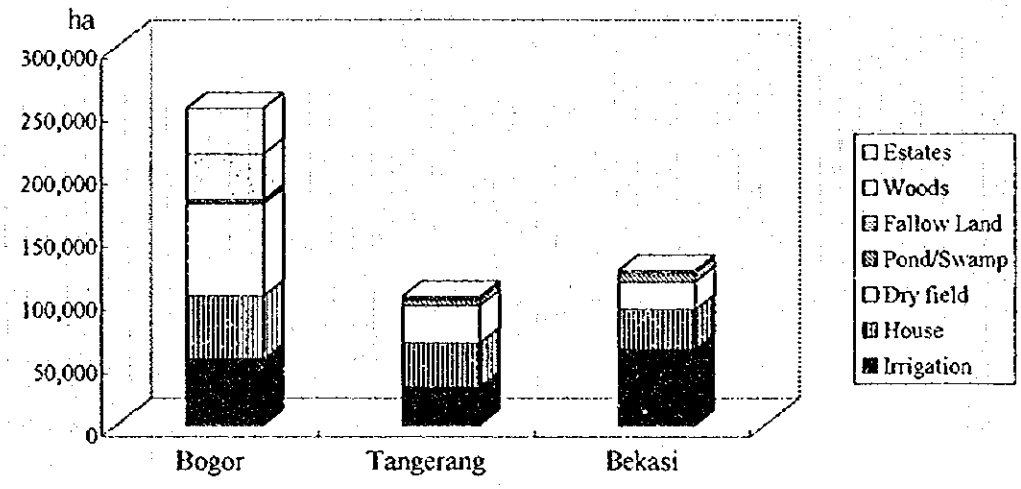


Figure-141.1

PRESENT LAND USE MAP

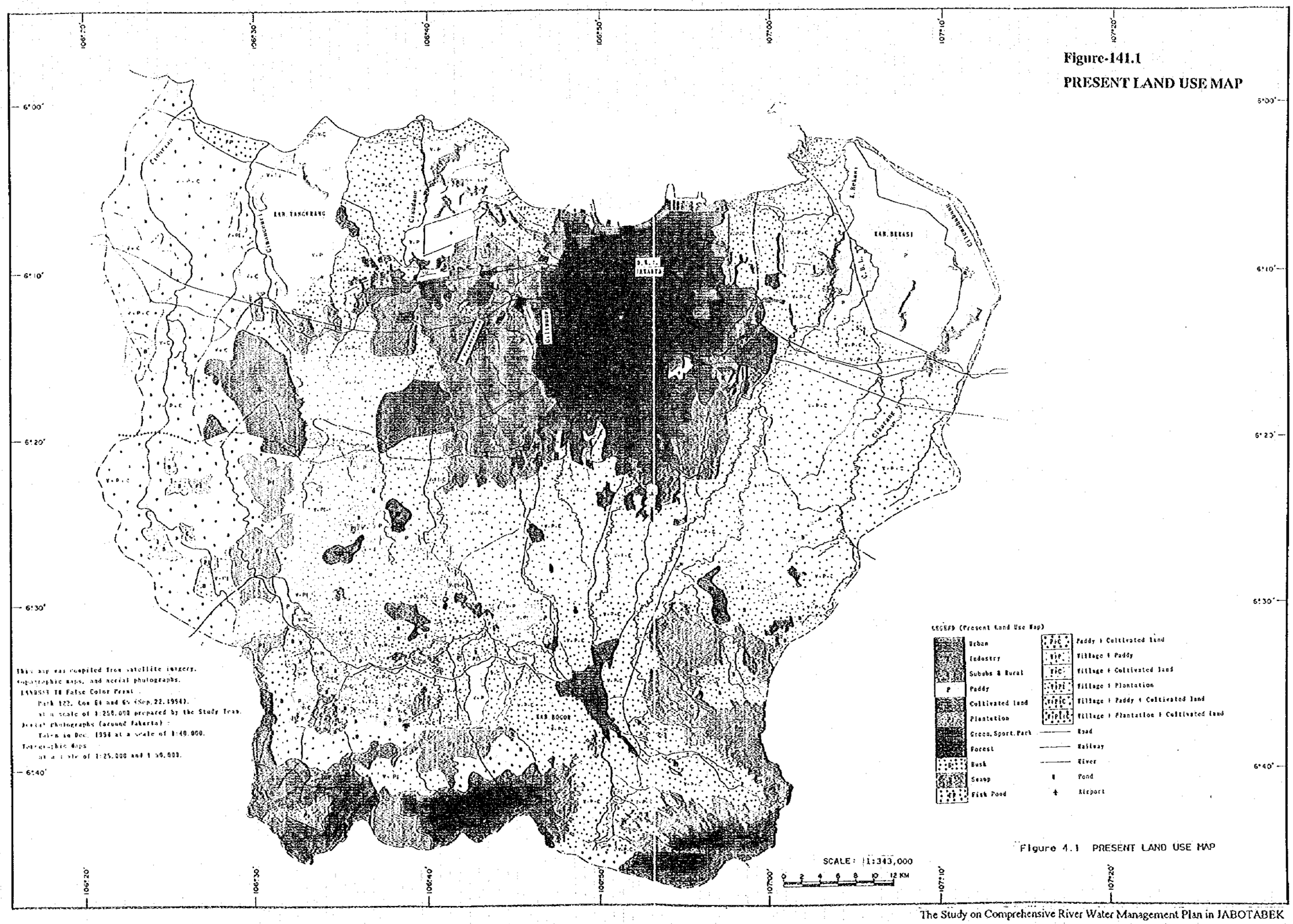


Figure 4.1 PRESENT LAND USE MAP

Figure-[illegible]

PRESENT LAND USE MAP

Figure-141.2

LAND USE PLANNING MAP

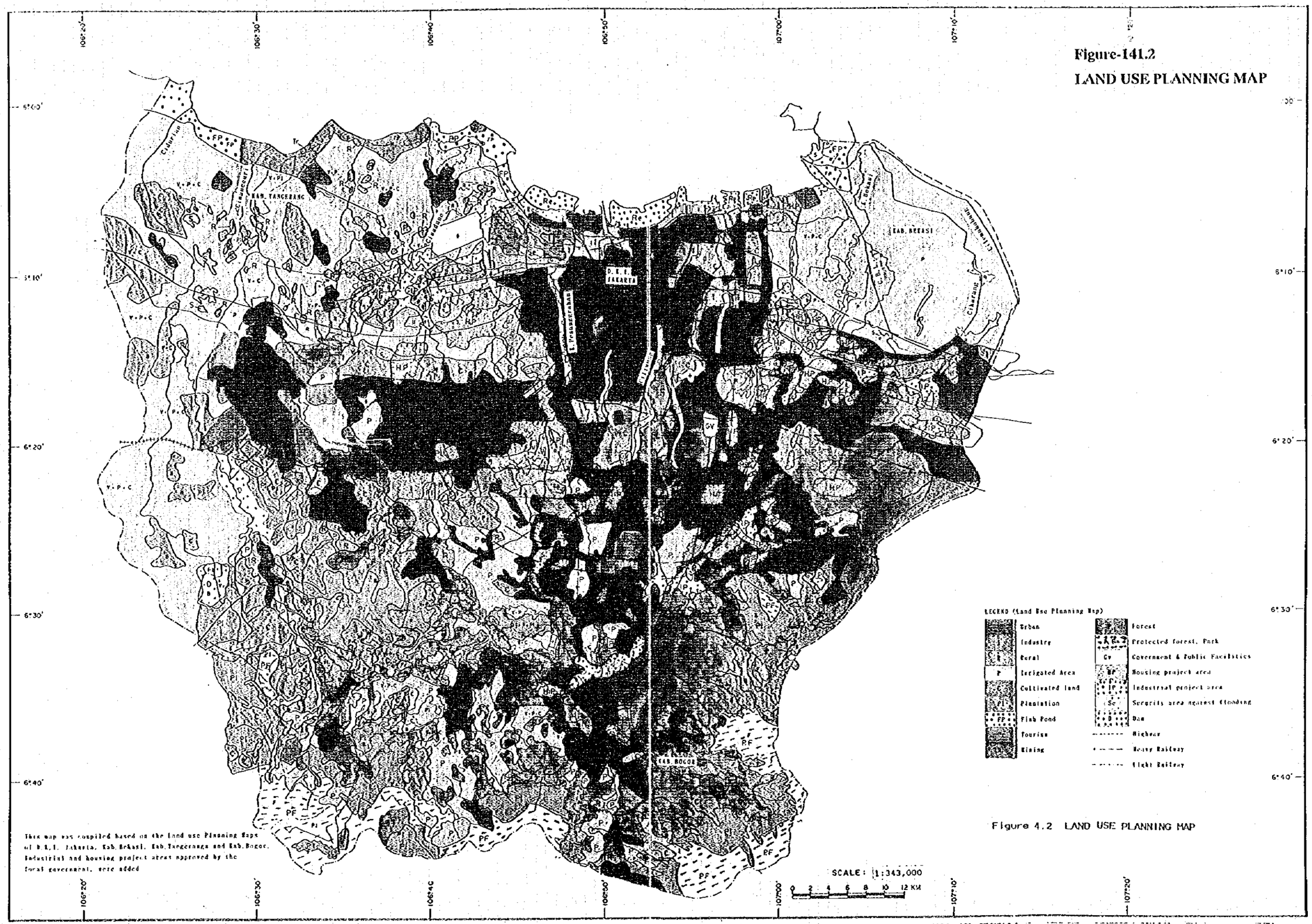


Figure 4.2 LAND USE PLANNING MAP

Figure-4.1.2

LAND USE PLANNING MAP

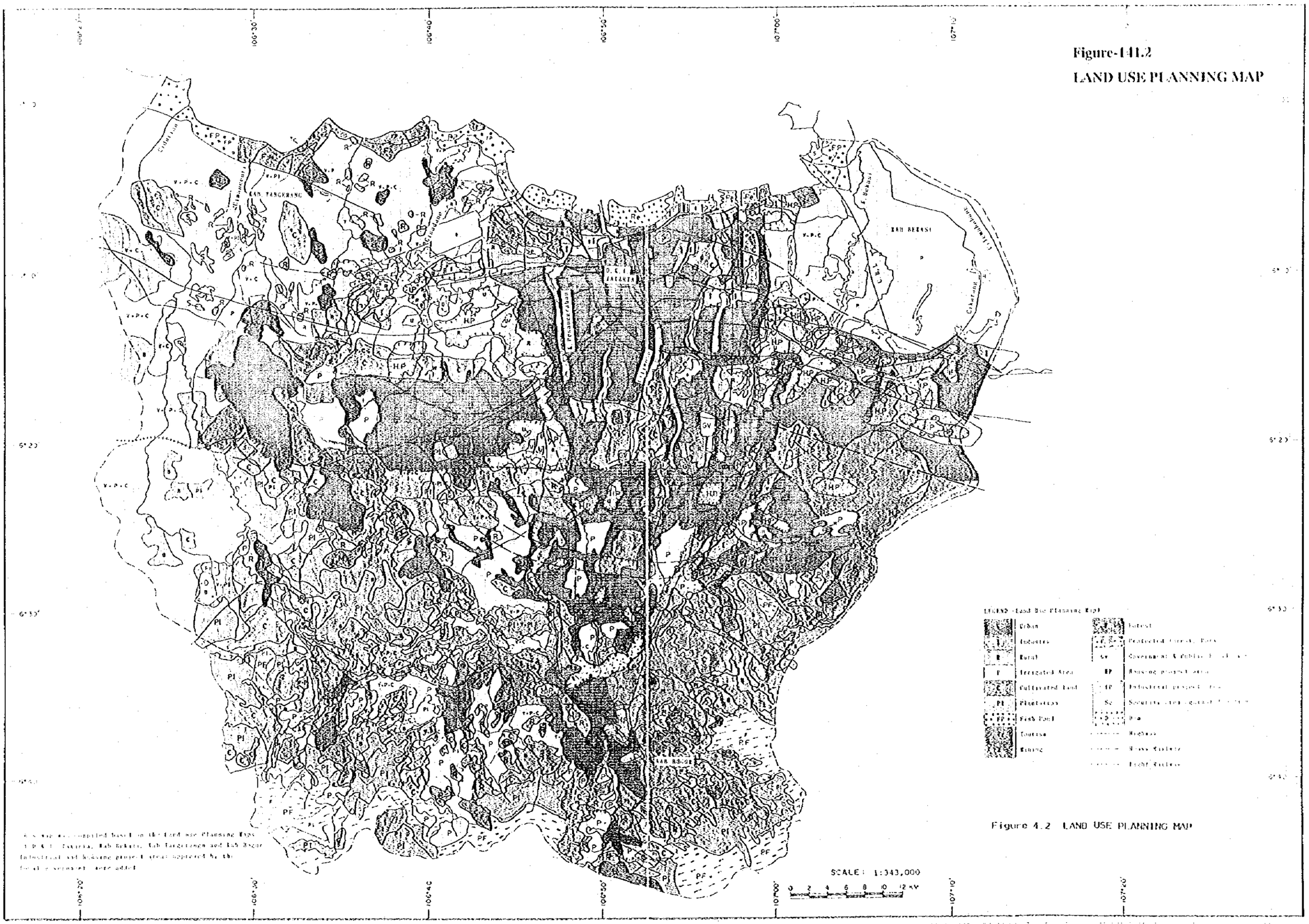


Figure 4.2 LAND USE PLANNING MAP

1.4.2 Road

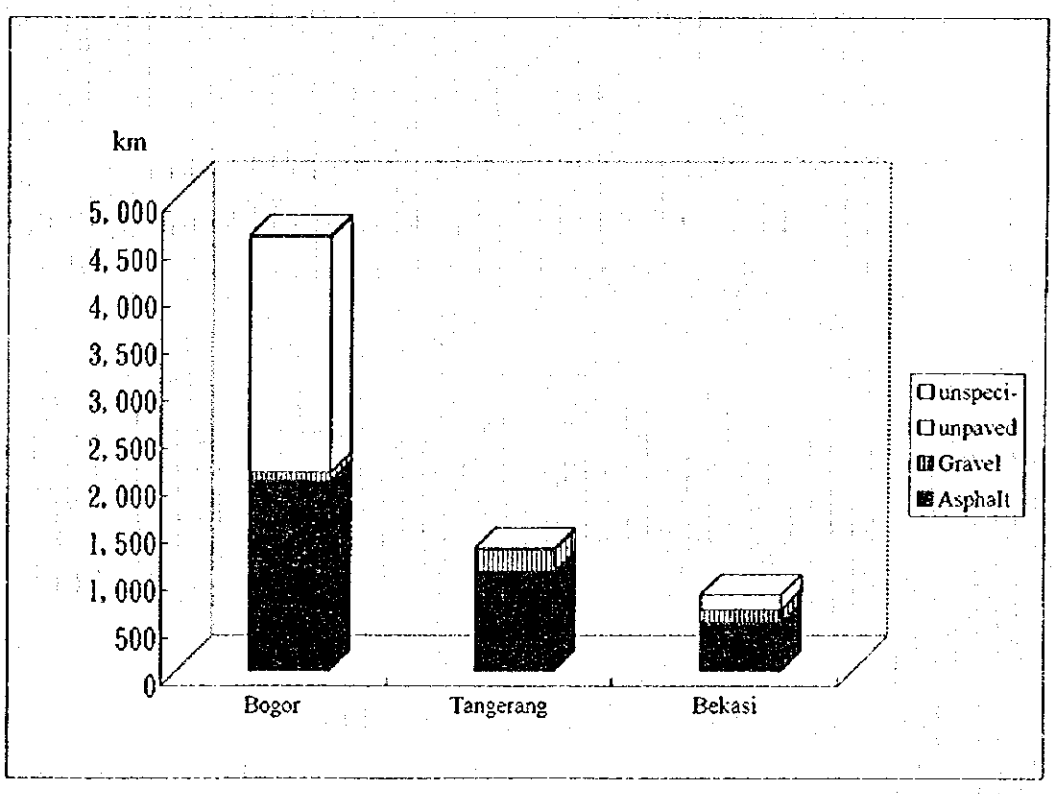
Length of road is presented in **Table-142.1** and **Figure-142.1.** Bogor has longer road than the other Botabek areas although more than half of road has not been paved. Bekasi has less road in unit area than the other Botabek areas. The road condition in Tangerang is better than the other fringe area as far as the paved road length is concerned.

Table-142.1 ROAD LENGTH BY ITS TYPE (1993)

Area	Asphalt (km)	Gravel (km)	unpaved (km)	unspeci-fied (km)	Total (km)	Unit length (km/km2)
Bogor	2,005	87	2,484	25	4,601	1.36
Tangerang	1,054	220	23		1,297	1.24
Bekasi	509	137	156		802	0.62

Source : JAWA BARAT DALAM ANGKA 1993

Figure-142.1 ROAD LENGTH BY ITS TYPE (1993)



1.5 DEVELOPMENT PLANS AND POLICIES

National and regional development plans are introduced in this section. Their general policy and policy on water supply sector are also described hereunder.

1.5.1 National Development Plan

(1) General Policy

National Development is implemented in stages of 25 year long term plan (Pembangunan Jangka Panjang, PJP) and 5 year medium term plan (Repelita). The 'Second 25 Year Long Term Development Plan' (PJP II) started from 1994 and its target year is 2019. The current '5 Year Development Plan' (Repelita VI) is defined as the first 5 year of PJP II which starts from 1994 and target year is 1999. The main point of this long term plan is economic sector development as the important activator of overall development. Conforming to the policy of the long term plan, the highest priority of Repelita VI is given to sectors development in economic situation in relation among industry, agriculture and other fields, and priority is given also to the improvement of human resources quality.

The general policy of Repelita VI is the autonomy growth of Indonesian society through the increase of involvement of society, efficiency and productivity to upgrade the standard of living, intelligence and prosperity. The development policy is to encourage and to guide the efforts for even allocation of development, high economic growth, expansion of opportunities for employment and development of retarded area in order to achieve the prosperity and autonomy growth.

(2) Policy on Water Supply Sector

Water supply sector is part of the targets determined in irrigation sector and also a part of residence environmental sanitation program of housing and residence development sector. One of the target of irrigation sector is to supply enough raw water for the community with safe quality for human health. By the end of Repelita VI period, year 1999, the target of raw water

supply is 210 m3/sec to fulfill the requirement of 72 % of the total community in all over the country.

In housing and residence development sector, the aim is to have the even fulfillment of requirement on infrastructure and housing means with the feasible and achievable quality and service especially for low income society. The policy on water supply service development are explained in the following.

1) Urban area

Urban area is defined as the region of which the population density is relatively high with non agricultural as the main activity and total population is more than 20,000. Urban area is also defined as an administrative unit with its own government organization such as first level of regional government (Dati I), second level of regional government (Dati II), administrative municipality (kotamadya) or sub-district city (kota kecamatan).

The policy on water supply service development in urban area are as follows:

- to increase the piped water supply system through reduction of leakage until the level of 35 - 25 % for metropolitan and big cities, and 35 - 30 % for medium and small cities
- to increase and expand the clean water supply facilities to fulfill the basic requirement and support the economic growth through piped or non piped water supply systems
- to increase the production capacity and expansion of new distribution system of 30,000 l/sec to serve 22 million people
- to increase the efficiency of management and exertion of PDAM
- to develop the private sector involvement in water supply services and management

2) Rural area

Rural area is defined as the region of which the population density is not so high with agriculture as the main activity. The organization of rural area is directly under the responsibility of sub-district local government. The policies on water supply development in rural area are as follows:

- to increase the number of water treatment facilities and optimize the existing plants at 22,000 villages

- to develop piped water supply system
- to develop the appropriate technology of water usage to increase the efficiency of clean water supply system
- to encourage self support of the community in clean water supply services and management
- to encourage elucidation of the importance of clean water supply for health condition

(3) Criteria of Water Supply Sector

The housing and residence development of Repelita VI shall be a guidance for annual planning of each department.

Some criteria of water supply and management were defined by Directorate General of Human Settlement as the understanding of strategies described in Repelita VI.

1) Urban area
   - to install the tertiary pipe network and house connection of 20,000 connection per year for metropolitan and big cities, and 6,000 connection per year for medium and small cities
   - to operate the treatment plants 24 hours a day
   - to maintain 5 meter water head at the house connection
   - to follow the urban development plan of the area with broad impact to the national development
   - to use new water resources or the existing resources which technically affordable
   - to have water consumption of 190 l/cap/day for metropolitan and big cities, and 150 l/cap/day per connection for medium and small cities with 7 persons per house connection

2) Rural area
   - to use individual system with low operation and maintenance cost and appropriate technology
   - to use communal system which can be operated and maintained by the community, with the capacity to serve 5 - 10 houses, simple and low pressure of piping system distributed to public tap

- to have water consumption of 30 l/cap/day with 100 persons per public tap

1.5.2 Regional Development Plan

According to the regulation issued by Ministry of Home Affairs, No.-Bangda 1/9/26 dated 20 November 1978, about Guidelines for Preparation of Regional Development Plan mentioned that Regional Development Plan should be based on:

- General framework of long term development plan
- General framework of 5 year development plan

The general framework of long term development plan covers:

- General policy of sector development
- Spatial policy to encourage sector development at certain area for regional benefit

This spatial policy is the basis for preparation of a more detailed structure plan, thus the General Structure Plan of DKI Jakarta year 1985-2005, so called "Jakarta 2005", is part of regional development in physical aspect. One of the target of 'Jakarta 2005' is to achieve a balance of physical environment and development integrity with Bogor, Tangerang, Bekasi (BOTABEK) and other region.

(1) Jabotabek

DKI Jakarta and the adjacent area i.e. Kabupaten Bogor, Tangerang and Bekasi are one unity of growth area of which it is called as Jabotabek metropolitan area. In order to have a harmonious relationship between DKI Jakarta and Botabek area, good coordination is to be increased in development implementation. Therefore, DKI Jakarta will increase the management capability of the apparatus and increase the coordination among institution and region.

1) General Policy

The outline of Jabotabek development policies as determined in Presidential Instruction No. 13 of 1976 are summarized as follows:

- to accelerate the economic growth in Botabek area
- to encourage the new growth center in Botabek by development of infrastructure and social facilities to stimulate the development of industry, trade and services
- to preserve the natural resources, particularly clean water resources to fulfill water demand at urban area and agriculture
- to accelerate the improvement of education and health services in rural area
- to improve the agricultural system and accelerate the provision of non agricultural job opportunities in order to increase the household income in rural area to reduce the migration flow to Jakarta
- to increase the management and financial capability in Botabek area
- to provide balance transport services in all region

2) Policy on Water Supply Sector

Water supply is one of the main component with strongest influence on implementation of Jabotabek Metropolitan Development Plan Review (JMDPR) strategy. The need of water supply by the year 2010 is estimated nearly 3.75 million m3/day to serve population of 30 million based on basic per capita consumption of 125 l/cap/day. Policy consideration of water supply recommended that piped water supply should be given a priority in areas where is threatened by population growth, affected by seasonal water shortage and where requires high demand for piped sources by domestic and industrial use. Key aspects of water supply program to increase the number of connections are to coordinate connections with alternative supplies, to optimize connection levels, to reduce water losses, and to improve management and cost recovery.

Some strategies studied by JMDPR for water supply management are as follows:

- to provide piped water to areas where a) population is greater than 50 persons/ha, b) there is some essential activity for public benefit, c) there is no alternative to meet government's obligation to provide water, d) there will be full cost recovery
- if new treatment plant is required, it should be located near the source to maximize the opportunity of clean water supply immediately down stream and to provide employment in more remote areas
- to have 2,440,585 new service connections (as guide) for the year 2010 in Jabotabek area

- to deliver piped potable water to the northern area urgently and to areas with densities greater than 150 persons/ha in order to reduce the use of groundwater

(2) **DKI Jakarta**

1) General Policy

The policies of structural development plan as mentioned in 'Jakarta 2005' are as follows:

- to increase the prosperity of DKI Jakarta society
- to motivate the growth of development in various sectors
- to encourage the sustainable urban livelihood
- to create healthy and peaceful residence environment with facilities
- to give opportunity for culture development and productive work opportunities without disturbing ecological environment and environmental balance of the surrounding areas

DKI Jakarta is divided into 9 development zones based on socio-economic condition and administrative boundary of kecamatan and kelurahan i.e. North West, North, Tanjung Priok, North East, West, Central, East, South and Thousand Islands.

Based on the above policies development plan of year 2005 as described in 'Jakarta 2005'are:

- to encourage main development to the West and East Development Zones
- to postpone and restrain the development to North West and East West Development Zones
- to limit and control strictly the growth at South Development Zone

2) Policy on Water Supply Sector

Target of water supply development is to increase the piped water supply for house hold and other socio-economic activities, to decrease the groundwater extraction and to have the even distribution and affordable water supply system. The projected demand of water supply at DKI Jakarta in 2005 is 31.5 m3/sec with average per capita consumption of 150 - 200 l/cap/day.

The main policies of drinking water development are as follows:

- to supply and improve raw water quality for the existing treatment plant
- to implement immediately the development of treatment plant capacity and distribution network
- to give priority to the area with high density and poor groundwater quality
- to accelerate the implementation of the second West Tarum Canal and widening the existing West Tarum Canal.
- to improve the coordination among institutions in order to protect raw water quality
- to rehabilitate the existing pipeline network in order to reduce the leakages

The implementation policies on water supply facility are to have the cross subsidy between the high and low income level such as increase the water connection fee for commercial use, and to increase the management capacity of PAM JAYA.

1.6 WATER FRONT CITY

The local government of Jakarta seeks a proper development strategy to accommodate the development of coastal area by establishing a development plan for the effective management of the area.

1.6.1 Strategy of Water Front City Development

The development plan is called "Water Front City" and the area of the Water Front City (WFC) consists of existing north coastal area and new reclamation area. For affective planning, the WFC area has been divided into three principal sub-areas namely Western Area, Central Area, and Eastern Port Area. General view of the WFC is shown on **Figure-161.1**.

The Western Area is proposed to continue developing as primarily a residential area. The Central Area is envisaged as mixed use area, with the development of a new high density, high rise water front city, associated with the heritage conservation areas of Kota and Sunda Kelapa. The Eastern Port Area comprises Tanjung Priok and its expansion areas. Adjacent to this, the

draft developments strategy plan proposes a support district of offices, showrooms, and other services.

The strategy plan recommends the extension of the proposed rail systems into the WFC business district. The successful implementation of the strategy will require an extension of the north-south mass transit systems so as to serve the proposed new WFC business district.

The strategy embraces engineering principles which involve improving the efficiency of existing drainage/river/canal systems; minimizing the additional length of drainage paths to the sea; maximizing opportunities to improve existing water quality; achieving good water quality for run off/groundwater for new development and designing new development areas which will accommodate the natural environment-waves, ocean water levels, subsidence and earthquake risk.

Development options for a sewerage for the area are examined, based on the options of the Kamal Muara or Pluit Pond locations for the sewerage treatment plant. The choice of option will influence the use of outfalls for ocean discharge.

1.6.2 Population and Area of Water Front City

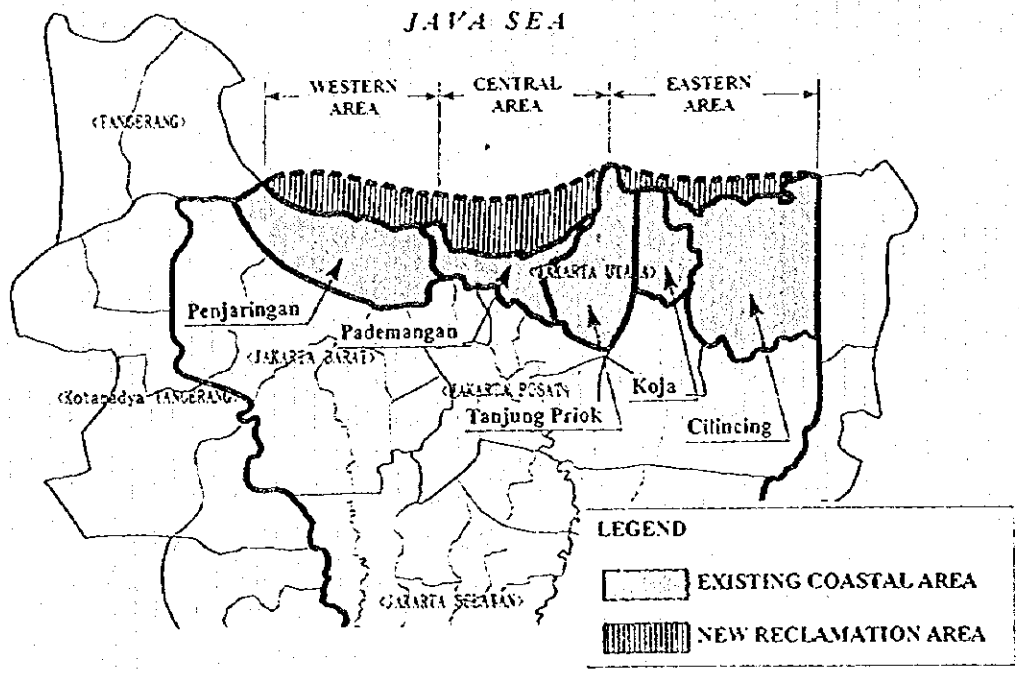
Kecamatans included in the existing north coastal area are Penjaringan, Pademangan, Tanjung Priok, Koja, and Cilincing. Population forecast in year 2005 and area of WFC planned by DKI Jakarta are shown on **Table-162.1**.

Table-162.1 POPULATION AND AREA OF WATER FRONT CITY IN 2005

	UNIT	WESTERN AREA	CENTRAL AREA	EASTERN AREA	TOTAL
Existing Coastal Area					
Area	ha	3,549	2,944	6,116	12,609
Population	capita	287,010	539,650	643,540	1,450,200
Population Density	capita/ha	75	183	105	115
New Reclamation Area					
Area	ha	1,000	1,700	1,100	3,800
Population	capita	350,000	400,000	0	750,000
Population Density	capita/ha	350	235	0	197
Total WFC Area					
Area	ha	4,549	4,644	7,216	16,409
Population	capita	617,010	939,650	643,540	2,200,200
Population Density	capita/ha	136	202	85	194

Source : Buku Rencana, Pengembangan Kawasan Pantai Utara Jakarta, DKI Jakarta

Figure-161.1 GENERAL VIEW OF WATER FRONT CITY



1.7 THE SOCIAL WEAK

1.7.1 Definition of the Social Weak (Depressed Kelurahan)

One of important part of the Study is to considerate the social weak. Of the 418 total kelurahan (village) in the Study Area, there are 22 kelurahan defined as Kelurahan Kumuh (depressed village) area based on the National criteria, according to the 1994 report of the Biro Pusat Statistik (BPS, Central Statistic Office). The list and location of these Kelurahan are shown in **Annex-17.**

On the other hand, DKI Jakarta also defines depressed Rukun Warga (RW, communities) based on the City's criteria in the year of 1993. The DKI Jakarta has its own criteria because the living cost in the city area especially in DKI Jakarta is higher than in the rural area. In this case, Badan Perencanaan Pembangunan Daerah (Regional Development Planning Office, DKI Jakarta) cooperate with BPS to identify them. The LGUs came up with their lists of depressed kelurahan with 3 categories by level based on the following criteria:

1) high population dense area

2) condition of houses and disposition of land

3) lack of suitable living conditions and or basic infrastructures, as roads, ventilation, housing dense, drainage and so on

4) communities without source of safe water, lack of toilets facilities, solid waste management, etc.

Based on these items, it was finally identified the area with high incidence of low income families vis-à-vis the high cost of commodities especially for food and fuel. The percentage of depressed land area and percentage of the depressed population by kelurahan level are shown in **Annex-17.**

The number and area of kelurahan with depressed condition were estimated as 212 kelurahan, with area of 2,948 ha and 941,682 persons as population. These numbers are equivalent to 4.46% of area and 12.73% of population of DKI Jakarta, moreover these area are densely populated than the average.

From view point of water supply condition, the Study Team also categorized depressed kelurahan into 3 types shown bellow:

1) Island areas

Depressed communities in island area are inhabited by poor families who subsist on fishing. And usually these area are lack of basic infrastructures such as transportation, education and sanitary facilities, where means their living environmental condition is not suitable.

In the Study Area, these communities could be found in the Pulau Seribu (Thousand Islands), Northern part of DKI Jakarta.

2) Inland areas where ground water is available

This category constitute by low income people mostly habitat in Southern up to Middle part of DKI Jakarta and also along the river sides. These communities commonly using groundwater for drinking purpose, even communities living in river sides, because river water quality in DKI Jakarta is not suitable to be used for drinking purpose. They still using river water for bathing and washing purpose, because of limited quantity of groundwater.

Same as Island area, in this area also usually lack of sewerage and drainage facilities. Sanitary environment is very poor because there are many illegal garbage dumping site, and domestic wastewater is discharged to river and/or side ditch. Also in rainy season flood disaster have been frequently occurred.

3) Inland areas where ground water is not available

Communities could be found in the North part of DKI Jakarta with same characteristics as inland area mentioned above, however, these communities are more difficult to find safe drinking water, because groundwater contains high salinity or it is contaminated.

These communities are usually using water from the venders came from nearest public water supply or direct from water station, it means water cost is much

expensive comparing to the other area.

1.7.2 Present Condition of the Depressed Kelurahan

(1) Present economic condition

The major economic activities of Island communities are fishery, with average daily income Rp.10,000 ~ Rp.20,000 per house hold, but in rainy season, it will be down to Rp.5,000 ~ Rp.10,000.

Average daily income of Inland communities are difficult to be estimated, because of differences on economic activities. But actually the major economic activities are labors such as a bus or taxi driver, construction labor, stall vender and so on. And roughly average daily income can be estimated around Rp.7,000 ~ Rp.24,000, depend on the labor demand and/or daily sales.

The expenditures was estimated same as income amount, because commonly they have no savings. In emergency cases such as medical fee, usually they loan or borrow from neighborhoods or their employer.

(2) Present living condition

The living condition in Island area is worse than Inland area. The significant problems are lack of basic infrastructures, such as transportation, solid waste, sewerage, and water supply. The most priority will be given to water supply development, because it was basic human needs which can not be improved only by themselves.

In Inland area, there are lack of sanitary infrastructure, such as drainage, sewerage and also water supply. Because of economic problem, usually improvement of living condition was done by community itself to save the expenses, even for personal residential problem. But for water supply, they can not take an action without specialist and/or government cooperation.

For analysis of communities living environment, sanitary environment especially on water supply development will be necessary to be implemented by related government or public agencies. And careful attention should be paid on operation and maintenance which should be balance with their economic and education level.

1.7.3 Present Condition of Water Supply in the Depressed Kelurahan

(1) Present Water Resources

In Island area, commonly they use shallow well even contains high salinity, but for drinking purpose, people use rain water or buying water from Jawa main island, which costs more than four times of Inland area including transportation fee.

Communities in Inland area where groundwater is available, they use personal or public shallow well. But according to the result of survey and estimation done by DKI Jakarta, the groundwater will not be available for drinking purpose in the near future. And also water quality of wells in river side can be seems that already affected by contaminated river water and solid waste illegally dumped.

In Inland area where groundwater is not available, the communities are using water bought from water vender for all purpose, although the prices depend on the season and water demand.

(2) Problems of Water Supply Distribution

The common problem of water supply distribution in depressed kelurahan by area are explained below;

Island area
Water supply by piped system to these area will be necessary to installed under sea water transmission pipeline, but must not be feasible and almost impossible because significant impact for sea ecosystems (corals, etc.) is foreseen and huge investment

will be required

Inland area where groundwater is available
In recent years, the communities are not necessary to connect to PAM Jaya water supply, because groundwater is still available and its free. But, from view point of geology, there are many problem will be rised up in near future because excessive groundwater abstraction will cause groundwater decrease and land subside which already become serious problem in the Northern part of DKI Jakarta.

Inland area where groundwater is not available
Actually the problem is not on the communities side, but on the PAM Jaya as a water supplier. Almost all of communities want to become PAM Jaya customer, because the water tariff of PAM Jaya will be cheaper than water from vender even though included administration fee and miscellaneous costs.

The problem is no water pressure at the end of distribution pipeline, especially for the area far back from main distribution line such as (depressed) kampung area.

1.7.4 Current Strategy of PAM JAYA for Depressed Kelurahan as a Socio-economic Poverty

At present, PAM JAYA has no special correspondence strategy for the social poverty.
But on the other hand, there are private company which planning to distribute drinking water to Kepulauan Seribu, including Island area and resort area.

For depressed area in Inland, water supply condition will be improved year by year. According to the future plan proposed in the Master Plan and Feasibility Study, future service area will be expanded and PAM Jaya service area will cover whole DKI Jakarta by the year of 2010.

Especially for the Northern part of DKI Jakarta where people can not depend on groundwater because of high salinity, condition of access to the drinking water will be also improved by distribution network improvement and expansion of water treatment plant capacity after water resources was developed.