

**RECONNAISSANCE STUDY OF
THE INSTITUTIONAL REVITALIZATION PROJECT
FOR MANAGEMENT OF
FLOOD, EROSION AND INNER WATER CONTROL
IN JABOTABEK WATERSHED**

**FINAL REPORT
SUMMARY**

JANUARY 2006

**JAPAN INTERNATIONAL COOPERATION AGENCY
YACHIYO ENGINEERING CO., LTD**

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Abbreviations

BMG	: Meteorological and Geo-physical Agency (Badan Meteorologi dan Geofisika)
CILCIS	: Ciliwung-Cisadane River Basin Development Project (Proyec Pengembangan Wilayah Sungai Ciliwung-Cisadane)
Cipta Karya	: Director General of Housing, Planning and Urban Development,
DGWR	: Director General of Water Resources
DKI Jakarta	: Special State Capital of Jakarta (Daerah Khusus Ibukota Jakarta)
DPU	: Public Works Department of DKI Jakarta (Dinas Pekerjaan Umum)
EBC	: Eastern Banjir Canal
JABOTABEK	: Jakarta, Bogor, Tangerang and Bekasi
JABODETABEK:	Jakarta, Bogor, Depok, Tangerang and Bekasi
JBIC	: Japan Bank for International Cooperation
JICA	: Japan International Cooperation Agency
KIMPRASWIL	: Ministry of Settlement and Regional Infrastructure (Permukiman dan Prasarana Wilayah)
NEDECO	: Netherlands Engineering Consultants
PP	: Low – Low Water (Priok Peil)
PU	: Ministry of Public Works (Departemen Pekerjaan Umum)
WBC	: Western Banjir Canal
1973 Master Plan:	Master Plan for Drainage and Flood Control of Jakarta
1997 Master Plan:	The Study on Comprehensive River Water Management Plan in JABOTABEK
2002 Flood Damage Study	: Urgent Inventory Study on Damage of Flood 2002 in Jabodetabek Area

1. INTRODUCTION

1.1 BACKGROUND

Jakarta, a capital of Indonesia, is located in lowland where rivers easily overflow because of topographical conditions and thus, is suffering from habitual flood damages. In addition, Jakarta has remarkably developed in recent years and becomes easily and seriously damaged due to concentration of population and properties in flood prone areas.

To tackle flooding problems, the Government of Indonesia has formulated a drainage and flood control master plan in 1973 and a flood control master plan for JABOTABEK in 1994. However, tremendous flooding attacked the Jakarta continuously in 1996 and 2002, paralyzing greatly the capital functions. Under these circumstances, the following projects have been implemented since 1997.

Table 1.1 Flood Control and Drainage Study and Project in JABOTABEK

Name of Project	Year Completed	Contents
The Study on Comprehensive River Management Plan in JABOTABEK	1997	Formulation of flood control master plan for JABOTABEK and feasibility study for priority projects
Ciliwung - Cisadane River Flood Control Project	1998	Implementation of river improvement and construction of a new floodway to protect DKI Jakarta
Urgent Inventory Study on Damage of Flood 2002 in JABODETABEK Area in Indonesia	2003	Study on damage and causes of 2002 flood in JABOTABEK

Furthermore, the Government of Indonesia requested the Government of Japan to implement a project-type cooperation, “The Institutional Revitalization Project for Management of Flood, Erosion and Inner Water Control in JABOTABEK Watershed”.

1.2 OBJECTIVES

In connection with the “The Institutional Revitalization Project for Management of Flood, Erosion and Inner Water Control in JABOTABEK Watershed”, JICA dispatched a study team to the Indonesia from September 11 to October 25 2005 to undertake a reconnaissance study for the Project. Objectives of the Study are;

- (1) to collect/arrange existing data and information of the related governmental agencies, their flood mitigation activities and flood damages in the JABOTABEK,
- (2) to implement additional survey/study; and

- (3) to identify problems and issues for institutional revitalization to mitigate flood damages in the JABOTABEK.

In Annex I, member list of the study team for the reconnaissance study, study schedule and interview list are indicated.

1.3 STUDY AREA

The Study Area covers so-called JABOTABEK area, which is composed of DKI Jakarta, regencies and municipalities of Bogor, Depok and Bekasi of the West Java Province and regency and municipality of Tangerang of the Banten Province.

2. PRESENT CONDITIONS

2.1 SOCIO-ECONOMIC CONDITIONS

2.1.1 Administration

Administrative units in Indonesia are as summarized in Figure 2.1. Their names under provinces are different for urban areas and rural areas as indicated.

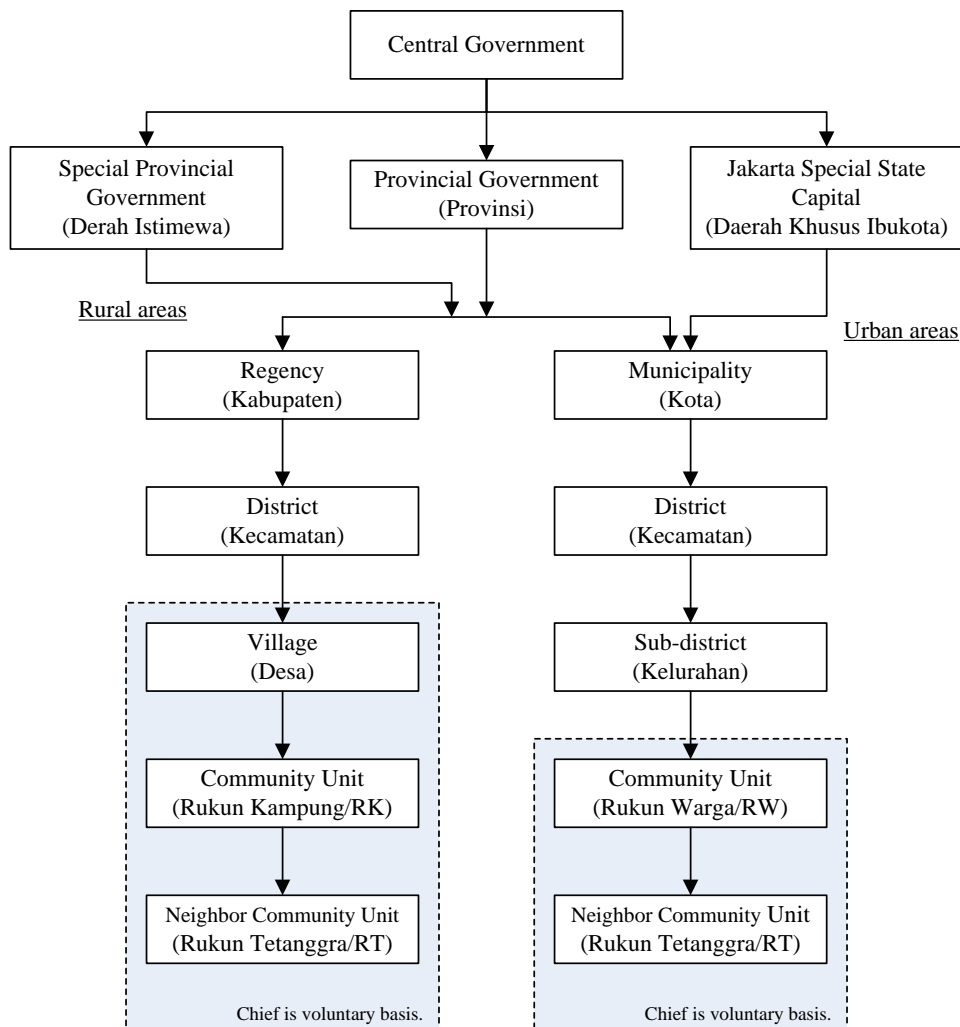


Figure 2.1 Administrative Units in Indonesia

The Study Area is so-called JABOTABEK with area of 6,128.53 km², which is composed of DKI Jakarta, Bogor (municipality and regency), Depok (municipality) and Bekasi (municipality and regency) of the West Java Province and Tangerang (municipality and regency) of the Banten Province as shown in Figure 2.2. DKI Jakarta is composed of one (1) regency of Seribu and five (5) municipalities of South Jakarta, East Jakarta, Central Jakarta, West Jakarta and North Jakarta.

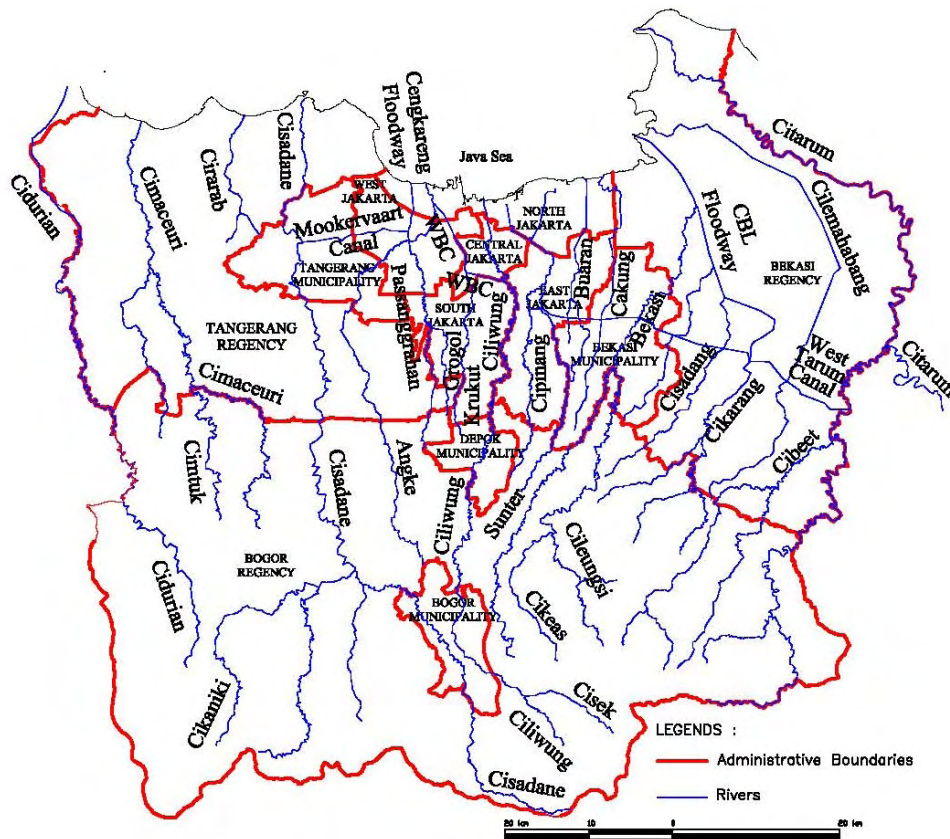


Figure 2.2 Administrative Boundary and Rivers of JABOTABEK

2.1.2 Population and Households

Table 2.1 Population and Households of JABOTABEK in 2003

Province	Municipality/Regency	House-holds	Population	Population Density (persons/km ²)
JABOTABEK		5,306,660	21,441,426	3,499
DKI Jakarta	Seribu Regency	5,189	19,596	1,659
	South Jakarta Municipality	386,584	1,707,093	11,714
	East Jakarta Municipality	561,591	2,103,525	11,204
	Central Jakarta Municipality	217,562	893,195	18,531
	West Jakarta Municipality	450,362	1,565,708	12,411
	North Jakarta Municipality	320,110	1,182,749	8,336
	Sub-total	1,941,398	7,471,866	11,295
West Java	Bogor Municipality	188,533	820,707	6,926
	Bogor Regency	845,800	3,408,810	1,427
	Depok Municipality	302,742	1,335,734	6,669
	Bekasi Municipality	430,070	1,914,316	9,095
	Bekasi Regency	512,792	1,877,414	1,474
	Sub-total	2,279,937	9,356,981	2,232
Banten	Tangerang Municipality	368,858	1,416,842	8,611
	Tangerang Regency	716,467	3,195,737	2,878
	Sub-total	1,085,325	4,612,579	3,618

Source: BP5 Each Municipality & Regency, 2003

2.2 NATURAL CONDITIONS

2.2.1 Climate

Generally, Indonesia including the Java Island has two seasons; a wet season from November to March and a dry season from June to October mainly affected by monsoons. Annual mean rainfall increases with elevation ranging from 1,500 mm at coastal plain to 5.500 mm at mountainous areas.

2.2.2 River Systems

Rivers in JABOTABEK can be generally divided into eight (8) independent river basins shown in Table 2.2 (Refer to Figure 2.2).

Table 2.2 Catchment Area and Length of Rivers of 8 River System

No.	River System	Sub-River System	Catchment Area (km ²)	Channel Length (km)
1	Cidurian	-	803	130
2	Cimanceuri	-	570	102
3	Cirarab	-	161	49
4	Cisadane	-	1,411	138
5	Cengkareng Floodway	5-1 Floodway	459	7.9
		5-2 Mookervaart Canal	67	13
		5-3 Upper Angke River	255	82
		5-4 Pesanggrahan	107	66
		5-5 Grogol River	30	21
6	WBC-Ciliwung River	6-1 WBC (at Krukut R. Confluence)	421	17
		6-2 Ciliwung River (at Manggarai)	337	109
		6-3 Krukut River	84	34
7	EBC System		207	
8	CBL Floodway	8-1 Floodway	915	29
		8-2 Bekasi River	403	116
		8-3 Cisadang River	135	37
		8-4 Cikarang River	230	66
		8-5 Cilemahabang River	220	63

3. BASIC INFORMATION RELATED TO FLOOD MITIGATION AND FLOODING IN JABODETABEK

3.1 INSTITUTION

3.1.1 Water Laws and Regulations

(1) Law on Water Resources 2004

The President of the Indonesia stipulated and issued a new water resources law in 2004. In this law, it is stipulated that water resources consist of water, water resources and water potentials, which include damage potentials. The formulation of water resources management master plan and implementation of water resource management shall be made by the National Government, Provincial Government and Regent/Municipal Government in accordance with the classification of river basins.

(2) The Government Regulation on River (No.35/1991)

River is the places and basins as well as the flow system where water flows starting from the spring to estuary and bordered by so-called the boundary line of river conservation zone along river meandering. River is owned by State and implemented by the Government.

For fighting against the danger of flood, the Government shall prepare 1) regulations for fighting to the flood danger, 2) management of flood plain zone included setting the retention area and 3) guidelines on fighting against flood danger, either the danger before the flood coming, during the flood and after the flood.

(3) Minister of Public Works' Regulation on River Zone and River Conservation Zone (No. 63/PRT/1993)

River conservation zone is defined to protect the functions of rivers, in addition to river zone. River conservation zone shall be determined; 1) for rivers under minister's authority: by ministerial regulation, 2) for rivers under Regional Government's authority: by Regional regulation and 3) rivers managed by Legal Institutions: by ministerial regulation.

Boundary line of river conservation zone is decided as follows corresponding to river characteristics, namely rivers with dike and rivers without dike, in consideration of areas where rivers flow, namely urban area or other area.

Table 3.1 Decision of River Conservation Zone

River	Inside Urban Area	Outside Urban Area
With Dike	at least 3m from outer part from the dike edge	at least 5 m from outer part from the dike edge.
Without Dike	<ul style="list-style-type: none"> • Stretches $H < 3$ m: at least 10 m from wet outer line • Stretches $3 \leq H < 20$ m : at least 15 m from wet outer line • Stretches $H \geq 20$ m from wet outer line 	<ul style="list-style-type: none"> • Stretches $A \geq 500 \text{ km}^2$: at least 100 m from wet outer line • Stretches $A < 500 \text{ km}^2$: at least 100 m from wet outer line

Note: H: Water depth, A: Catchment area

For rivers influenced by tide, the boundary line of river conservation zone is at least 100 m from the wet outer line of river flow.

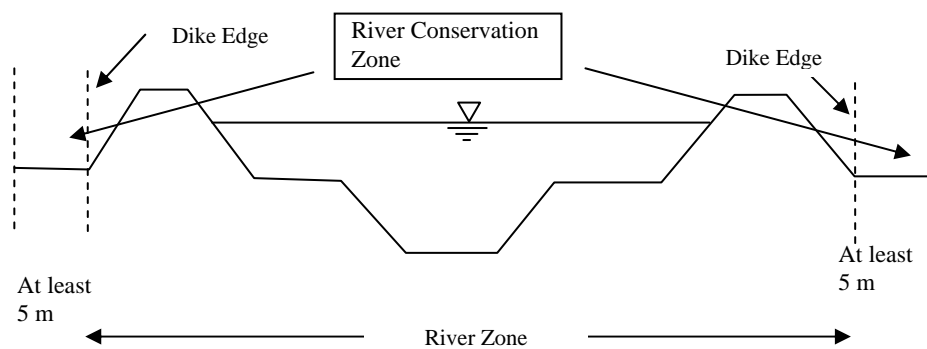


Figure 3.1 River Conservation Zone for River with Dike

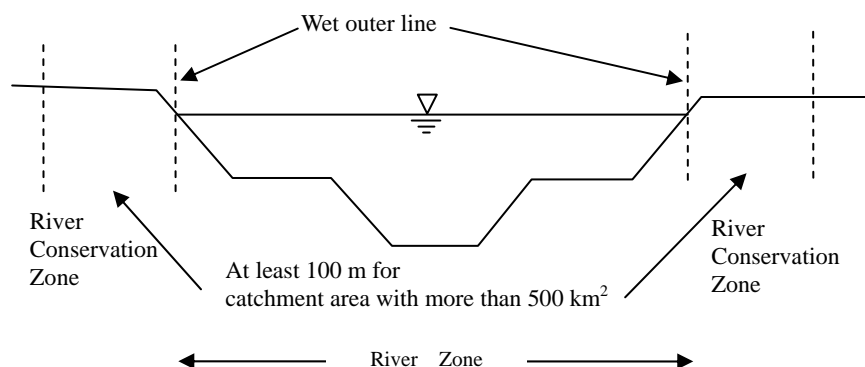


Figure 3.2 River Conservation Zone for River without Dike

3.1.2 Decentralization and Autonomy

One of the most important laws in relation to decentralization and how it works is the Law No. 22 of the year 1999. Decentralization, in the case of Indonesia, is transfer of an

authority from the central government to regency and municipal governments (local government).

3.1.3 Organization and Functions of Flood Control and Drainage System

After the decentralization in 1997, flood control and drainage activities are made under the responsibility of the following organizations.

Table 3.2 Responsibility of Organization for Flood Control and Drainage Activities

Work Items	Flood control facilities in Rivers flowing in more than one (1) province				Flood control facilities main drains/rives in DKI & macro drainage facilities			
	Planning & design	Implementation	Operation	Maintenance	Planning & design	Implementation	Operation	Maintenance
PU	○			○	○			
CILCIS		○	○			○		
DPU DKI				○	○		○	○

Macro drainage facilities cover most of drainage facilities such as drains, gates and pumping stations, while micro drainage facilities are composed of road ditches and gutters. Out of Macro drainage system, secondary/tertiary drains are planned and designed by DPU of DKI Jakarta but maintained by SDPU, namely mayor level of DKI. Hereinafter, outline of organizations of the PU and Ciliwung-Cisadane River Basin Development Project Office (CILCIS) is explained.

(1) Ministry of Public Works (PU)

The Ministry of Public Works (PU) was reorganized in 2004 from the KIMPRASWIL which was created in 1999. PU is composed of three (3) DGs (Directorates General), namely DG of Water Resources (DGWR), DG of Housing Planning and Urban Development, DG of Spatial Planning and DG of Highway.

Flood control of rivers is under management by Directorate of River, Lake and Dam, DGWR. DGWR has implementation units composed of 10 project offices including the CILCIS. DG of Housing Planning and Urban Development is related to drainage planning, while DG of Spatial Planning is related to land use planning, which affects runoff discharge.

(2) CILCIS

This project organization mainly consists of three (3) projects i.e.; Project of East Banjir Canal, Project of Flood Control as well as Project of Water Resources Conservation. The Project of Flood Control is undertaking the river maintenance works of the Ciliwung-Cisadane river basin, which covers the Cidurian River Basin in westernmost part and the Cibeet River Basin in easternmost part (Refer to Figure 2.2). The Project of Eastern Banjir Canal is constructing the EBC to protect Jakarta against flood particularly East Jakarta.

3.2 MAPPING

National Coordination Survey and Mapping Bureau prepares topographical maps with a scale of 1/25,000, which cover all of the Java Island, Bali and Nusa Tenggara. Furthermore, these maps have been digitized and can be purchased from this agency.

Land and Mapping Services (Dinas Pertanahan dan Pemetaan) of DKI Jakarta has made digital maps (Auto CAD dwg files) of all the areas with a scale of 1/10,000 based on aero photos taken in 2003.

3.3 RAINFALL AND WATER LEVEL OBSERVATION

The CILCIS installed in the year of 2003 a monitoring system consisting of three (3) rainfall gauging stations, 17 water level gauging stations and two (2) stations monitoring both of water level and rainfall as shown in Figure 3.3. All of the water level gauges and rainfall gauges are telemetered. Data are sent to the operation center of the CILCIS and stored in the database.

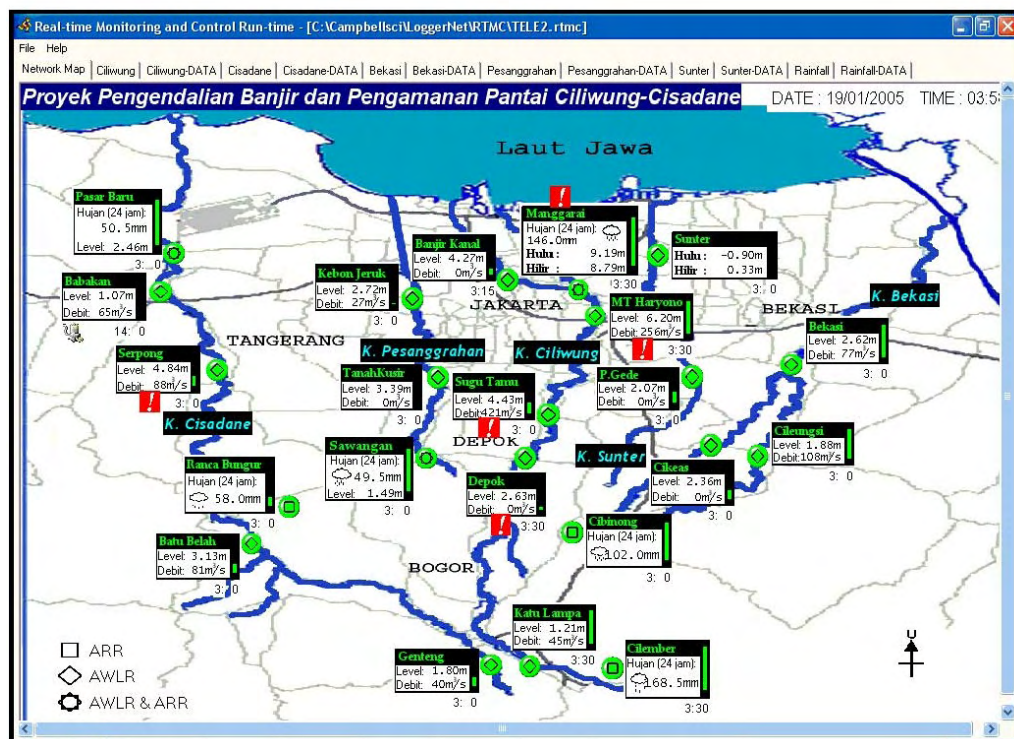


Figure 3.3 Flood Monitoring System of Ciliwung-Cisadane Project Office

The BMG sends daily rainfall data to the governmental agencies through facsimile, when they request the rainfall data of the JABOTABEK. Figure 3.4 indicates locations of 13 rainfall stations, data of which were sent during the 2002 flood to the operation center of the CILCIS.

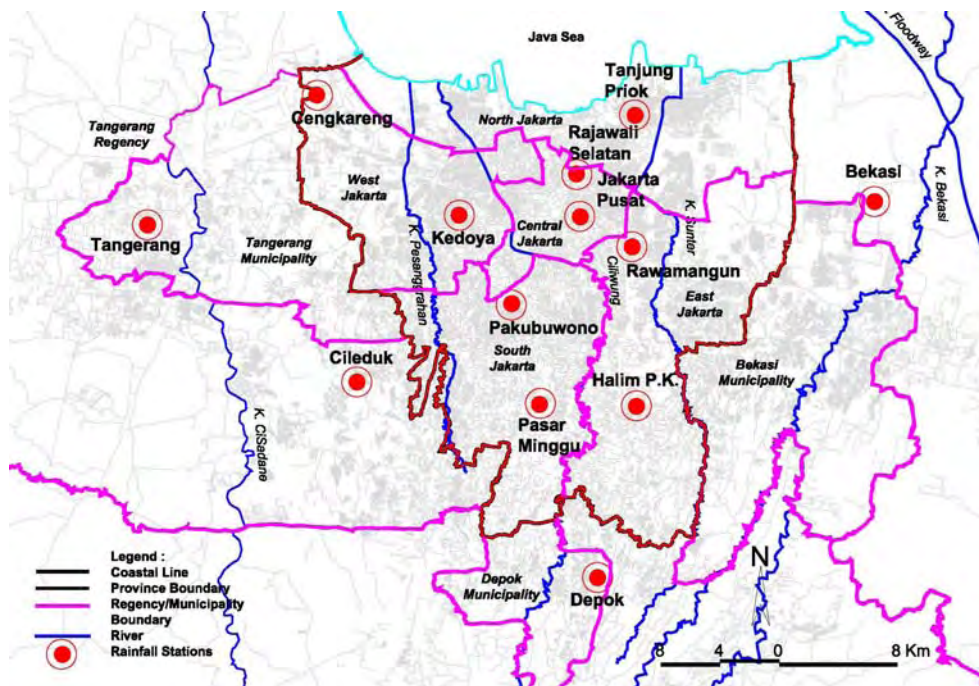


Figure 3.4 Daily Rainfall Data Provided by BMG

3.4 FLOOD CONTROL MEASURES

3.4.1 Agreement on Flood Control and Urban Drainage

In 1997, the DGWR and the DKI Jakarta have concluded an agreement on the flood control and urban drainage in DKI Jakarta. It is agreed that the responsibility of the DGWR is particularly to the main rivers upstream, while the DKI Jakarta is to the drainage system in its municipalities.

3.4.2 Master Plan and Feasibility Study

(1) 1973 Master Plan Study

In this Master Plan for Drainage and Flood Control of Jakarta, flood control of Jakarta was intended to intercept floods from the south by two (2) floodways, namely the Western Banjir Canal and the Eastern Banjir Canal before they flow into the central Jakarta. For the Western Banjir Canal, the existing one was planned to be improved and extended, while for the Eastern Banjir Canal, a new floodway was planned to be constructed (Figure 3.5). Both of the canals were planned to have flow capacity of 100-year return period.

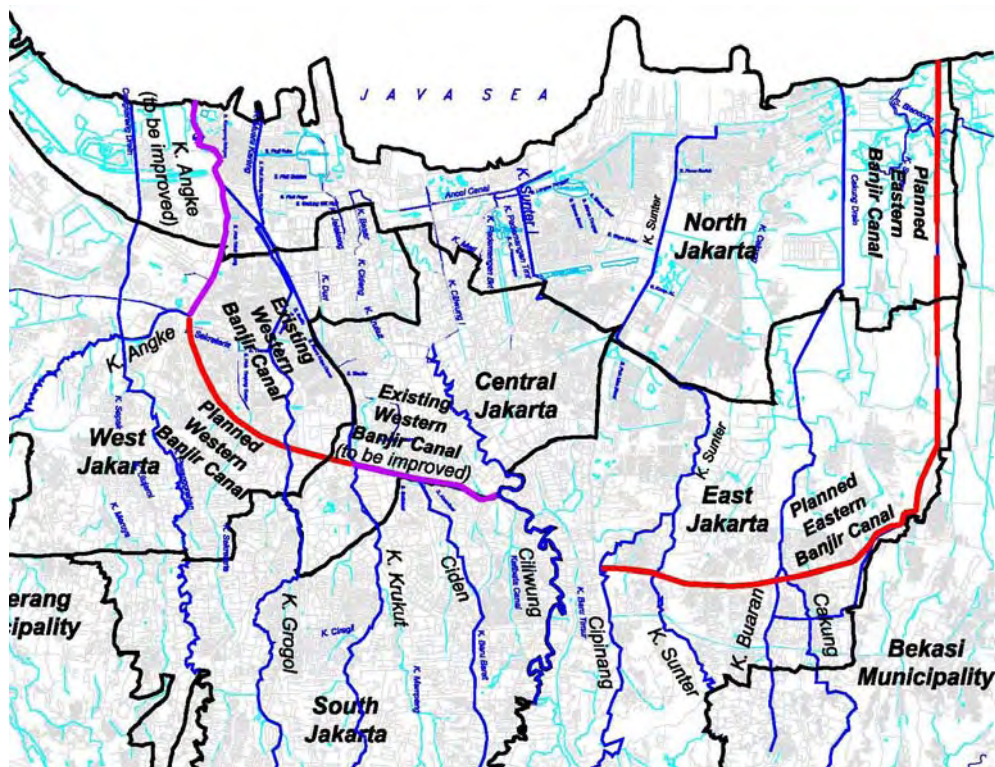


Figure 3.5 Planned Western and Eastern Banjir Canals in 1973 Master Plan

(2) 1997 Master Plan Study

The two (2) floodways proposed in the 1973 Master Plan could not be materialized due to difficulty in land acquisition. Furthermore, it is judged necessary to formulate a flood control master plan for the developing JABOTABEK. Under these circumstances, the JICA conducted “The Study on Comprehensive River Management Plan in JABOTABEK” from 1995 to 1997 to formulate flood control master plan and to conduct Feasibility Study for the selected projects.

Master Plan

(a) Target Year for Completion and Land Use

Target year of the Mater Plan was the year of 2025, in which most of area was assumed to be developed.

(b) Design Discharge Distribution

The master plan intended to increase safety level of eight (8) river systems in the JABOTABEK to 25-year, 50 year or 100-year return period corresponding to importance of the areas to be protected.

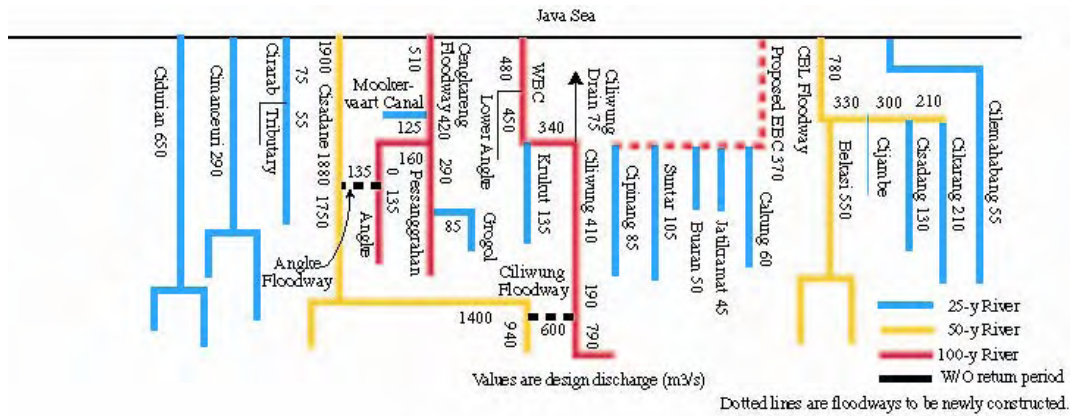


Figure 3.6 Design Discharge Distribution for Eight River Systems in JABOTABEK

(c) Structural Measures

In consideration of flow capacity of the existing river channels, following river improvement and new construction of floodways were proposed (Figure 3.7).

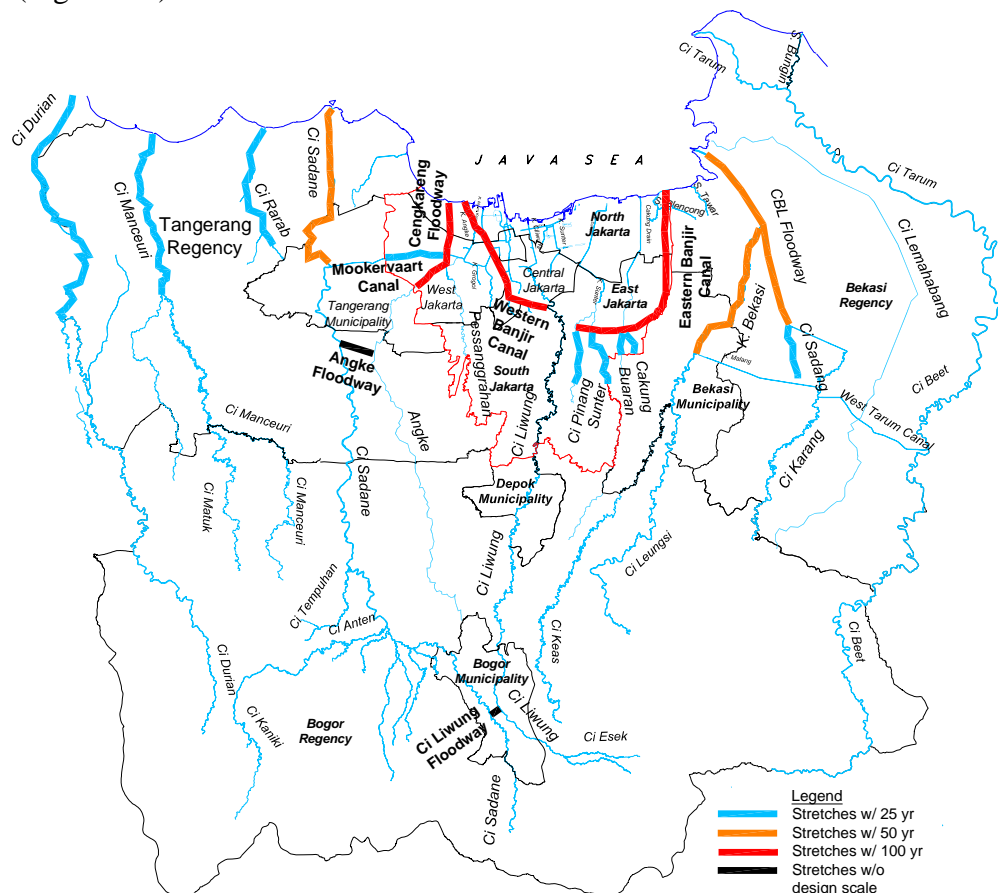


Figure 3.7 Location of New Floodways and Stretches for Improvement

Priority Project

Followings were selected as priority projects in order to mitigate flood damages in western parts of DKI Jakarta and down stream areas of the Cisadane River in consideration of importance of the areas.

- Improvement of the Western Banjir Canal,
- Construction of the Ciliwung Floodway, and
- Improvement of the Cisadane River

Discharge warning was planned to be issued to inhabitants along the Cisadane River on diversion of flood water through the Ciliwung Floodway.

3.4.3 Ongoing Project

(1) Ciliwung-Cisadane River Flood Control Project (1)

Due to the urgent necessity to protect the western part of DKI Jakarta, this project was commenced in 1998 under the JBIC Loan (IP-496). Components of the project were; 1) construction of the Ciliwung Floodway and 2) river bank reinforcement (length 15 km) of the Cisadane River. However, this project was cancelled due to difficulty in obtaining consensus of stakeholders and land acquisition.

(2) Construction of Eastern Banjir Canal (EBC)

Construction of the EBC, which was proposed in the 1973 Master Plan and the 1997 Master Plan, commenced in 2004 under the local fund and is on-going at present, scheduled to be completed in 2010.

3.4.4 On-Going and Planned Study

(1) Review Master Plan of Ciliwung – Cisadane River Basin

This is undertaking under the framework of the Java Irrigation and Water Management Project. Under the framework, a Basin Water Resources Planning Project commenced in February 1996 with technical assistance from consultants of the Netherlands to support the Government of Indonesia in formulating Basin Water Resources Plans. Interim Report was issued on July 2004 including Annex I Flood Control, which covers 1) Previous study and works on flood control, 2) drainage system and Situ-situ, 3) flooding area, 4) operation and maintenance of flood control system and 5) Proposed measures on flooding in JABOTABEK.

3.4.5 Present Flood Control Facilities

(1) Rivers

According to the interview survey and existing reports, improvement of the existing rivers and/or construction of floodways, which drastically increase the safe level against floods, have not been conducted in recent years, except the EBC.

Cross-sectional survey of the existing rivers has not been conducted in most of the rivers in the JABOTABEK, since the survey was made by the JICA Study team in the period of August to October 1995. Therefore, flow capacity estimated in the 1997 Master Plan Study is possibly applicable to the existing rivers. No inventory system for river structures has been established.

(2) Ponds and Reservoirs

In the JABOTABEK Area, there are 202 small lakes and/or ponds, which are called as “Situ-situ”. Originally, situ-situ was developed with three (3) purposes; flood retention, water supply and aesthetic view. At present, most of situ-situ is suffering from several problems such as decrease in size due to sedimentation and growth of weeds/grasses.

3.5 DRAINAGE SYSTEM

3.5.1 Master Plan for Drainage and Flood Control of Jakarta (1973)

Based on this master plan, the existing drainage system in the area located northern part of the planned WBC and EBC has been installed or improved. This plan intended to conduct 1) Extensive rehabilitation of the existing rivers to be used as main drain, and 2) pump drainage for low-lying areas.

The area to be protected by the WBC and the EBC was planned to be subdivided into six (6) drainage areas. In addition to the existing pumping stations in western part, four (4) pumping stations were proposed to be installed. The design scale is 25-year return period for both of pumps and main drains. Figure 3.10 indicates a mass curve used to design pumps and main drains.

3.5.2 Present Drainage System

DKI Jakarta has drainage system, but in other municipalities of West Java Province and Banten Province, only limited areas have drainage systems. Hereinafter, drainage system of DKI Jakarta is explained.

(1) Drainage Zones

The whole area of DKI Jakarta is divided into three (3) drainage regions, which are further into ten (10) drainage zones as tabulated below.

Table 3.3 Drainage Zones in DKI Jakarta

Drainage Region	Drainage Zone	Catchment Area (ha.)	Drainage System
I. Western Region	Zone-1	11,300	Cengkareng Floodway
	Zone-2	4,500	Grogol – Sekretaris
II Central Region	Zone-3	500	Muara Karang
	Zone-4	17,350	Ciliwung – WBC
	Zone-5	1,900	Pluit
	Zone-6	1,100	Ciliwung – Gunung Sahari
III Eastern Region	Zone-7	2,760	Sentiong – Pademangan
	Zone-8	1,250	Sunter Utara (Barai)
	Zone-9	12,575	Sunter – Cipinang
	Zone-10	8,050	Buaran - Cakung

(2) Pump Drainage Areas

Figure 3.8 shows present pump drainage area, which can be divided into 17 drainage areas. The drainage areas have area of 90.76 km² or 14.0 % of the total DKI Jakarta.

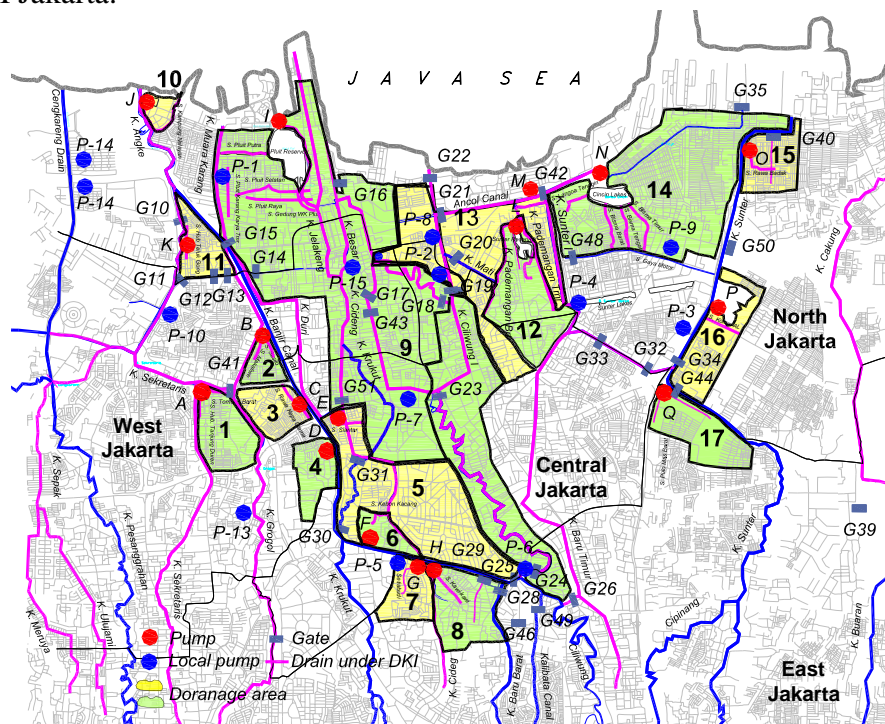


Figure 3.8 Present Pump Drainage Areas in DKI Jakarta

The pumps with red color in Figure 3.8 are main pumps of the respective drainage areas. Furthermore a lot of local pumps (blue color) have been installed as explained below.

Followings explain the characteristics of pump drainage system in DKI Jakarta.