Directorate General of Water Resources,
Ministry of Public Works
Republic of Indonesia

THE PROJECT FOR CAPACITY DEVELOPMENT OF JAKARTA COMPREHENSIVE FLOOD MANAGEMENT IN INDONESIA

TECHNICAL COOPERATION REPORT

COMPREHENSIVE FLOOD MANAGEMENT PLAN

OCTOBER, 2013

JAPAN INTERNATIONAL COOPERATION AGENCY
YACHIYO ENGINEERING CO., LTD.

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The Project for Capacity Development of
Jakarta Comprehensive Flood Management
in Indonesia

Technical Cooperation Report
Comprehensive Flood Management Plan

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【OUTLINE OF COMPREHENSIVE FLOOD MANAGEMENT PLAN】

The Ciliwung River running through the central area in Jakarta Special Province (DKI Jakarta) has caused a large scale flood disaster every 5 years, resulting in serious impacts on the capital in Indonesia. Moreover, due to the rapid economic growth, the urbanized area in the Ciliwung River Basin is increasing causing the reduction of retention and retarding functions in the basin, and land subsidence is induced by the excess use of groundwater. If the urbanization and excess groundwater use continue in the current rate, the peak discharge in the river course may rise in the heavy rainfall, and larger area will be inundated.

In order to reduce the flood disaster risks, it is necessary to implement the following measures of Comprehensive Flood Management in coordination and collaboration among the related government organizations in the Ciliwung River Basin:

- Flood control measures in the river course
- Runoff control measures in the river basin
- Land use regulation
- Disaster mitigation measures

For the purpose of the mitigation of flood damages in the Ciliwung River Basin, this report describes the Comprehensive Flood Management Plan (hereinafter referred to as the “CFMP”). The CFMP consists of the policy, strategy, required measures and target volume for the implementation of the comprehensive flood management measures, and action plan of the CFMP (hereinafter referred to as the “CFMAP”) compiling the role allocation among related organizations to realize the CFMP.

CHAPTER 1 OUTLINE OF CILIWUNG RIVER BASIN

1.1 Characteristics of Ciliwung River and Its Basin

The Ciliwung River is one of the major Indonesian rivers running down through Jakarta Special Province (DKI Jakarta), with length and basin area of 145 km is 553 km^2, respectively. Downstream area of Manggarai Gate is lowland area where Dutch settled in the past and important national facilities, such as the presidential palace and embassies, are located. In the past, the river run widely in the lowland area with meandering and diverting, however, most of the discharge reaches to Java Sea through the West Banjir Canal nowadays.

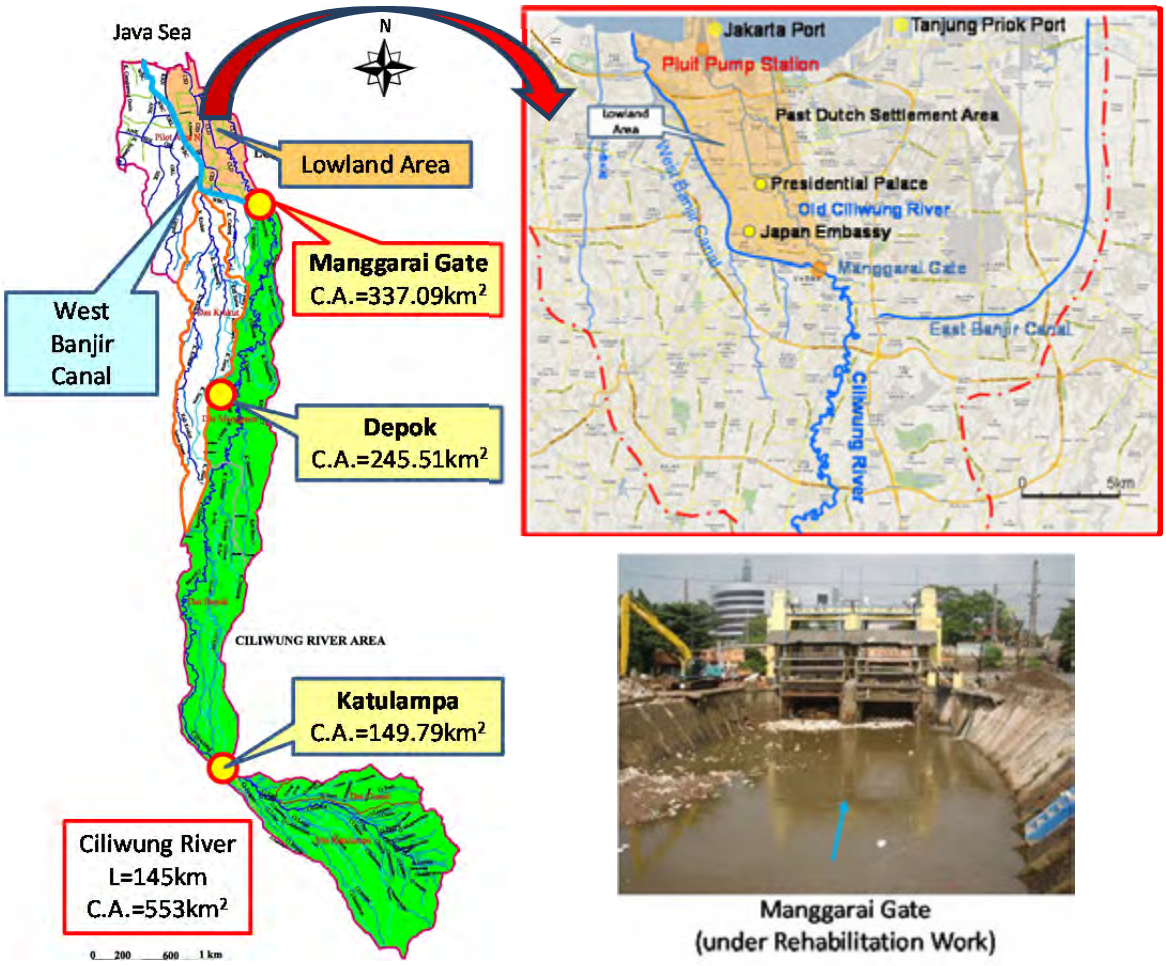
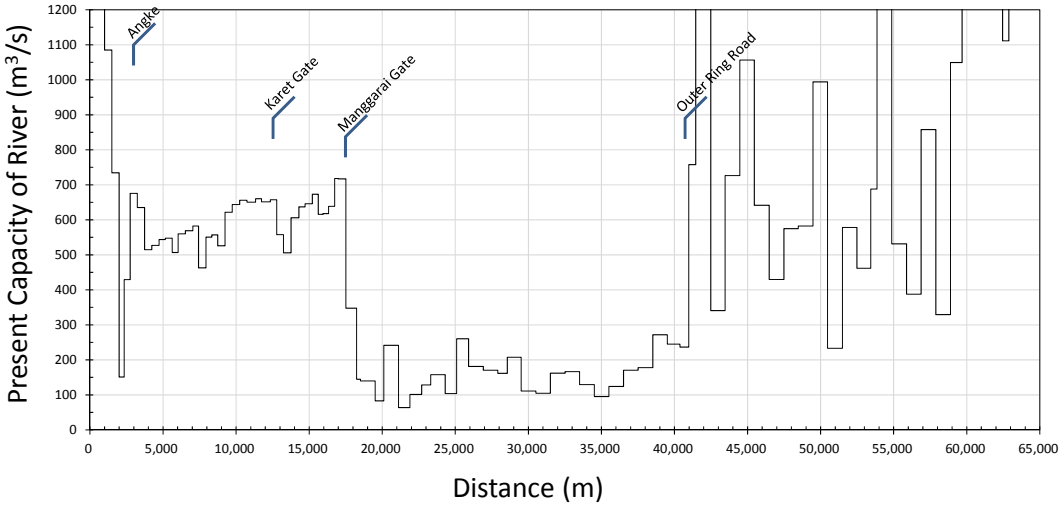


Figure 1.1-1 Outline of Ciliwung River Basin

The current flow capacity of the Ciliwung River is approximately 500 m^3/s from Manggarai Water Gate to the downstream up to the West Banjir Canal. On the other hand, the flow capacity of approximately 23 km of the river section, from Manggarai Gate to the upstream by Outer Ring Road is limited to 100 – 300 m^3/s. The surround area in this section is recognized as flood prone area.



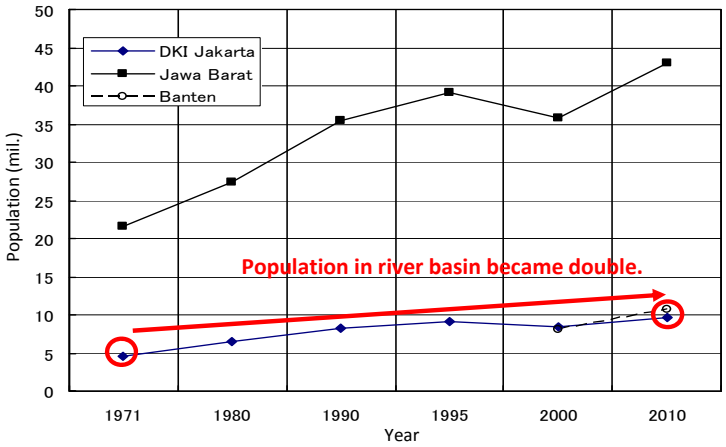
Source: JCFM Project

Figure 1.1-2 Current Flow Capacity of Ciliwung River

1.2 Urbanization in Ciliwung River Basin

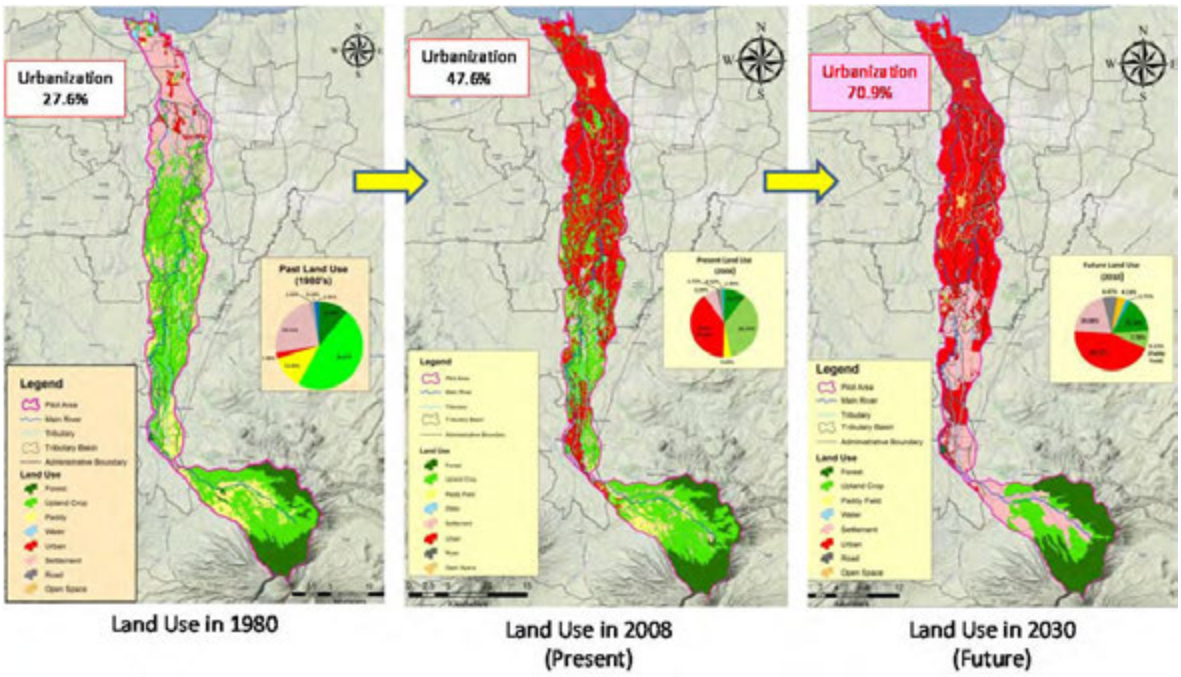
With the rapid economic growth in Indonesia, the population is growing and urbanized area in the Ciliwung River Basin is expanding. The population of DKI Jakarta approximately doubled in the last 40 years, from 1971 to 2010. The urbanization area ratio in the Ciliwung River Basin rose approximately by 1.7 times, from 27.6 % to 47.6 %, in the past 30 years (from 1980s to 2008).

According to the 2011spatial plan, approximately 70 % of the basin will be urbanized by 2030. There is a concern that discharge volume to the Ciliwung River will increase due to decreasing of natural retarding function in the basin since rapid urbanization is expected.



Source: Central Statistics Office

Figure 1.2-1 Population Change in Related Provinces



* Urbanization Rate = (Urban Area + Settlement Area + Road and Railway Area)/Basin Area

Figure 1.2-2 Land Use Change (Urbanization) in Ciliwung River Basin

1.3 Climate Change Impact in Ciliwung River Basin

Comparing rainfall data of recent 10 years (1999-2008) and the preceding 10 years (1989-1998), it is found that the annual average maximum 24-hour rainfall increased by about 9 %. Besides, sea level at Jakarta Bay has risen by 7 mm annually. There are concerns that flood risk in the Ciliwung River Basin might increase considerably due to climate change impact.

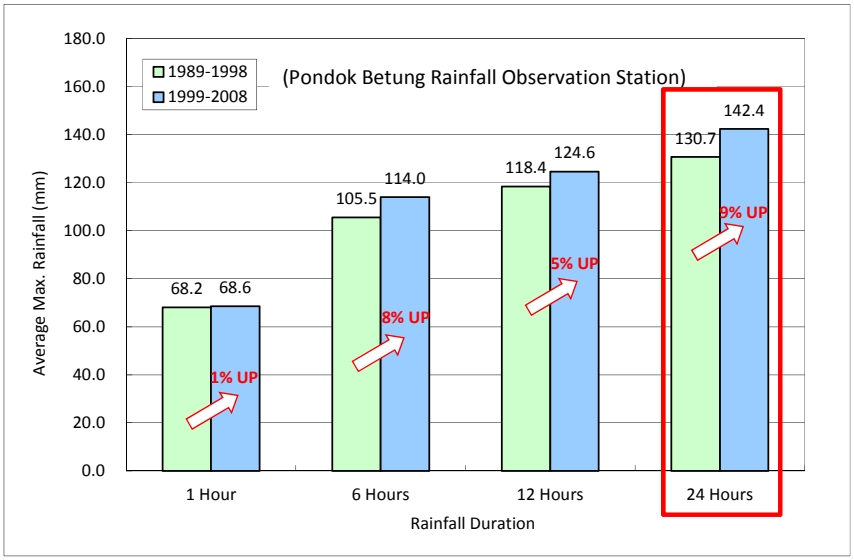
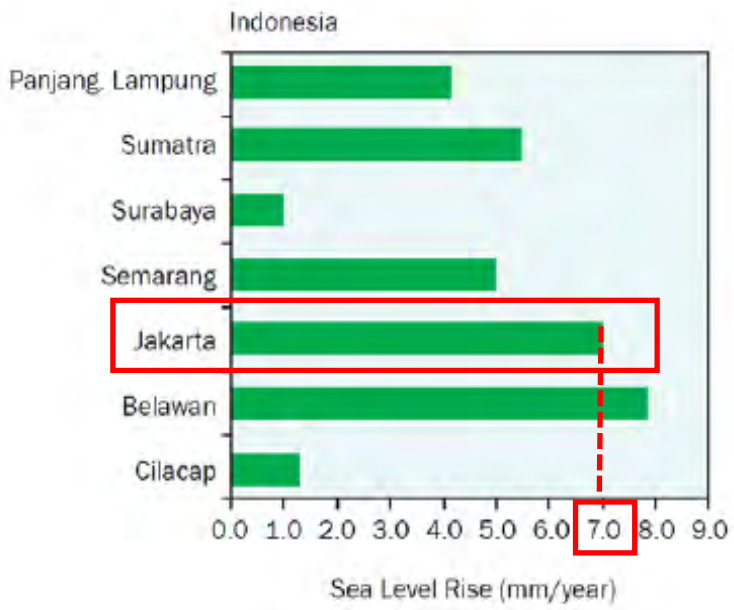


Figure 1.3-1 Change of Annual Maximum Rainfall in Ciliwung River Basin

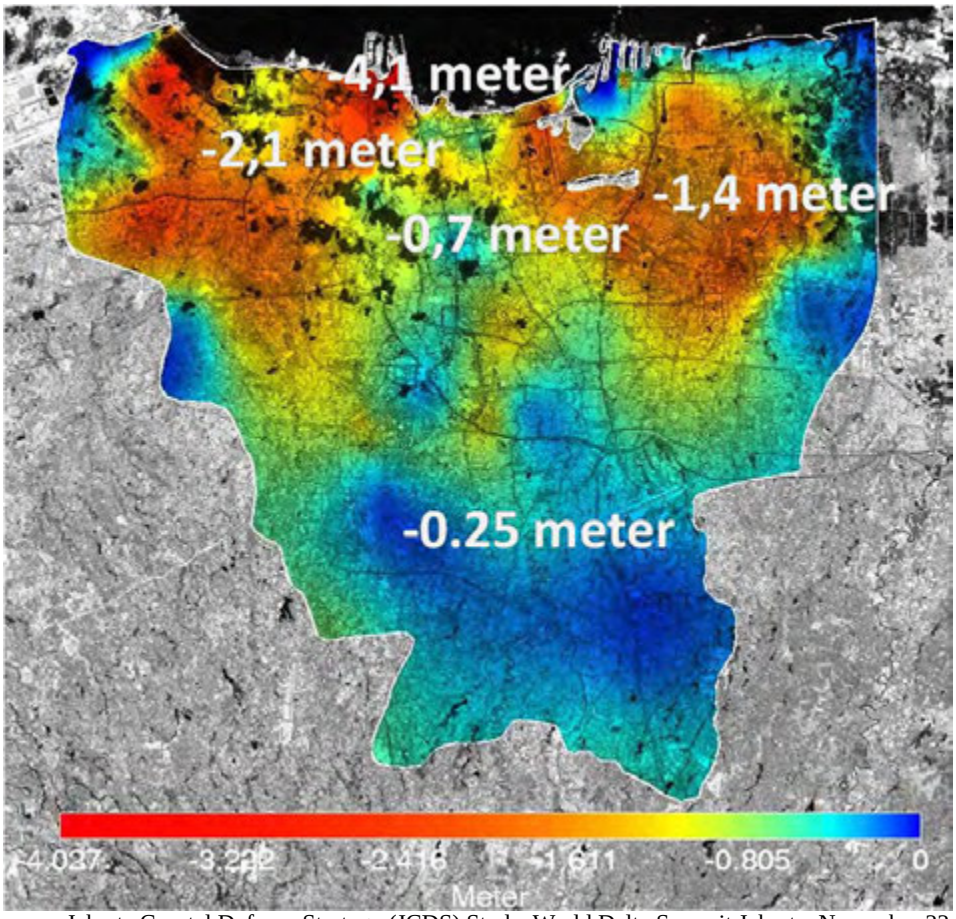


Source: ADB, the Economics of Climate Change in Southeast Asia: A Regional Review, April 2009

Figure 1.3-2 Annual Rise of Sea Level in Jakarta Bay

1.4 Land Subsidence in Lower Ciliwung River Basin

Land subsidence has been broadly advanced in the lower Ciliwung River Basin due to excess use and recharge decrease of groundwater in upstream basin caused by settlement area development in the basin. According to the study report of "Jakarta Coastal Defense Strategy (JCDS)" (currently named as "National Capital Integrated Coastal Development" (NCICD)), even though the degree of land subsidence is different depending on the locations, the land subsidence tendency in the coastal area is comparatively high. The accumulated land subsidence degree for about 35 years, from 1974 to 2010, is estimated in the range of 25 to 410 cm. Moreover, the results of land subsidence survey and analysis conducted by the JCFM Project shows that the trend of the land subsidence has extended to the southern area of DKI Jakarta. The Land subsidence is one of the factors increasing the flood risks, and land subsidence is expected to continue with the economic growth if the excess extraction of groundwater is not properly regulated.



Source: Jakarta Coastal Defense Strategy (JCDS) Study, World Delta Summit Jakarta, November 22, 2011

Figure 1.4-1 Accumulated Land Subsidence in Lower Ciliwung River Basin

CHAPTER 2 CONDITION AND FEATURE OF FLOOD DISASTER IN CILIWUNG RIVER BASIN

2.1 Causes of Flood Disaster

The causes of flood disaster can be classified as follows.

1) Flood of River Water

- The rainfall in the middle and upstream flows into the river, resulting in the inundaiton in the river section with insufficient flow capacity.
- A large scale rainfall in the upstream flows to the downstream. In this case, the inundaiton occurs at the downstream river and lowland areas, which is called as ”Banjir Kiriman”. Once the inundaiton occurs,it will continue for several days.
- Flood disaster by river water also occurs in the Krukut River Basin, a sub-basin of the Ciliwung River in the river section with limited flow capacity.

2) Inland Water Inundation

- It occurs mainly in lowland area of DKI Jakarta where discharge capacity is insufficient due to topographic condition.
- In Ciliwung River Basin, the lowland area in DKI Jakarta is the main prone area.
- Duration of inundation depends on water level of river or sea as well as capacity of drainage pump.

3) High Tide

- Due to the land subsidence, sea water overflowing to the inland area during high tide causes the inundation, which is called as ”Banjir Rob”.
- In the Ciliwung River Basin, this type of inundation can be identified in the lowland area of DKI Jakarta.
- Since the lowland area below sea level is expanding due to the land subsidence, the inundation risk by high tide is increasing.

4) Inundation by Insufficient Drainage Capacity

- Due to the following reasons, the rainwater will not be drained into the urban drainage system smoothly, causing the local inundation.
  - Insufficient capacity of the urban drainage
  - Decline of drainage cross section by settlement development
  - Sedimentation in the drainage,

2.2 Major Flood Disasters in Recent Years

A large scale of river water floods have occurred approximately once every 5 years in the Ciliwung River Basin, such as the floods in 1996, 2002, 2007 and 2013. It is identified that the river water flood will occur in case that the rainfall at the upstream area continues for approximately 4 to 13 days intermittently.

Table 2.2-1 Major Flood Disaster in Recent Years

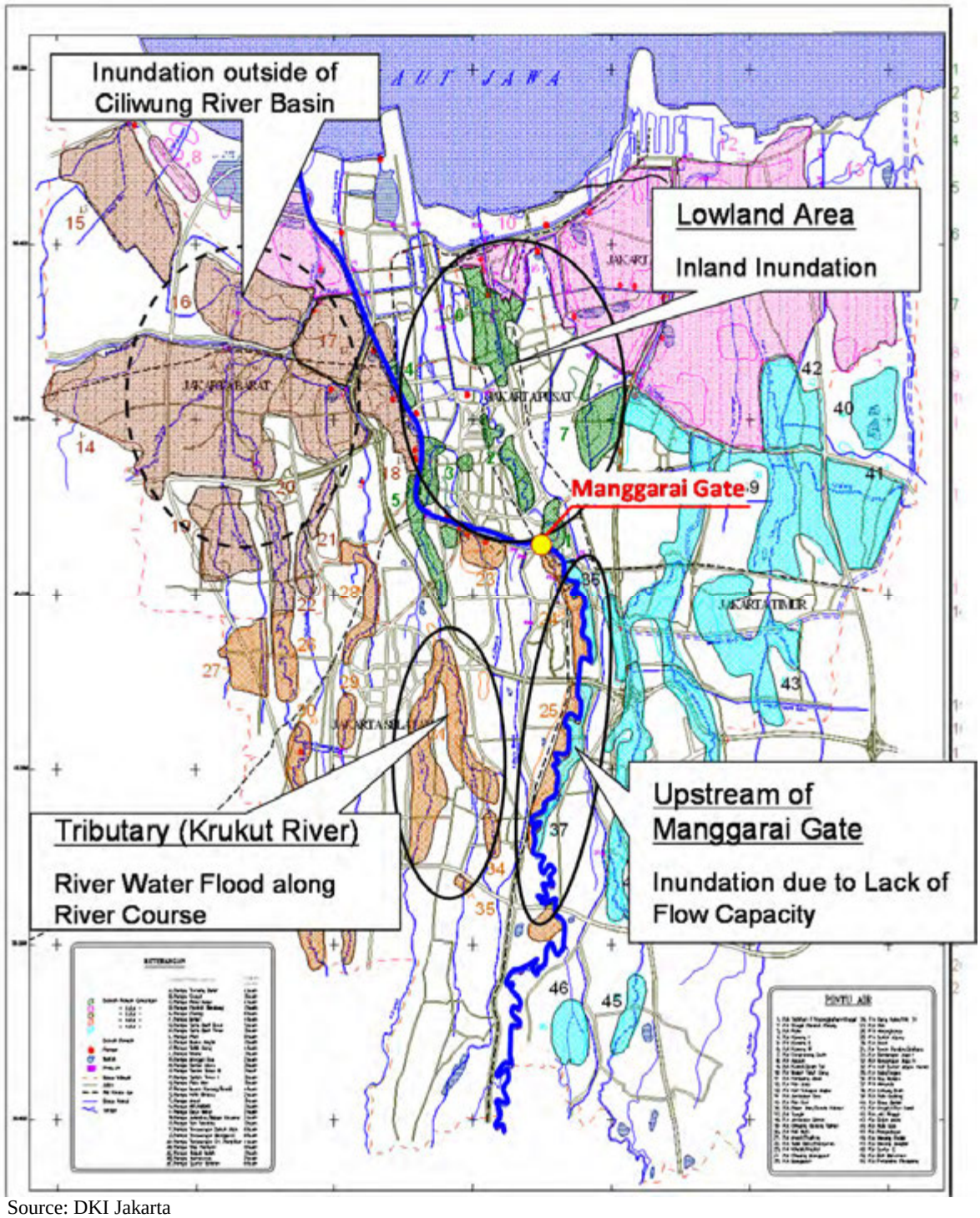
Year of Occurrence	Duration of Rainfall (hr)	Average Rainfall in Basin at Manggarai Gate Point					Manggarai Gate Point Peak WL (EL.m)	Disaster Condition	Inundatioin Area (km^2)
		1 hour (mm)	6 hour (mm)	24 hour (mm)	48 hour (mm)	168 hour (mm)			
1-6 Jan. 1996	102	**31.8**	64.6	130.5	156.9	296.7	9.70	Overflow, Inland Water	–
26 Jan.-2 Feb. 2002	164	16.6	59.9	132.4	194.9	397.8	10.50	Overflow, Inland Water	87
30 Jan.-6 Feb. 2007	153	21.5	**86.6**	**179.5**	**254.6**	**445.6**	**10.61**	Overflow, Inland Water	**300**
8-20 Jan. 2013	**305**	21.6	54.4	90.7	161.6	334.5	10.00	Dike Break, Overflow, Inland Water	140

* Duration of rainfall is the duration of average rainfall at Manggarai including non-rain time for less than 6 hours.

* Inundation area is a record in DKI Jakarta.

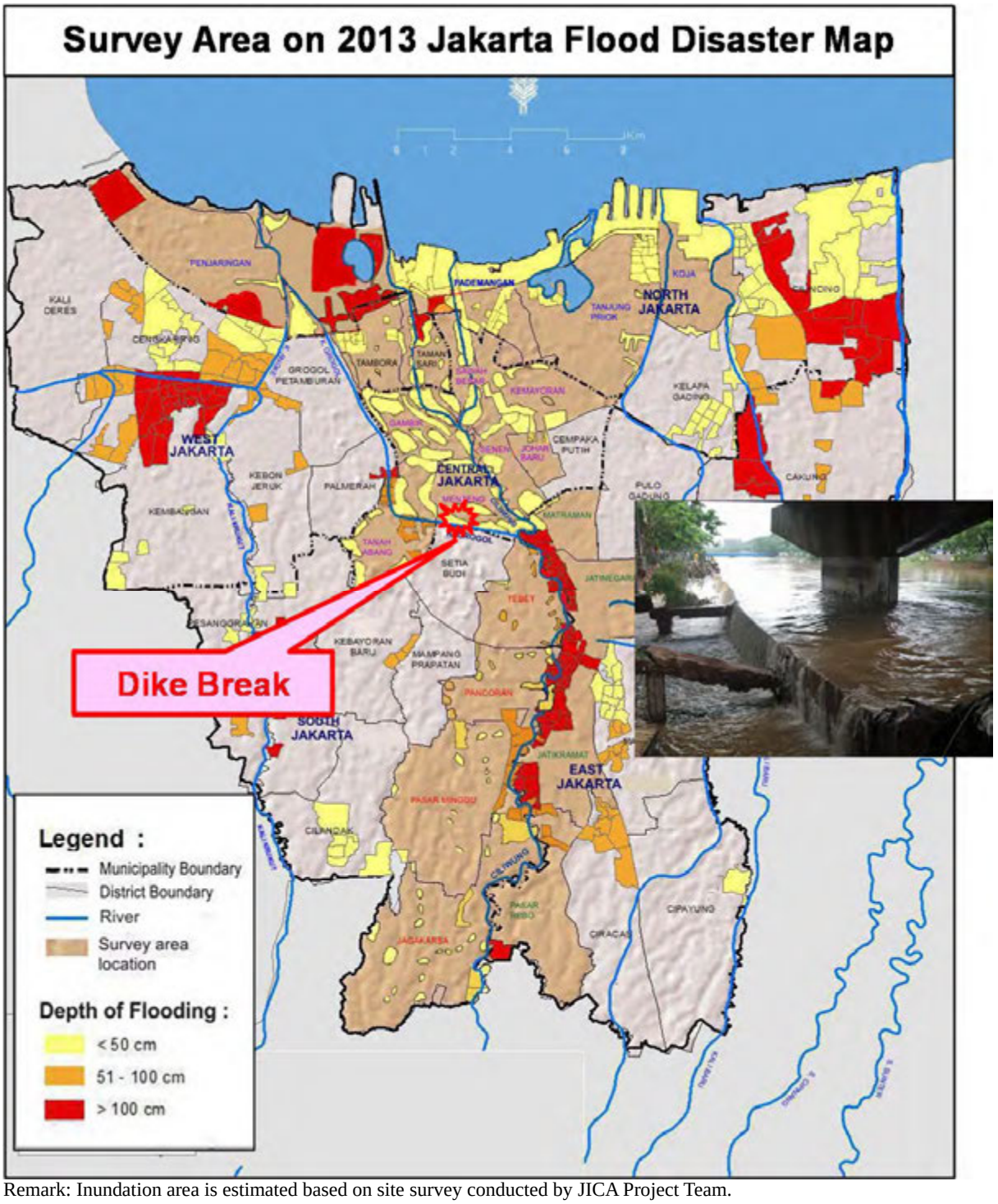
* Inundation area in January, 2013 is estimated based on field survey by JICA Project Team.

The flood disaster in February, 2007 caused a large scale of inundation in approximately 45 % of DKI Jakarta area. At this time, the peak water level at Manggarai Gate was EL. 10.61 m which is the largest record, and exceeded dangerous water level for approximately 1.5 days. Moreover, at the time of the January, 2013 Flood, the flood water flowed into the central area of DKI Jakarta, where the embassy and presidential palace are located, up to the lowland area along the coast due to the dike break at Jl. Latuharhari.



Source: DKI Jakarta

Figure 2.2-1 Inundation Area in February 2007 Flood



Remark: Inundation area is estimated based on site survey conducted by JICA Project Team.

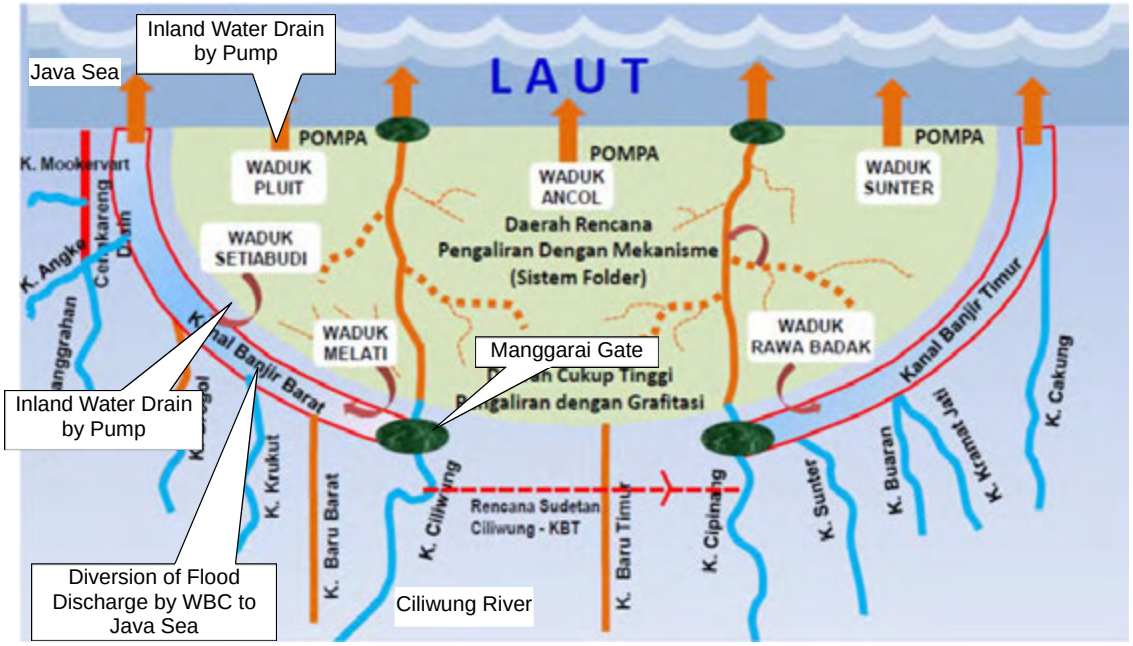
Figure 2.2-2 Inundation Area and Dike Break at West Banjir Canal

CHAPTER 3 FLOOD CONTROL MEASURES IN CILIWUNG RIVER

3.1 Basic Concept of Flood Control Measures in Ciliwung River

Basic concepts of flood control measures in the lowland area of DKI Jakarta are summarized as follows.

- All the flood discharge shall be drained to Java Sea through the West Banjir Canal from Manggarai Gate so that flood discharge does not flow into the lowland area of the Ciliwung River Basin.
- A water gate for the Old Ciliwung River at Manggarai is always closed, so discharge of the Old Ciliwung River is not considered in flood control plan.
- Inland water in the lowland area shall be drained to the West Banjir Canal or Java Sea by drainage pump.



Source: Strategi dan Rencana Aksi Penanggulangan Banjir di Wilayah DKI Jakarta, Balai Besar Wilayah Sungai Ciliwung-Cisadane, Kementerian Pekerjaan Umum, June 2013

Figure 3.1-1 Basic Concept of Flood Control Measures in the Ciliwung River

3.2 Flood Control Plan of Ciliwung River

Based on the master plan formulated in 1997* (hereinafter referred to as the "1997 Master Plan"), the flood control measures have been carried out targeting 1/100 design scale of flood. However, due to the difficulty for the construction of Ciliwung Floodway diverting 600 m^3/s discharge from the Ciliwung River to the Cisadane River, flood safety level of the river course was reviewed from 1/100 years to 1/25 years as temporary target. Thus, the flood control measures have been currently implemented based on this flood safety level.

* Final Report Volume II, Main Report - Master Plan, the Study on Comprehensive River Water Management Plan in JABODETABEK, March 1997, JICA

The flood control measures in the Ciliwung River have been conducted based on the 1997 Master Plan to mitigate the flood damage with 1/100 design scale of flood. The outline of the flood control measures based on this master plan is summarized in the table below.

Table 3.2-1 Outline of Flood Control Measure in Ciliwung River based on 1997 Master Plan

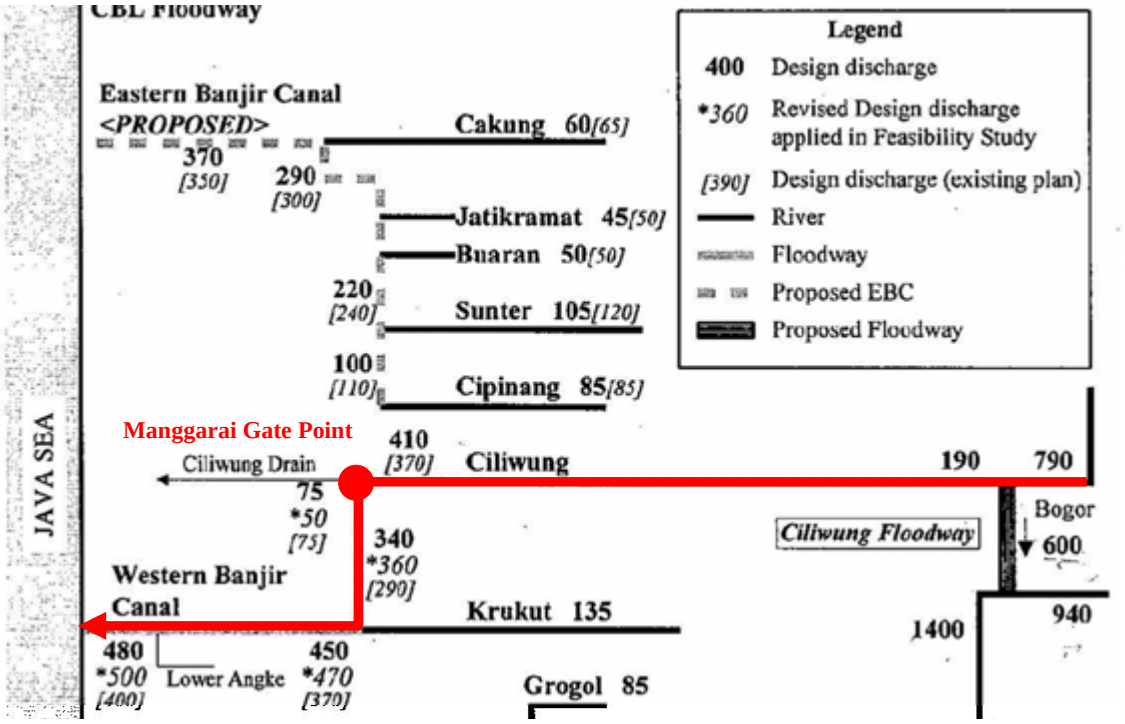
Design Scale	1/100 design scale (equivalent to the final target of flood control measures for the rivers in urban area with more than 2 million population)
Target Year of Future Land Use	2025
Outline of Structural Measures	➢ To construct "Ciliwung Floodway" at Bogor point to divert 600 m^3/s discharge from the Ciliwung River to the Cisadane River ➢ To divert 75 m^3/s discharge at Manggarai Water Gate point to the Old Ciliwung River ➢ To flow 340 m^3/s from Manggarai Water Gate point to the West Banjir Canal

Based on the following standard, the design scale for the flood control measures in the 1997 Master Plan which is equivalent to the final target of continued flood control measures for the rivers in urban area with more than 2 million populations is set.

Table 3.2-2 Standard of Design Scale of Flood in Indonesia

System	Type of Flood Control Measure	Initial Target (year)	Final Target (year)
River	Urgent Project	5	10
	New Project	10	25
	Continued Project (in rural and urban area with less than 2 million populations)	25	50
	Continued Project (in rural and urban area with more than 2 million populations)	25	100

Source: Flood Control Manual, Volume II, Guidelines for Planning and Survey, Project No WSTCF 091/011, (June 1993)



Source: Final Report Volume II, Main Report - Master Plan, The Study on Comprehensive River Water Management Plan in JABOTABEK, March 1997, JICA

Figure 3.2-1 Design Peak Discharge Allocation in 1997 Master Plan

However, it was realized that the construction of "Ciliwung Floodway" diverting 600 m^3/s discharge from the Ciliwung River to the Cisadane River became difficult to be implemented. Therefore, in the present condition, the flood control measures have been implemented based on 1/25 design scale as temporary target, which is equivalent to the initial target design scale. The outline of the current flood control measures is summarized below.

Table 3.2-3 Outline of Current Flood Control Measure in Ciliwung River

Design Scale	1/25 design scale (equivalent to the initial target of flood control measures for the rivers in the urban area with more than 2 million populations)
Target Year of Future Land Use	2025
Outline of Structural Measures	➢ Not to construct "Ciliwung Floodway" ➢ Not to divert the discharge from Manggarai Gate point to Old Ciliwung River ➢ To flow 507 m^3/s from Manggarai Water Gate point to the West Banjir Canal by upgrading the flow capacity of the West Banjir Canal (due to the flood in February 2007, the river widening works were conducted for the length of approximately 14.9 km from Manngarai Water Gate to PIK bridge in the West Banjir Canal)

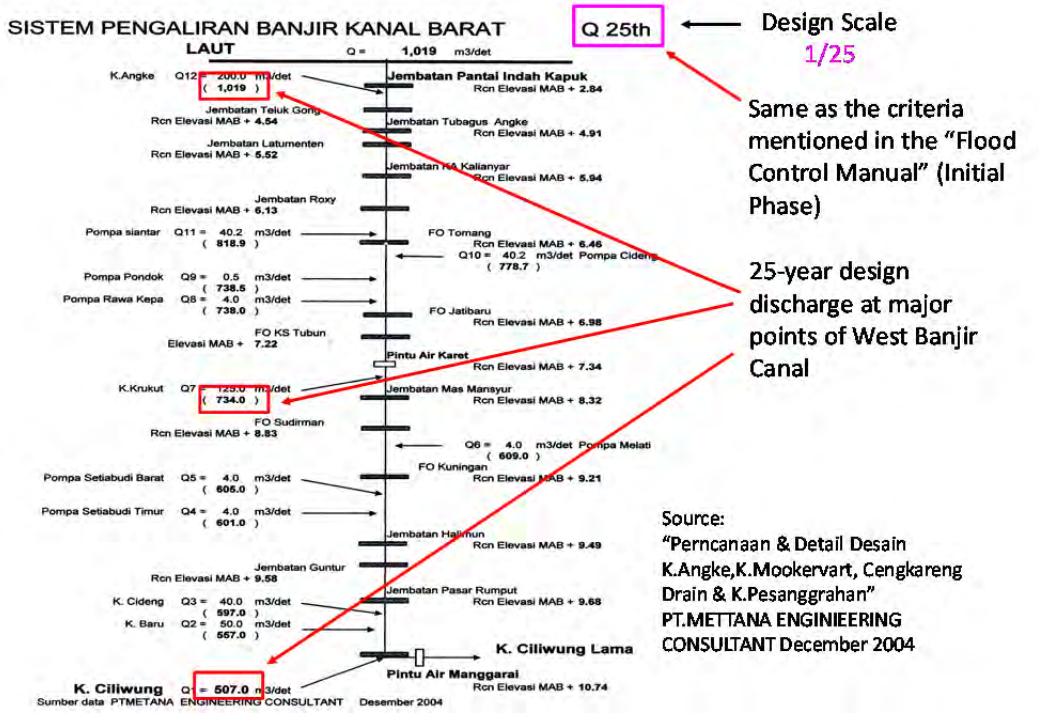


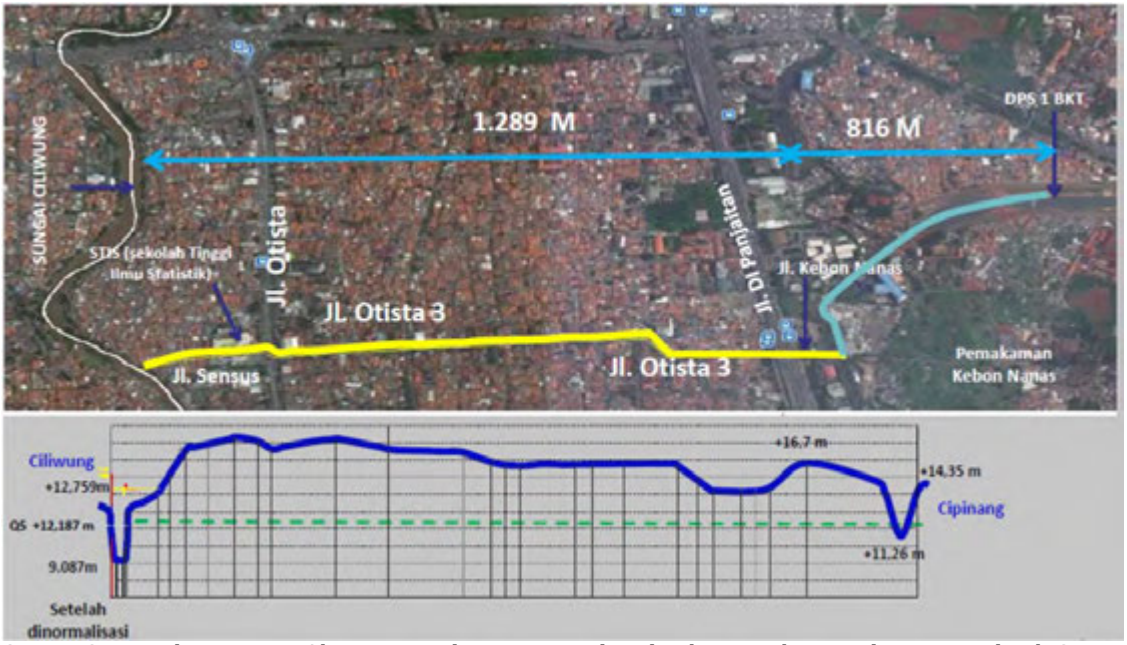
Figure 3.2-2 Design Peak Discharge Allocation based on Current Flood Control Plan

3.3 Major Flood Control Plan in the Future

The major planned flood control measures in the Ciliwung River with clear flood control effect are shown below. The measures are planned to be completed by the end of 2014.

Table 3.3-1 Outline of Major Planned Flood Control Measure in Ciliwung River

Purpose	Measure	Flood Control Effect at Manggarai Water Gate Point
Improvement of Flow Capacity of Ciliwung River	- River improvement in the section from Manggarai Water Gate to Outer Ring Road (L= 23.8 km) - Improvement of Manggarai Water Gate and Karet Water Gate (one gate for each)	To secure 500 m^3/s of river flow capacity
Reduction of Flood Peak Discharge	- Construction of diversion tunnel from the Ciliwung River to the East Banjir Canal	To reduce flood peak discharge by diverting 60 m^3/s



Source: Strategi dan Rencana Aksi Penanggulangan Banjir di Wilayah DKI Jakarta, Balai Besar Wilayah Sungai Ciliwung-Cisadane, Kementerian Pekerjaan Umum, June 2013

Figure 3.3-1 Outline of Diversion Tunnel to East Banjir Canal

The design peak discharge allocation based on the current flood control plan, including the flood control effect shown in Table 3.3-1, is shown below.

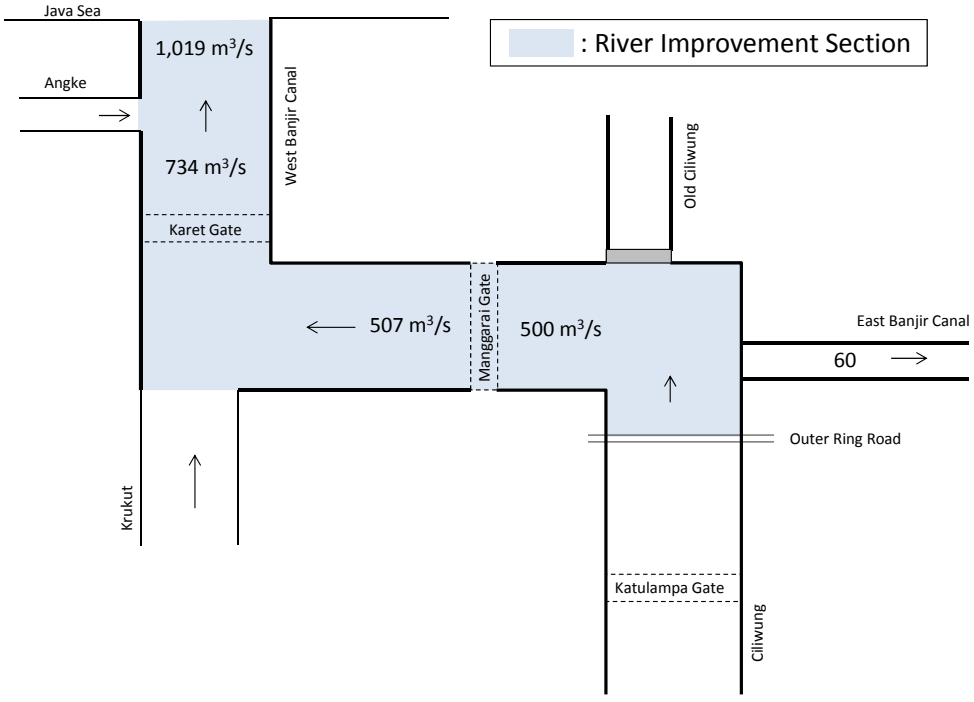


Figure 3.3-2 Design Peak Discharge Allocation including Planned Measures

CHAPTER 4 ISSUES ON FLOOD CONTROL MEASURES FOR CILIWUNG RIVER AND COUNTERMEASURES

4.1 Increase of Flood Peak Discharge by Rapid Urbanization

Issues on flood control measures for the Ciliwung River are summarized as follows.

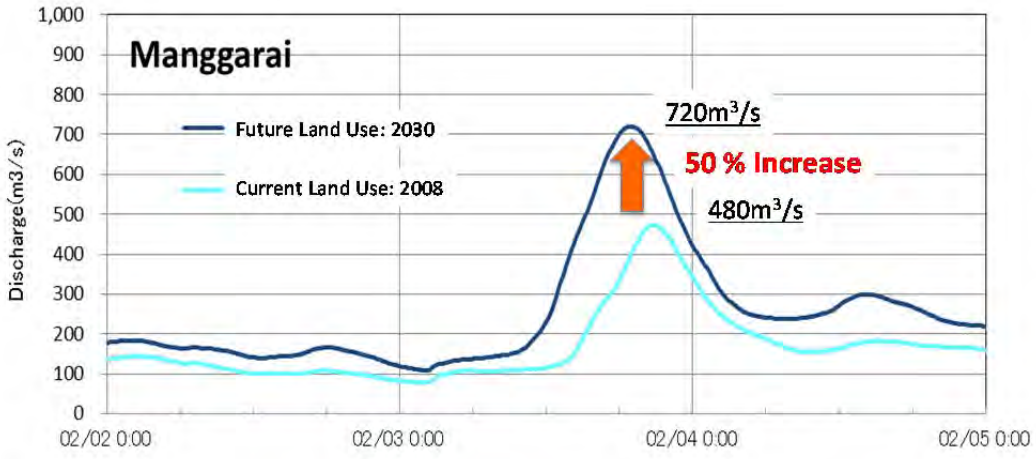
<Issue>

- Due to the rapid urbanization, it is estimated that flood peak discharge will become 1.5 times larger from 480 m^3/s to 720 m^3/s in 2030 with 50-year return period at Manggarai Water Gate point. The estimated flood peak discharge is remarkably larger than the 500 m^3/s of target design scale of current flood control measures.

<Countermeasure>

- Since the surrounding areas of the West Banjir Canal are highly urbanized, it seems difficult to improve the flow capacity of the West Banjir Canal. Therefore, through the implementation of various flood control measures at the upstream of Manggarai Water Gate, the flood peak discharge is expected to reduce.

According to the spatial plans collected in 2011, urbanization ratio in the Ciliwung River Basin will increase from 48 % in 2008 to 71 % in 2030. From the results of the runoff analysis conducted by the JCFM Project based on this projected future urbanization ratio, it is estimated that the flood peak discharge will become 1.5 times larger from 480 m^3/s in 2008 to 720 m^3/s in 2030 with 50-year return period at Manggarai Water Gate point.



Source: JCFM Project

Figure 4.1-1 Increase of Flood Peak Discharge due to Urbanization in Ciliwung River Basin (W=1/50)

4.2 Increase of Flood Disaster Risk due to Land Subsidence

<Issue>

- Due to the wide range of land subsidence caused by excess extraction of groundwater, the areas below sea level are expanding mainly in northern area of DKI Jakarta resulting in the degradation of protection functions against high tide and the reduction of urban drainage functions with gravity flow. Therefore, the flood disaster risks increase in the lowland areas due to the high tide and inland water.

<Countermeasure>

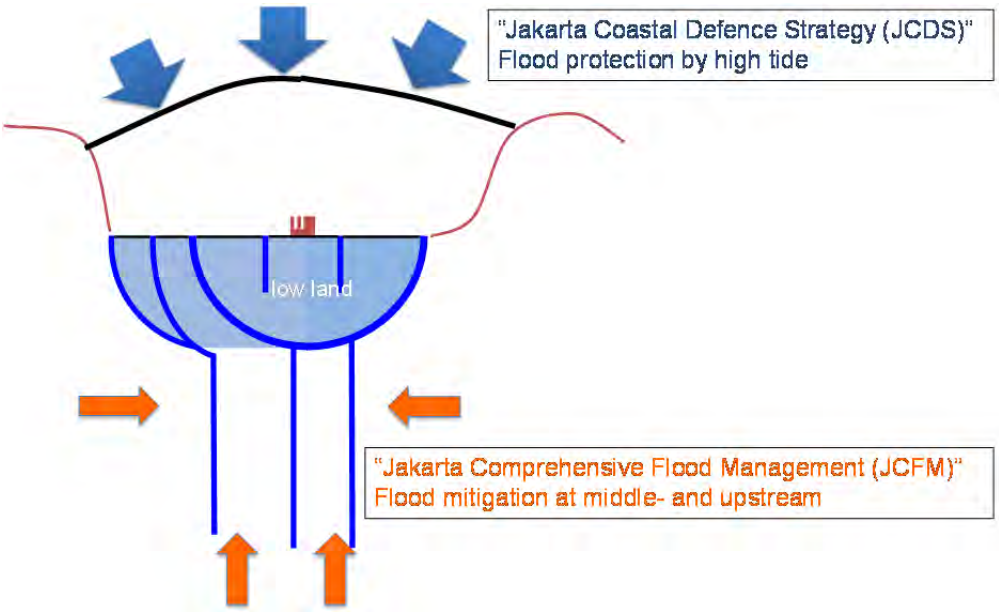
- Through the implementation of the following measures, the flood disaster risks in lowland area will be mitigated:
  - Rehabilitation of drainage facilities to improve the flow capacity of drainage in lowland area
  - Construction of tide wall to protect against high tide
  - Acceleration of groundwater recharge measures against land subsidence
  - Regulation of groundwater extraction
  - Provision of alternative source of water

CHAPTER 5 POLICY FOR FLOOD DISASTER MITIGATION

5.1 Multidisciplinary Approach

For the mitigation of flood disaster in the Ciliwung River Basin and the lowland areas of DKI Jakarta, it is necessary to implement the measures in combination based on the Comprehensive Flood Management Plan (CFMP) targeting the middle and upstream of the Ciliwung River, the Jakarta Coastal Defense Strategy (JCDS)* focusing on the flood protection by high tide, and existing drainage plans for the improvement of drainage flow capacity in the lowland areas.

* Jakarta Coastal Defense Strategy (JCDS) is currently named "National Capital Integrated Coastal Development" (NCICD).



* Jakarta Coastal Defense Strategy (JCDS) is currently named "National Capital Integrated Coastal Development" (NCICD).

Figure 5.1-1 Conceptual Figure of Basic Policy for Flood Disaster Mitigation in Jakarta Metropolitan Area

5.2 Implementation of Comprehensive Flood Management Measures in Ciliwung River Basin

In order to mitigate the flood risks in the Ciliwung River Basin by reducing the flood peak discharge at the upstream from Manggarai Gate, it is necessary to implement the comprehensive flood management measures consisting of flood control measures in the river as well as runoff control in the basin and land use regulation.

The flood control measures such as river improvement, diversion channel and dam construction have high effectiveness for the flood control. However, it might take a long period from the planning stage to the completion, and require a huge investment cost. The Ciliwung River Basin has been struck by a large scale flood every 5 years. Thus, in order to realize the flood mitigation effect urgently, it is necessary to implement the comprehensive flood management measures consisting of structural measures in the river course and the basin as well as non-structural measures.

Structural measures are composed of flood control measures (such as river improvement, diversion channel, dam construction as main measures) and runoff control measures in the river basin (including the installation of rainwater storage and infiltration facility, conservation and rehabilitation of pond (*Situ*), and others). In addition, non-structural measures consist of land use regulation for the

preservation of retention and retarding functions and disaster mitigation measures such as preparation of flood hazard map, improvement of disaster information system and others. The runoff control measures and land use regulation are collectively called as the ”Basin Management”, which will contribute to the water resources conservation and groundwater recharge as well.

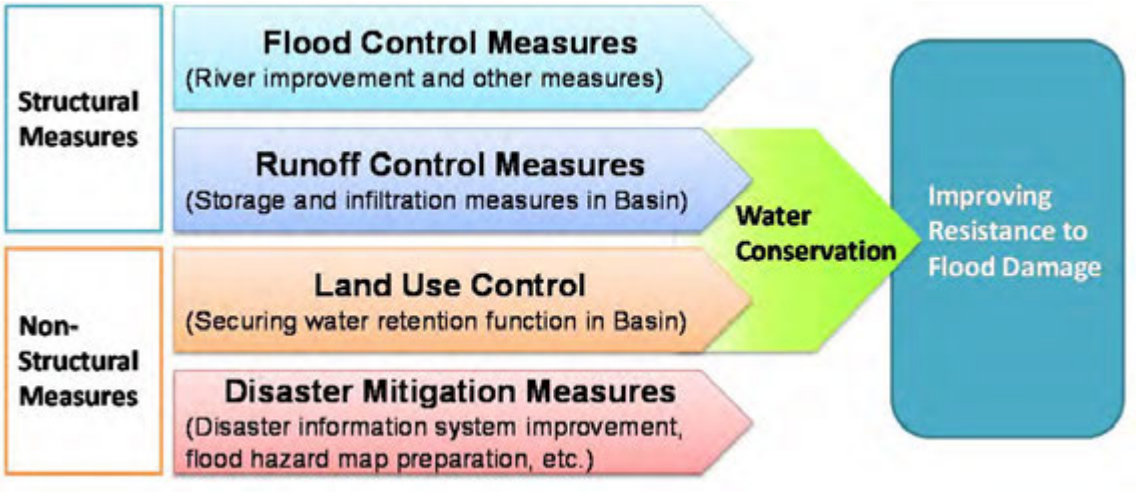


Figure 5.2-1 Conceptual Figure of CFMP

5.3 Targeted Flood in Comprehensive Flood Management Plan (CFMP)

The Comprehensive Flood Management Plan (CFMP) in the Ciliwung River Basin targets the flood disaster occurred by the river water flood in the surrounding area of the Ciliwung River. Besides, the runoff control measures described in the CFMP will function to mitigate the intensive rainwater inflow to the drainage, so that it will contribute to the mitigation of inundation in the sub-basin and drainage.

CHAPTER 6 TARGET OF COMPREHENSIVE FLOOD MANAGEMENT PLAN

6.1 Target Year of Comprehensive Flood Management Plan

The target year of the CFMP is set as 2030 (for next 20 years).

The target year of the spatial plan, Water Resources Management Policy (POLA), Water Resources Management Plan (Rencana), and long-term development plans in Indonesia is set as for 20 years. Thus, target year of the CFMP is approximately for 20 years until 2030 in line with the above plans.

6.2 Target of Structural Measure

6.2.1 Design Reference Point of Flood Control Measures

The unregulated peak discharge for the structural measures is estimated at Manggarai Water Gate point in the Ciliwung River, which is the design reference point of flood control measures.

Manggarai Water Gate point in the Ciliwung River is selected as design reference point for the following reasons:

- It is the exit point of valley section of the Ciliwung River.
- It is located at the immediate upstream of the central part of DKI Jakarta where many important facilities exist.
- There is water level observation station so that sufficient observation data can be collected.

6.2.2 Design Scale

The design scale of the CFMP is equivalent to the unregulated peak discharge caused by 50-year probable rainfall.

The design scale is set as the unregulated peak discharge in the 50-year probable rainfall for the following reasons:

- After the completion of the river improvement based on the current flood control plan, the flood safety level of 25-year return period (temporary target) can be secured.
- Ciliwung River is a major river running down through DKI Jakarta, and flood safety level shall be improved as much as possible.
- However, it might require a long period to achieve flood safety level of 1/100 design scale.
- Probability of the estimated peak discharge of the flood in February 2007 was 1/60 design scale, which is the maximum scale of flood in the past, and almost equivalent to 1/50 design scale.

6.2.3 Unregulated Peak Discharge

The unregulated peak discharge at the design reference point for the structural measures is 720m^3/s.

The unregulated peak discharge is defined as shown in the following flow chart.

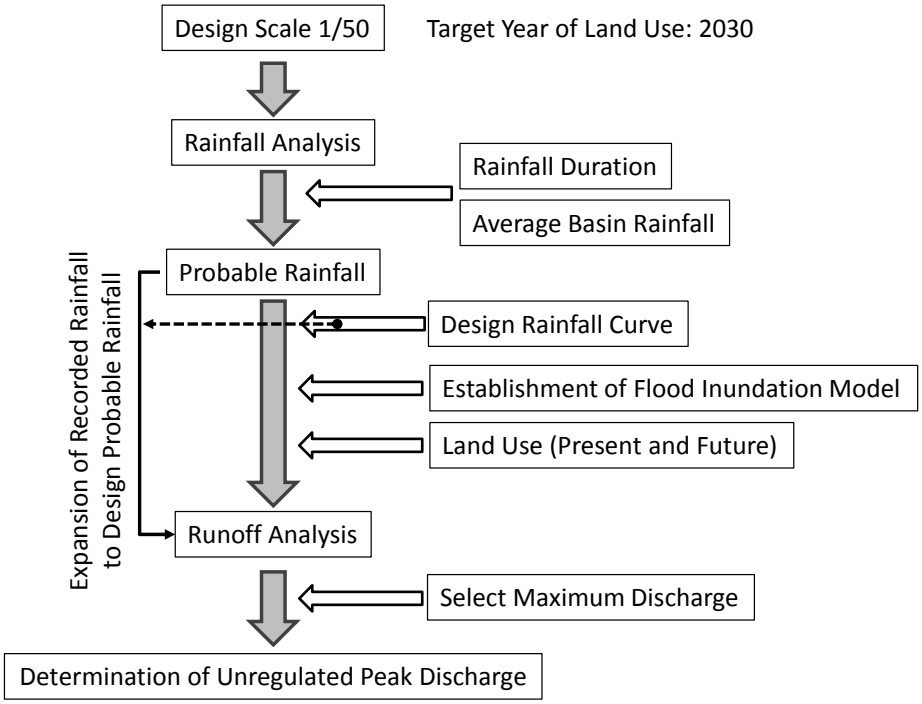


Figure 6.2-1 Workflow for Setting of Unregulated Peak Discharge

a) The rainfall duration is set for 48 hours.

Table 6.2-1 Rainfall Duration and Ratio against Total Rainfall*

Rainfall Duration	24hr	36hr	48hr	60hr	72hr
Ratio	67.4%	80.3%	88.8%	95.4%	99.3%

* Major Foods in 1994-2007

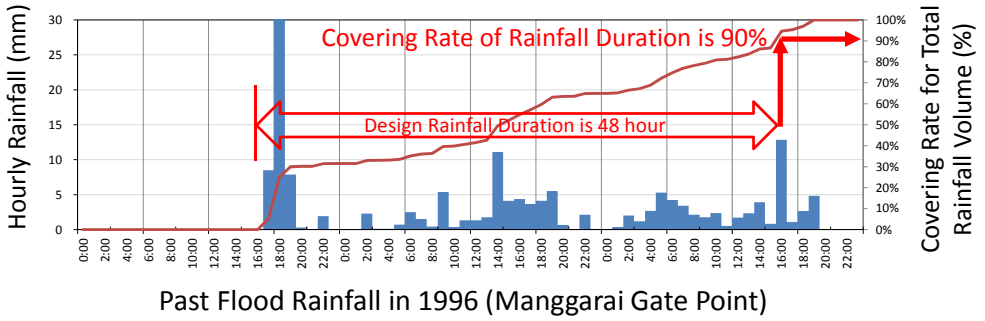


Figure 6.2-2 Relationship between Rainfall Duration and Covering Ratio for Total Rainfall Volume

b) The rainfall curve of flood in February 2007 is applied.

c) Design rainfall volume is set as 247 mm (48-hour average rainfall in the basin, Gumbel distribution)

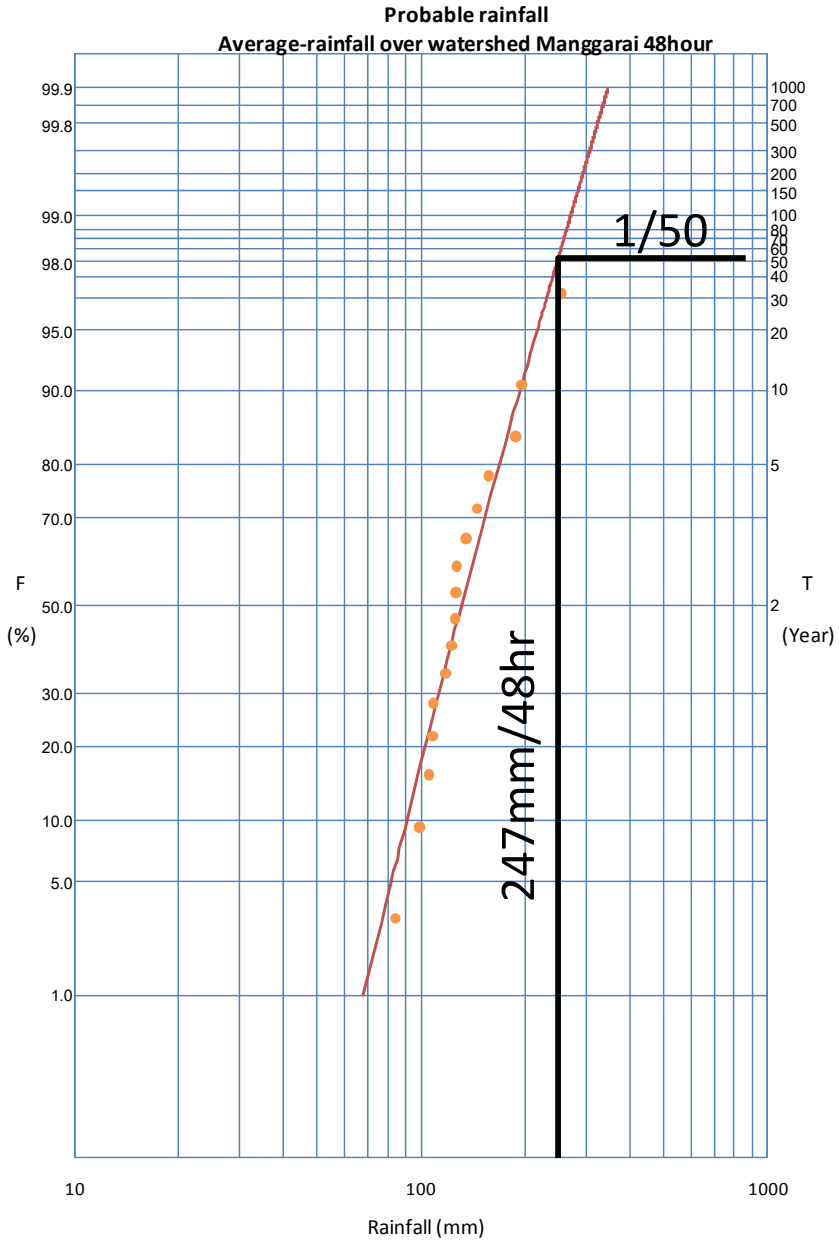


Figure 6.2-3 Rainfall Analysis Result (Design Rainfall at Manggarai Gate Point)

d) For the runoff analysis, the following two models are applied depending on the inundation characters in the Ciliwung River Basin: Distribution Design Flow Model (for consideration of discharge flow by topographic gradient in mountainous and hilly areas in discharge basin) and Two-Dimensional Unsteady Flow Model (describing the distribution of flood water flow in the inundation basin).

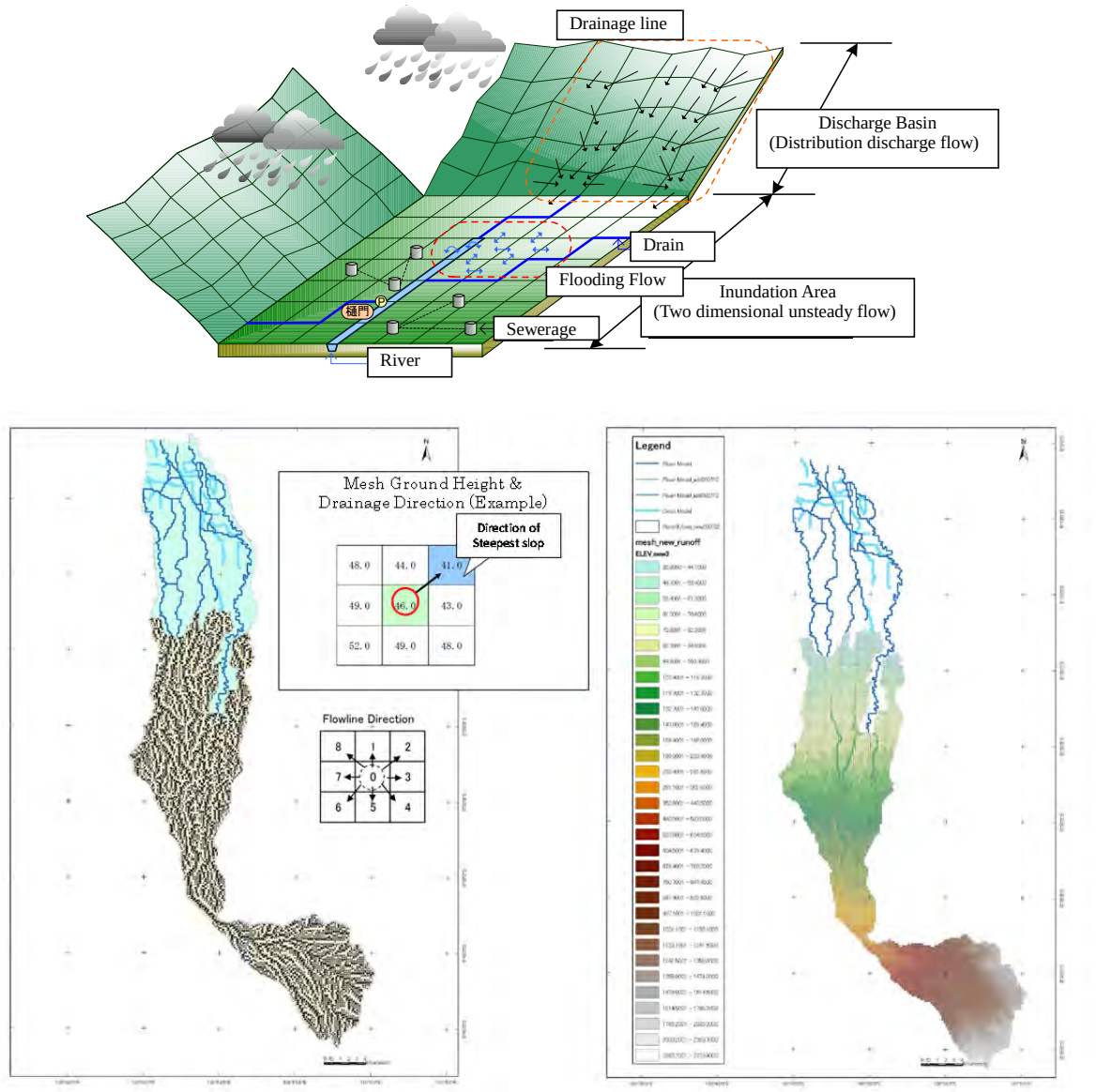


Figure 6.2-4 Conceptual Figure of Runoff Analysis Model

Table 6.2-2 Result of Estimation of Unregulated Peak Discharge

(Unit: m^3/s)

No.	Occurrence Date	Katulampa	Depok	Manggarai Gate	Karet Gate
1	1994/01/20	272	413	387	431
2	2001/02/06	327	498	497	519
3	2006/01/23	341	379	380	397
4	2007/01/30	644	769	**720**	732

Note) land use: as of 2030, inundation condition: no inundation

6.2.4 Control Volume by Structural Measure

The unregulated peak discharge cannot be fully controlled by the existing river facilities and planned measures mentioned in Chapter 3. Therefore, the control volume by structural measures is set as the regulated volume by the new flood control measures estimated by the following procedures.

1) Since the surrounding areas of the West Banjir Canal from the downstream of Manggarai Water

Gate is fully urbanized, it seems difficult to improve the flow capacity. Thus, the flood discharge volume at Manggarai Water Gate point is 500 m^3/s at maximum. This means it is necessary to reduce the 720 m^3/s of unregulated peak discharge to 500 m^3/s at the upstream of Manggarai Water Gate point. The difference between the two discharges is 220 m^3/s (i.e.= 720 – 500 = 220).

2) Considering the reduced volume of 60 m^3/s to be diverted to East Banjir Canal, 160 m^3/s is the control volume that should be regulated by the new flood control facilities (i.e.= 220 – 60 = 160).

3) Besides, at the upstream section from diverting point to the East Banjir Canal in the Ciliwung River, it is necessary to conduct the river improvement to increase the flow capaicty to more than 560 m^3/s.

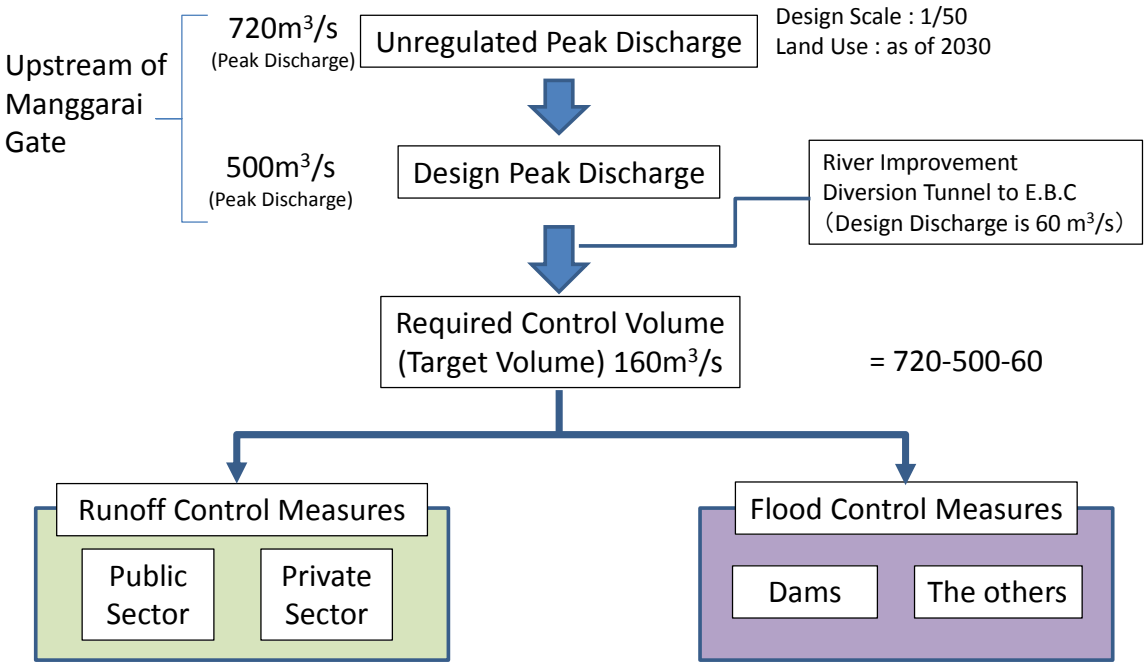


Figure 6.2-5 Required Flood Control Volume by Structural Measures in CFMP

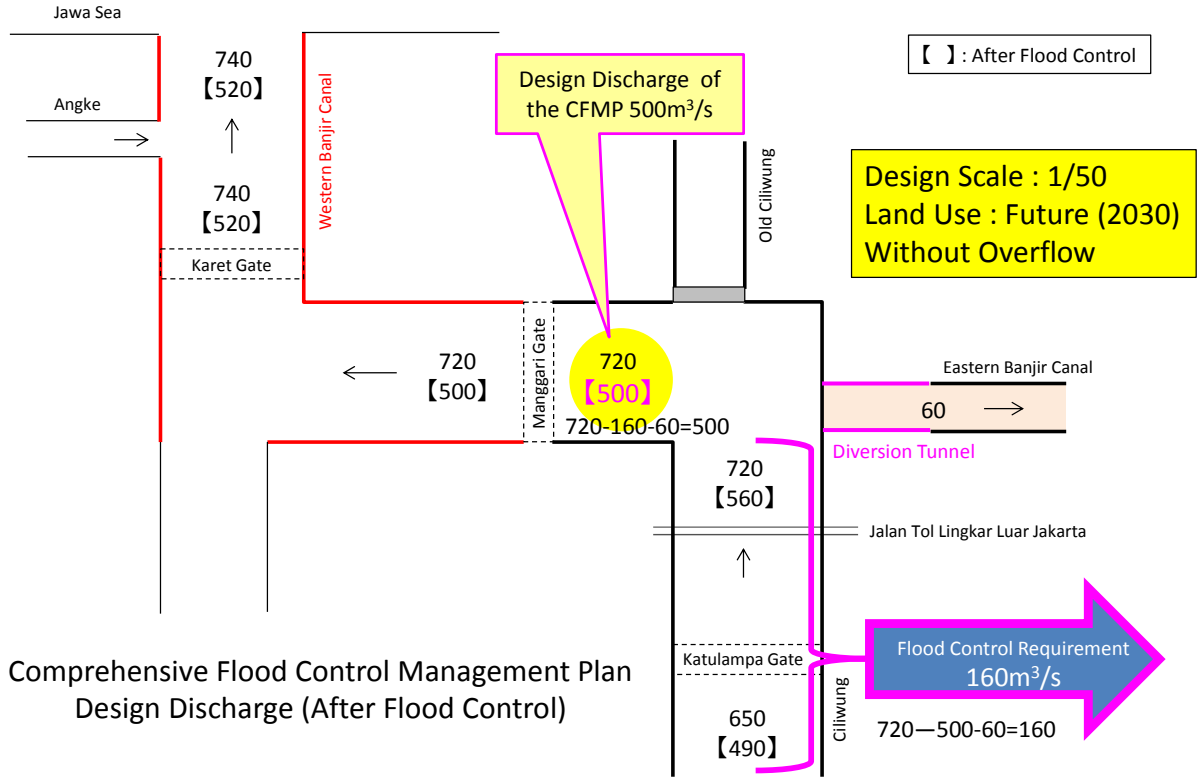


Figure 6.2-6 Allocation of Design Peak Discharge in CFMP

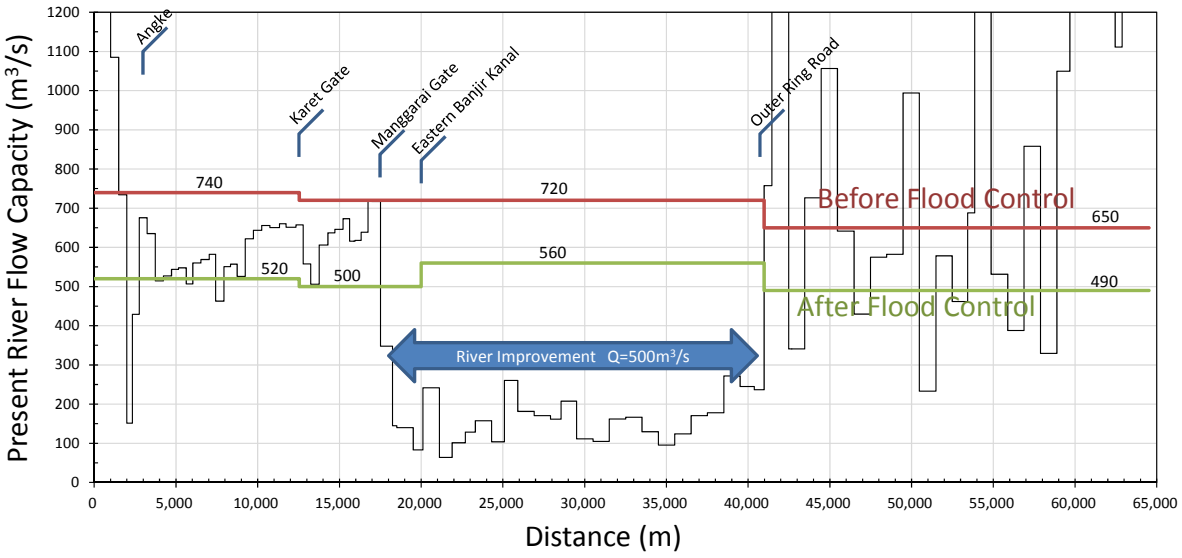


Figure 6.2-7 Present River Flow Capacity and Design Peak Discharge in Ciliwung River

6.2.5 Relation with Existing Flood Control Plan

The relationship between the existing flood control plan and the CFMP in Ciliwung River is summarized as follows.

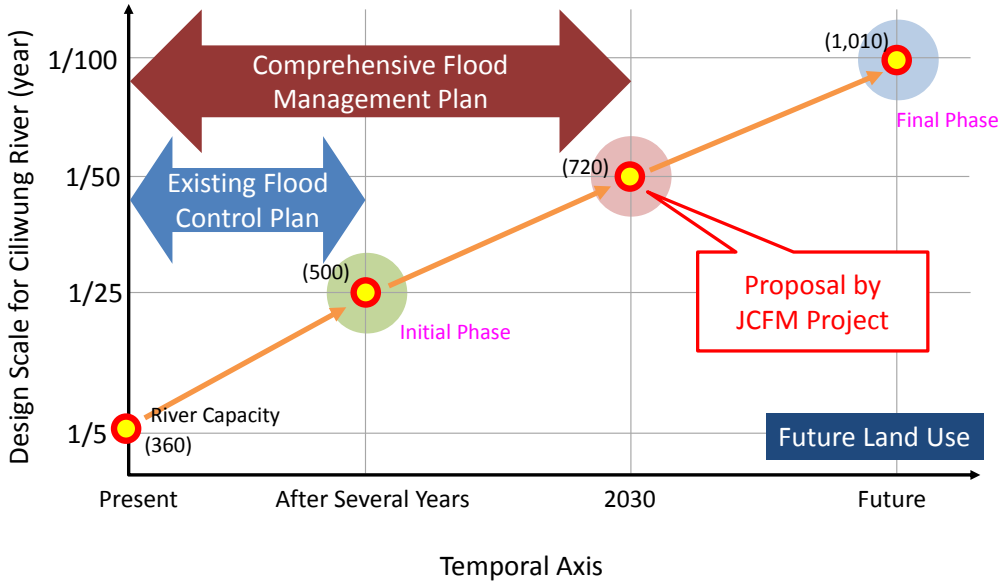


Figure 6.2-8 Design Scale of CFMP for Ciliwung River Basin

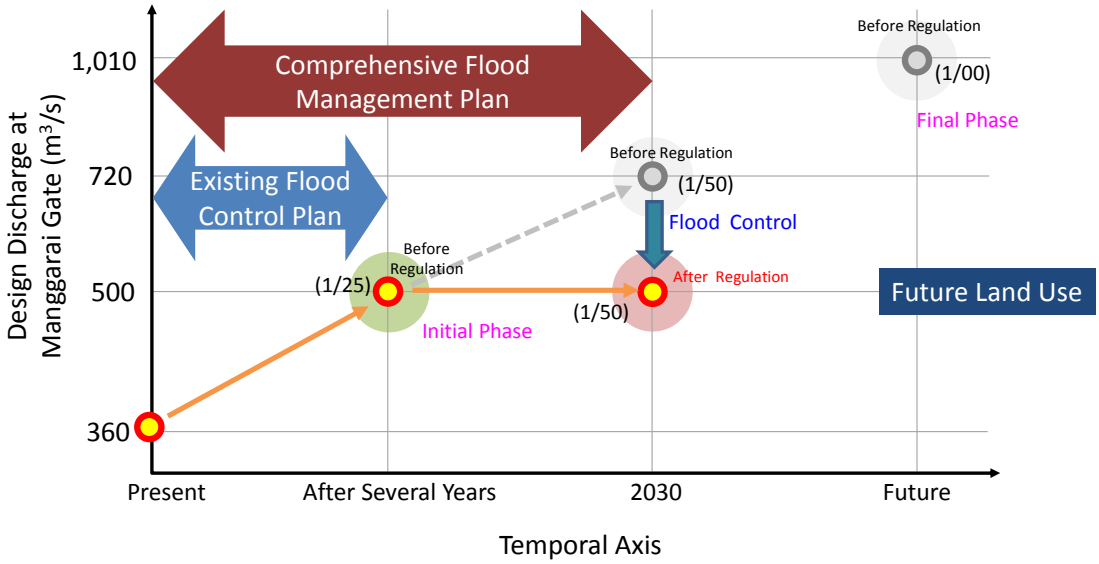


Figure 6.2-9 Unregulated Peak Discharge and Design Peak Discharge at Manggarai Gate Point

Table 6.2-1 Relation between Existing Plan and CFMP

Flood Control Plan	Design Scale (Year)	Peak Discharge at Manggarai Gate Point		Target Year of Land Use
		Unregulated Peak Discharge (before regulated by the flood control facility)	Design Peak Discharge (after regulated by the flood control facility)	
1997 Master Plan (Final Phase)	100	1,010 m^3/s	340 m^3/s	2025
CFMP	50	720 m^3/s	500 m^3/s	2030
1997 Master Plan (Initial Phase)	25	500 m^3/s	500 m^3/s	2025

Note) 1997 Master Plan (final plan) includes the flood control effects by Ciliwung Floodway (600 m^3/s) and diversion to old Ciliwung (75 m^3/s).

CHAPTER 7 FLOOD CONTROL MEASURES IN RIVER COURSE

7.1 Outline of Flood Control Measures in River Course

The flood control measures in the river course proposed in the CFMP are summarized below.

- The control volume of 160 m^3/s at Manggarai Water Gate point set in the previous chapter will be regulated by both flood control measures in the river course and runoff control measures in the basin.
- Based on the applicable flood control facilities with sufficient expected flood control effects in consideration of the topographic features and social and environmental conditions in the Ciliwung River Basin, two alternatives of flood control facilities are selected: large dam and tunnel storage.
- Based on the estimation of flood control effects and rough construction costs for both alternatives, it is realized that comparing to tunnel storage, large dam has sufficient flood control effects at Manggarai Water Gate point with lower investment cost. Moreover, since the proposed site for large dam will be upstream more than tunnel storage, large dam has big advantage in terms of flood control effects in the upstream river. Therefore, in the JCFM Project, the large dam alternative is selected as priority project at the upstream of the Ciliwung River.
- Due to the characteristic of the foundation soil, it is difficult to improve its permeability (less than 2 of Lugeon unit) significantly. Thus, the applicability of dry dam is examined, which temporarily stores the flood discharge.
- In accordance with the existing data on topographic and geological conditions in the proposed site, two alternatives are proposed: alternative (A), one dam construction (Ciawi Dam-1), and alternative (B), two dams construction (Ciawi Dam-2 and Cisukabirus Dam). Even though further studies on geological conditions are required, based on the available data, alternative (B) can be selected to control 130 m^3/s at maximum of the design peak discharge at Manggarai Water Gate point.

7.2 Selection of Flood Control Facility with Large Effect

The alternative flood control facilities consist of gate dam and small dams as well as tunnel storage and large dam. Since the required control volume by structural measures, both flood control measures in the river course and runoff control measures in the basin, at Manggarai Water Gate point is 160 m^3/s, flood control facilities which can regulate approximately 100 m^3/s are extracted. As a result, large dam and tunnel storage are selected as a facility with large effect of flood control at Manggarai Water Gate point.

Table 7.2-1 Selection of Flood Control Facilities with Large Effect

Flood Control Facility		Flood Control Effect	Remarks
Flood Control Dam	Large Dam	Large	Approx. 100 m^3/s (see below)
	Small Dams	Small	Approx. 30 m^3/s (see in Annex-1)
Gate Dam (storage facility in river course)		Small	Approx. 4 m^3/s (see in Annex-1)
Tunnel Storage Facility		Large	Approx. 100 m^3/s (see below)

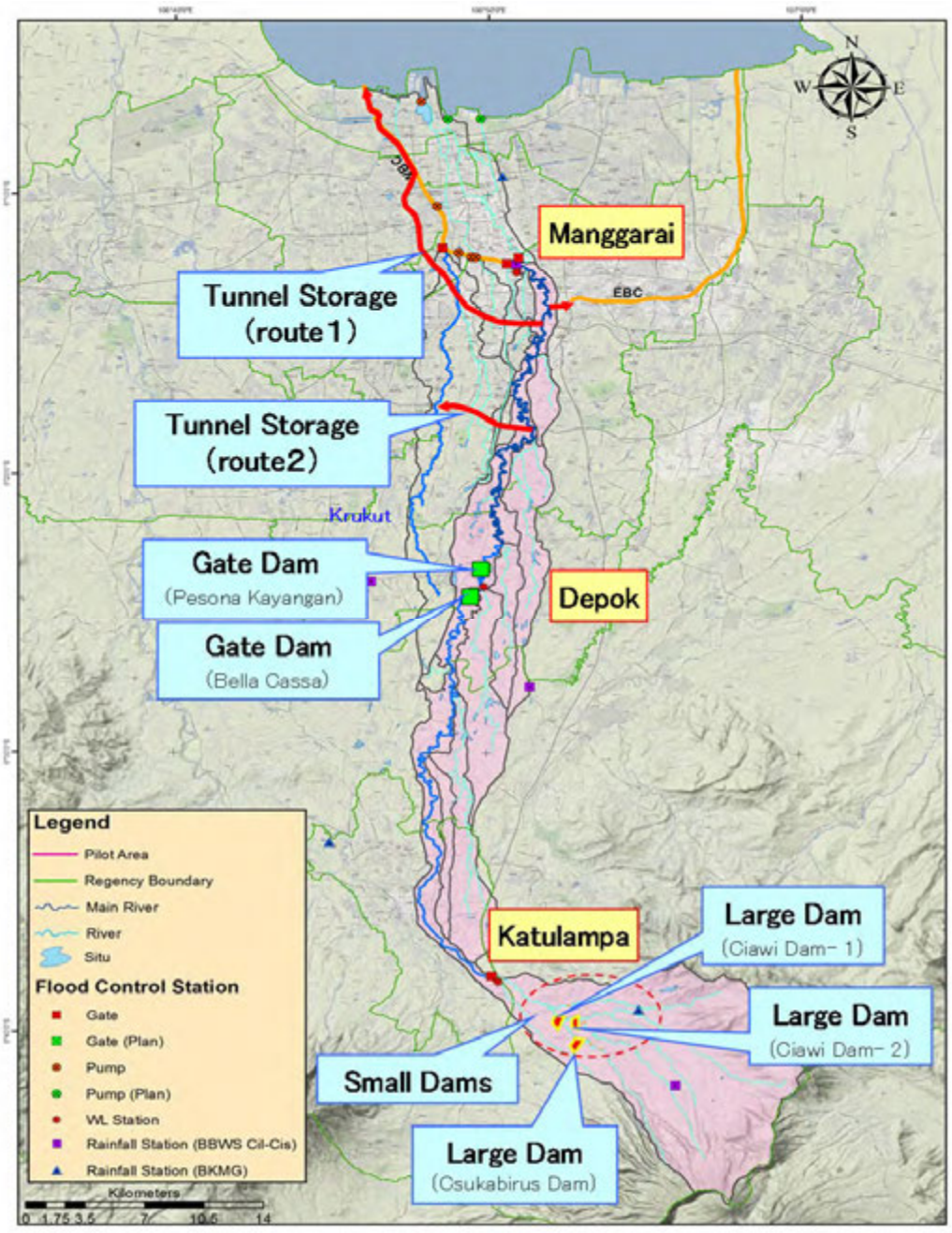


Figure 7.2-1 Locations of Considerable Flood Control Facilities

7.3 Examination of Large Dam

The examination results of the large dam are as follows.

- Based on the examination of the topography, two alternatives are selected considering storage capacity and flood control effect: Alternative (A) of Ciawi Dam-1, and Alternative (B) of Ciawi Dam-2 + Cisukabirus Dam (tributary) (see Figure 7.3-1).
- Based on the available geological data, base rock at dam sites is judged as the Quaternary deposit. The Quaternary deposit has low shear strength, bearing capacity and permeable fracture resistance in general. Thus, based on Japanese dam experiences, the examination of dam height preventing from the permeable collapse of weathered tuff breccia by water pressure concluded that the maximum heights of dam are set as 1) 40 m for the Ciliwung Main River, and 2) 30 m for the Cisukabirus River (see Figure 7.3-2).
- The dry dam is applied for the flood control, considering 1) the possibility of target value for permeability improvement for the temporary storage purpose with the assumption that the permeability of foundation rock is high, and 2) effective utilization of storage capacity by flowing the sediment with water flow to the downstream (see Table 7.3-1).
- By comparing both alternatives, in terms of the flood control effects and required construction cost, Alternative (B) (Ciawi Dam-2 and Cisukabirus Dam) is selected.
- Besides, to secure the water use capacity, it is proposed to construct storage dam at other sites of dry dam through the detail geotechnical investigation.

Based on the existing dam plan, the site survey was carried out on the topographic and geological conditions. As a result, the selected dam site is shown below.

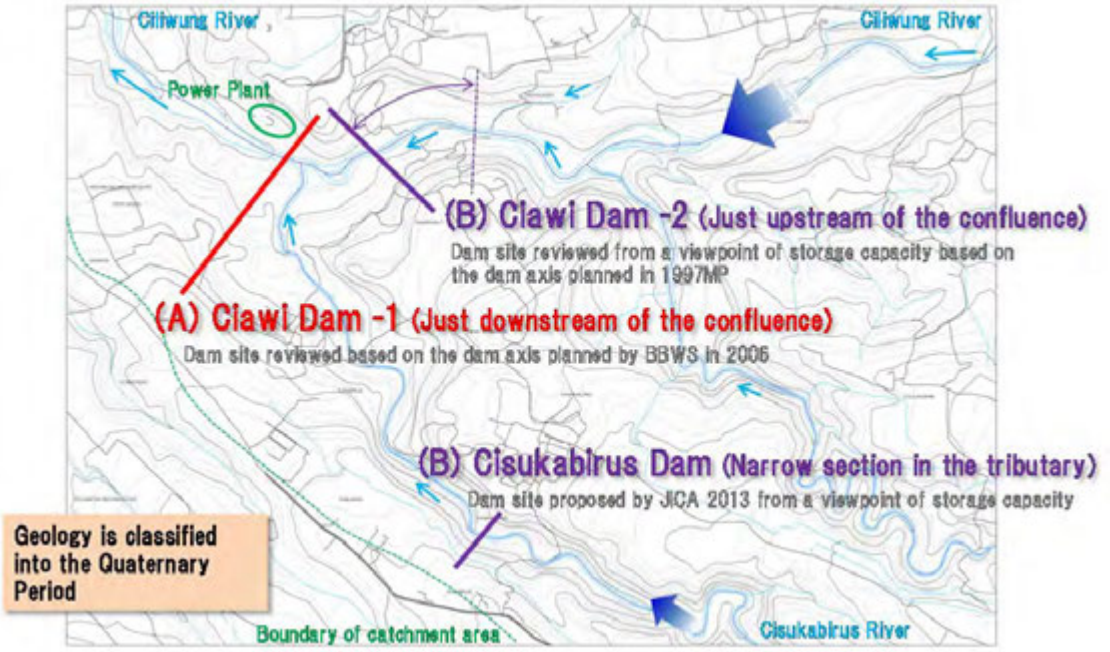


Figure 7.3-1 Locations of Alternatives of Dam Sites

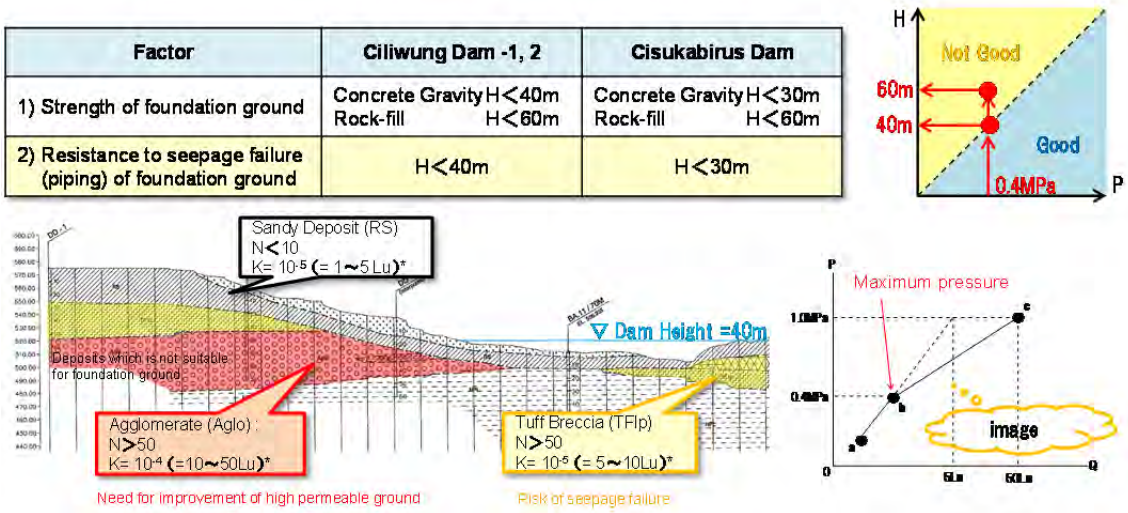
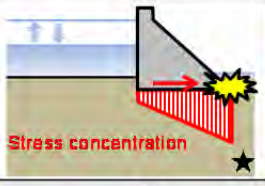
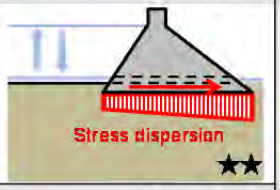
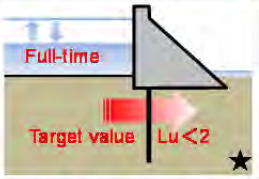
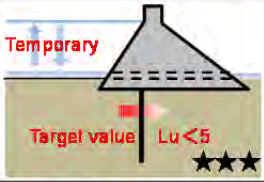


Figure 7.3-2 Examination of Dam Height based on Geology and Permeability at Dam Site

Table 7.3-1 Selection of Dam Type

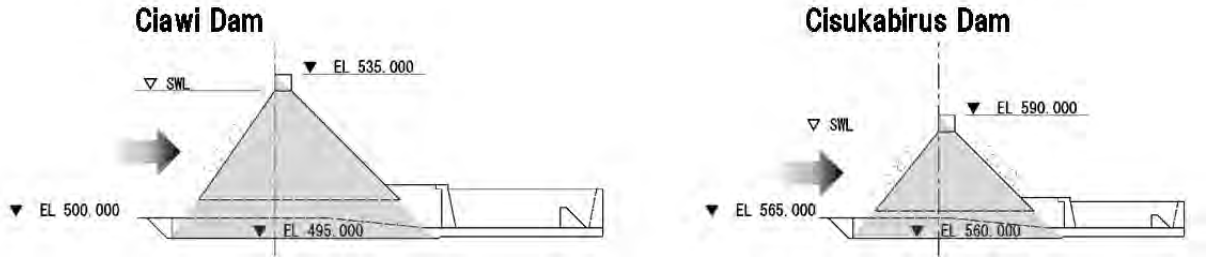
	Storage Dam		Dry Dam
1. Dam Type	Concrete gravity dam	Rock-fill dam	Concrete gravity dam
2. Function	Multi-Purpose ★★★		Only Flood Control ★
3. Water Quality	Affected ★		Not Affected ★★★
4. Sedimentation	Enough capacity for sedimentation needs to be taken into account. ★		Sedimentation can be flushed to downstream ★★★
5. Bearing Capacity and Shear Strength of Foundation	 Stress concentration ★	 Stress dispersion ★★★	 Stress dispersion ★★
6. Target for Permeability Improvement (to minimize water leakage)	 Full-time Target value Lu<2 ★	 Full-time Target value Lu<2~5 ★★	 Temporary Target value Lu<5 ★★★
Evaluation	"Dry Dam" is suitable for these dam sites, because a) target for permeability improvement can be reduced because of temporary water rising and b) storage capacity can be used efficiently since most sediment can be flushed to downstream through openings.		
	★	★★	★★★

Dry dam enables the sediment flow to the downstream from the opening. However, openings of the dry dam can be blocked by boulder stones produced from the upstream riverbed and/or river bank. Thus, it is effective to construct the open type sabo dam to trap the boulder stones at the upstream of the dam reservoir.

Table 7.3-2 Comparative Analysis of Large Dam Type

Item	Unit	Result		
Alternative		(A) Ciawi Dam-1	(B) Ciawi Dam-2 + Cisukabirus Dam	
Dam Height (Max.)	(m)	40.0	40.0	30.0
Dam Volume	(m^3)	438,000	320,000	80,000
Gross Storage Volume	(m^3)	2.607×10^6	3.850×10^6	0.420×10^6
Flood Control Effect				
・Manggarai Gate Point	(m^3/s)	95	130	
・Katulampa Point	(m^3/s)	135	170	
・Dam Point	(m^3/s)	135	150	
			165	20
Project Cost	Million Rp.	2,453,000	2,291,000	
・Construction Cost (Dam)		1,533,000	1,120,000	281,000
・Land Acquisition*		920,000 (36.8ha)	737,500 (29.5ha)	152,500 (6.1ha)
Evaluation			Superior in flood control effect and economic efficiency	

* land acquisition cost is assumed as Rp. 25,000 million/ha.



Necessary survey and study items for planning and design of the dam are as follows:

1) Topographic survey (1/500 scale for dam site, 1/1,000 scale for reservoir)
2) Survey on active fault
3) Survey and analysis for landslide
4) Geotechnical investigation
5) Riverbed material survey
6) Study on dam height, dam type and sabo dam at the upstream of the reservoir

7.4 Examination of Tunnel Storage Facility

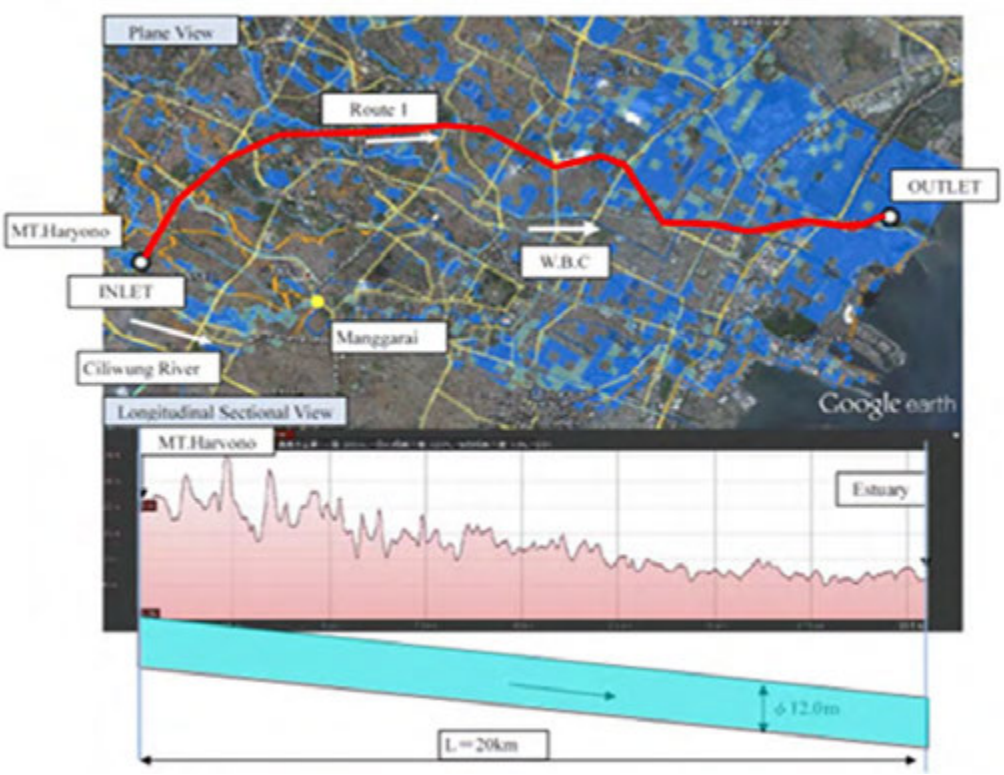
The results of the examination of the tunnel storage facility are summarized below.

- Tunnel storage is a storage facility constructed under arterial roads which store flood discharge and drain it after the flood by pump.
- Two alternatives are selected considering possible storage capacity: Route 1 with L=20.0 km (MT. Haryono - Java Sea) and Route 2 with L=6.1 km (Outer Ring Road - Krukut River).
- Diameter of the tunnel is Φ=12 m based on the experiences of tunnel storage using shield method in Japan.
- Peak cut method is applied for flood control of which storage volume shall meet capacity of tunnel storage (equivalent to 80 % of the tunnel inside volume).
- Tunnel storage requires high cost due to importing of the shield machine and required advanced technology. Route-1 has an advantage for flood control effect.

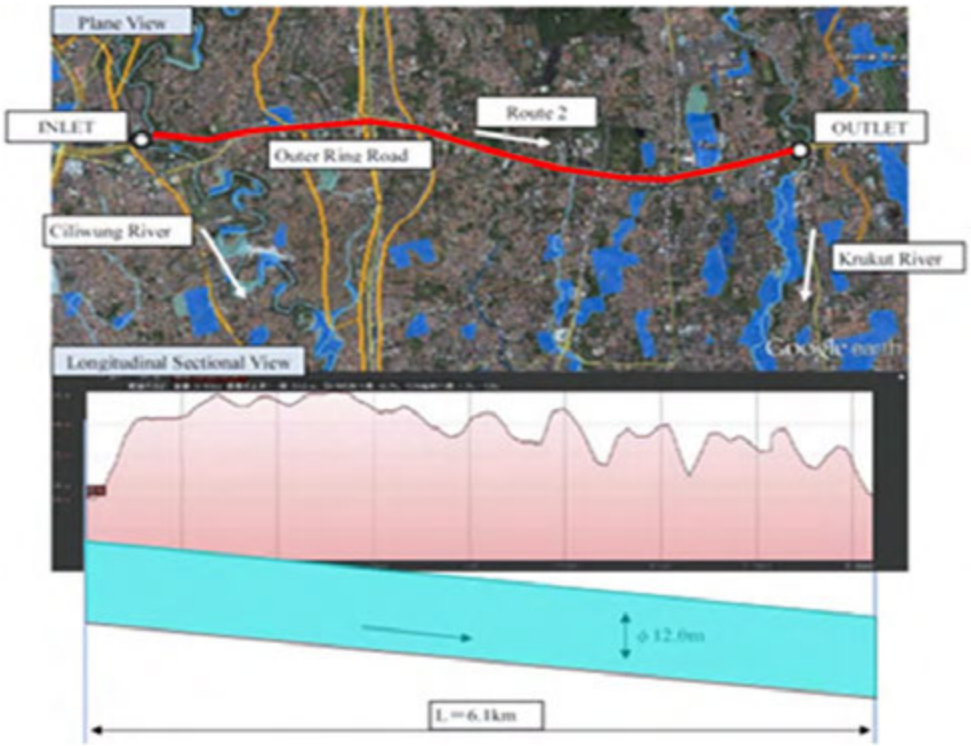
Comparison of basic specifications and location plans of the tunnel storage facility is shown in Table 7.4-1.

Table 7.4-1 Basic Specification of Tunnel Storage

Alternative	Item	Specification
Route 1	Route	MT. Haryono - Java Sea
	Length	L=20.0 km
	Inside Diameter	Φ=12 m
	Storage Capacity	V=1,809,000 m^3
	Flood Control Effect	140 m^3/s (at Manggarai Gate)
Route 2	Route	Outer Ring Road - Krukut River
	Length	L=6.1 km
	Inside Diameter	Φ=12 m
	Storage Capacity	V=550,000 m^3
	Flood Control Effect	65 m^3/s (at Manggarai Gate)



Route 1



Route 2

Figure 7.4-1 Alternative Routes for Tunnel Storage

7.5 Selection of Priority Flood Control Measure in River Course

Alternative (B) of large dam (Ciawi B Dam-2 + Cisukabirus Dam) is selected as the priority flood control measure in the river course for the following reasons:

- Large dam has higher flood control effect with less construction cost compared to tunnel storage facility.
- Dam also has another advantage to have flood control effect at Katulampa point since it is located at upstream in the Ciliwung River.
- Regarding the two alternative dam plans, their combination (Ciawi Dam-2 and Cisukabirus Dam) is advantageous. Flood control effect at Manggarai Gate point is estimated as 130 m^3/s.

Table 7.5-1 Comparison of Flood Control Measures

Item of Evaluation		Dam		Tunnel Storage	
		Ciawi-1	Ciawi-2 + Cisukabirus	Route 1	Route 2
Flood Control Effect (m^3/s)	Manggarai Katulampa	95 135	130 170	140 0	65 0
	Evaluation	☆	☆☆☆	☆☆	-
Economical Efficiency (million Rp)		2,500 ☆☆	2,300 ☆☆☆	9,500 -	3,000 ☆
Ease of Maintenance		☆	☆	-	-
Eco-friendliness		☆	☆	☆☆☆	☆☆☆
Small Socio-economic Impact		☆☆	☆☆	☆☆☆	☆☆☆
Selection for Priority Facility		Flood control effect is relatively small.	High flood control effect and low construction cost.	High construction cost. Flood control effect at Katulampa is 0.	Flood control effect is relatively small.
		☆☆	☆☆☆	☆	☆

CHAPTER 8 RUNOFF CONTROL MEASURES IN THE BASIN

8.1 Outline of Runoff Control Measures in the Basin

The outlines of runoff control measures proposed in the CFMP are summarized as follows.

- In order to minimize the additional runoff discharge from the new development areas in the Ciliwung River Basin, in accordance with the "*zero delta Q*" policy stipulated in the Government Regulation No. 26/2008, all the applicable runoff control measures shall be actively implemented.
- The runoff control facilities are mainly composed of "Rainwater Storage Facility" which temporarily stores the rainwater or river water and gradually flows the stored water to the downstream, "Rainwater Infiltration Facility" which recharges the rainwater into the ground, and "Rainwater Storage and Infiltration Facility" which has the combined functions of both.
- The small scale storage facility does not function to reduce the peak discharge sufficiently since it will be filled by the water before the peak discharge in the 50-year return period rainfall. Therefore, in the CFMP, the Target Volume for the runoff control facility in the Ciliwung River Basin is set based on the rainwater infiltration facility and rainwater storage and infiltration facility to secure the rainwater infiltration even after the facility is filled by the rainwater. The flood control effect of those facilities is estimated at the Manggarai Gate point.
- In accordance with the existing legislatives (Governor Regulation of DKI Jakarta No. 20/2013) and case studies, the applicable Unit Amount and the Target Volume for the installation of runoff control facilities from 2008 to 2030 are estimated. As a result, it is clarified that the expected flood control effect at Manggarai Water Gate point is approximately 70 m^3/s in case that the rainwater infiltration facility and rainwater storage and infiltration facility with the total volume of about 2.9 million m^3/s are installed in the Ciliwung River Basin.

8.2 Outline of Runoff Control Facility

Even though the various runoff control facilities exist, they can be categorized to 2 types: storage facility and infiltration facility.

The storage facility is the facility to control the runoff discharge by storing the rainwater temporarily and releasing the stored water to the downstream gradually. The infiltration facility functions to recharge the rainwater into the ground.

Storage facility is also divided into the following two categories.

- Off-site storage facility which collects and stores rainwater through channel or river
- On-site storage facility which stores rainwater directly consisting of storage facility and infiltration facility

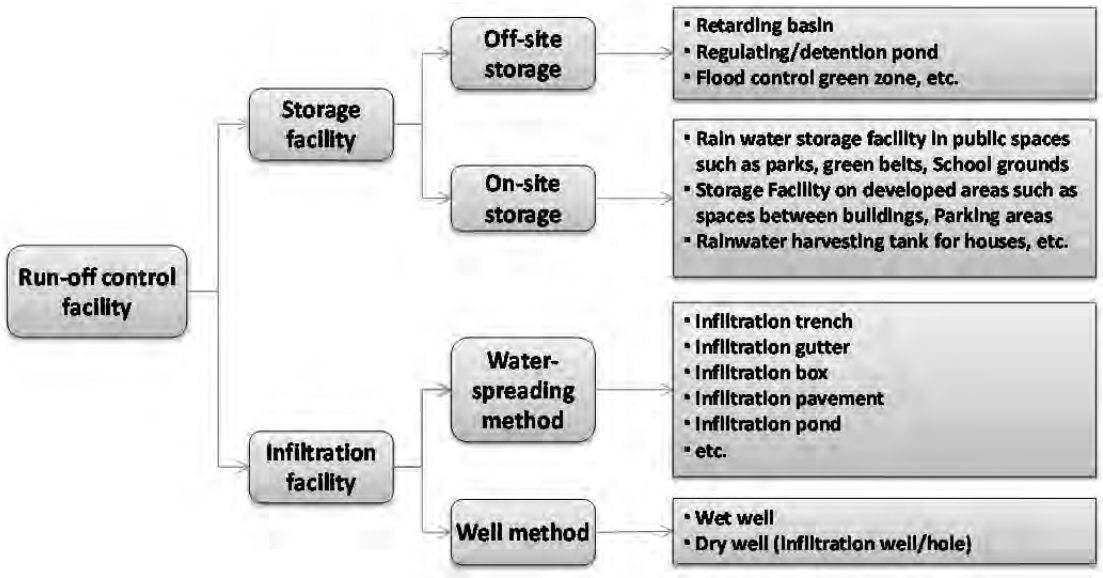


Figure 8.2-1 Runoff Control Facility

The examples of major runoff control facilities are shown below.

Utilized as Tennis Court during Normal Time

Storage Facility in Jakarta

Figure 8.2-2 Examples of Off-site Storage Facility

Example of On-site Storage Facility

Figure 8.2-3 Examples of On-site Storage Facility

Infiltration Inlet and Trench
(Example in Japan)

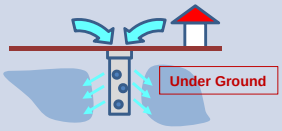
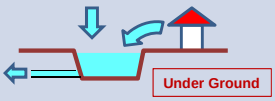
Infiltration Facility
(Example in Bogor)

Figure 8.2-4 Examples of Rainwater Infiltration Facility

8.3 Target Facility for Evaluation of Flood Control Effect in CFMP

The functions of storage facility and infiltration facility are summarized as follows.

Table 8.3-1 Characteristics of Infiltration Facility and Storage Facility

Item	Infiltration Facility	Storage Facility
Schematic Diagram		
1. Major Function	• To reduce the runoff volume by accelerating the infiltration of rainwater to underground. • To contribute to recharge of groundwater	• To reduce the runoff volume by storing the rainfall temporarily.
2. Key Consideration for Planning	The following places needs to be avoided. • A place where water is difficult to infiltrate • A steep terrain where ground may become loose and cause landslide	Except for small facility such as a rainwater harvesting tank, a downstream channel has sufficient flow capacity .
3. Ceiling on Performance	Even if the facility is filled up, the amount of infiltration can be taken into account as runoff control effect.	The facility is effective until it is filled up.
4. Type of Facilities	• Infiltration Well (*Sumur Resapan*) • Infiltration Pond (*Kolam Resapan, Situ*) • Infiltration Hole (*Biopori*) • Rainwater Storage Infiltration Facility proposed by JICA, etc.	[Off-site Facility] • Regulating Pond (Improved *Situ*) • Retarding Basin, etc. [On-site Facility] • Rainwater Harvesting Tank • Storage area at schoolyards and parks (in Japan), etc.
Evaluation Policy of Runoff Control Function	Even if the facility is filled up, the amount of infiltration can be taken into account as runoff control effect. Therefore, runoff control function of the infiltration facility can be considered in the CFMP for the Ciliwung River	With a large scale rainfall in the flood, the storage facilities may be filled up before the peak inflow. Therefore, runoff control function of the storage facilities shall be taken into account only in case of a small-medium scale rainfall with 1 to 10-year return period.

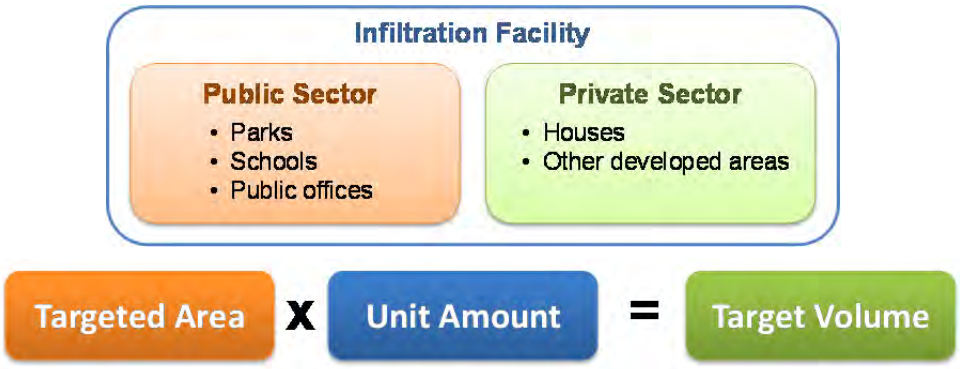
In order to minimize the additional runoff discharge from the new development areas in the Ciliwung River Basin, in accordance with the "zero delta Q policy" stipulated in the Government Regulation No. 26/2008, all the applicable runoff control measures shall be actively implemented.

The small scale storage facility does not function to reduce the peak discharge sufficiently since it will be filled by the water before the peak discharge in the 50-year probable rainfall. Therefore, in the CFMP, the Target Volume for the runoff control facility in Ciliwung River Basin is set based on the rainwater infiltration facility and rainwater storage and infiltration facility to secure the rainwater infiltration even after it is filled by the rainwater. The flood control effect of those facilities is estimated at the Manggarai Water Gate point.

8.4 Target Volume of Infiltration Facility in Ciliwung River Basin

8.4.1 Estimation Method of Target Volume

With assumption that the land use by 2030 is equivalent to the projection set in the existing spatial plans, the target volume of infiltration facility in the Ciliwung River Basin is estimated as follows:.



1) The Target Volume of infiltration facility is set separately for public sector and private sector.
2) Park, school and public offices which have certain open areas are treated as public sector.
3) Houses and other areas to be developed privately are treated as private sector.
4) The target volume per ha is called as "Unit Amount", and the Unit Amount is determined separately for the public sector (public office, parks, school) and the private sector.
5) The available area for the installation of infiltration facility in consideration with the land use until the target year of 2030 is called as the "Targeted Area". The Target Volume is estimated by multiplying the Unit Amount by the Targeted Area.

Target Volumes for public sector and private sector are estimated as follows.

1) Public Sector

- Since the available spaces in park, school and public offices are different for each, the Unit Amount is estimated based on site survey (see Table 8.4-2, Figure 8.4-2 and Table 8.4-3).
- Targeted Area by 2030 is estimated as follows (see Table 8.4-4).
  - Area where infiltration facility can be installed is estimated out of current public sector area.
  - Future public facility area is estimated assuming that population growth rate of each city/regency is same as increasing rate of the public sector.
- Target Volume is estimated by multiplying the Unit Amount by the Targeted Area (see Table 8.4-6).

2) Private Sector

- Residential and other areas to be developed by the private sector are selected as target facility for infiltration facility installation.
- Unit Amount is set based on the Governor Regulation of DKI Jakarta No. 20/2013 on the controlled rainwater volume by infiltration well (*Sumur Resapan*) depending on the roof area of the building (see Figure 8.4-4).
- Targeted Area by 2030 is planned in the development area of the urbanization (urban area and settlement area) from 2008 to 2030 (see Table 8.4-5).
- Target Volume is estimated by multiplying the Unit Amount by the Targeted Area in each local government area (see Table 8.4-7).

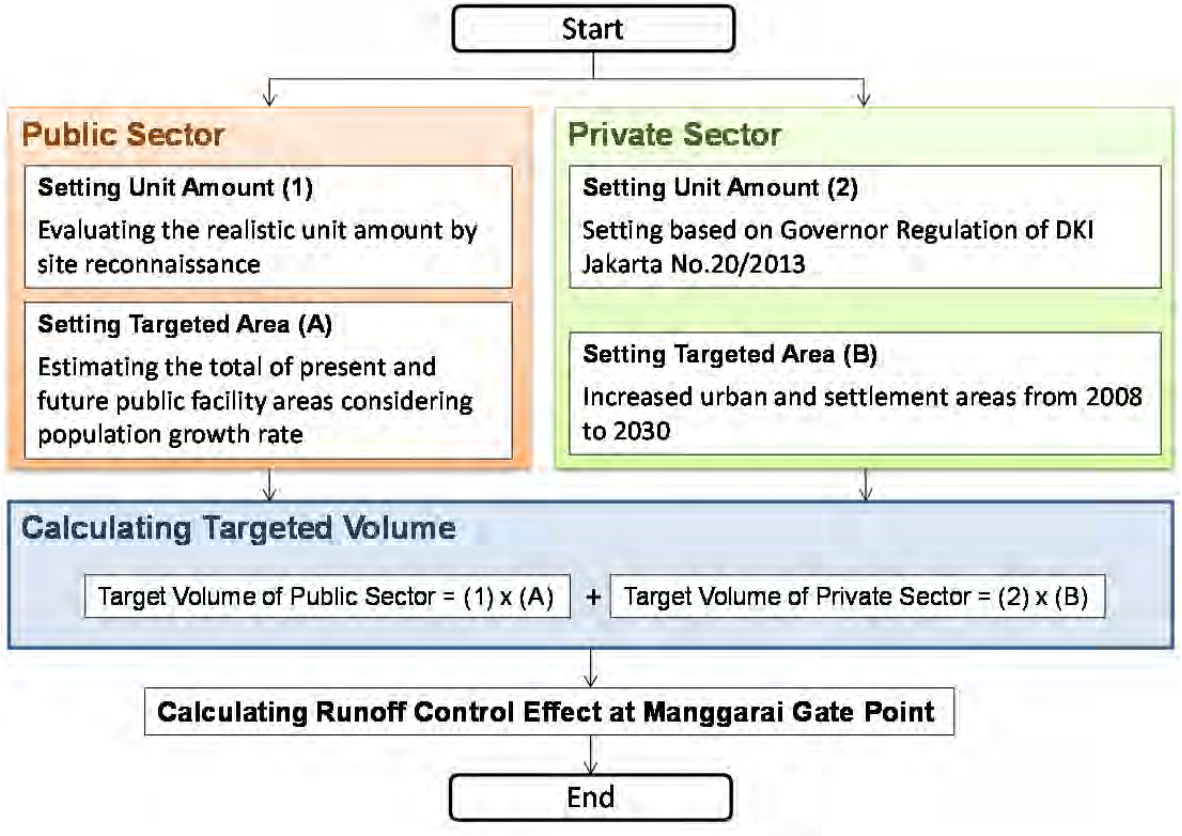


Figure 8.4-1 Workflow of Estimation of Target Volume of Infiltration Facility

Table 8.4-1 Conditions for Estimation of Target Volume of Infiltration Facility

Public Sector	Unit Amount	Based on the site reconnaissance
		School: 140 m^3/ha, Public office: 100 m^3/ha, Park: 150 m^3/ha
	Targeted Area	(Present Area) × (1 + population growth rate by city/regency)
Private Sector	Unit Amount	Based on Governor Regulation of DKI Jakarta No. 20/2013
		280 m^3/ha
	Targeted Area	Increased urban and settlement areas from 2008 to 2030

Table 8.4-2 Estimation of Unit Amount (School: Case Study in South Jakarta)

Name of School	Area (m^2) (a)	Infiltration Well (Number)	Volume for Infiltration Well (m^3) (b)	Unit Amount (m^3/ha) (1)= (b)/(a) x 1,000
SMK NGGERI 30	5,200	7	42	81
SMPN 11	4,800	4	24	50
SMPN 2 SSN	4,000	5	30	75
SMPN 28	4,000	7	42	105
SDN Bambu Apus	5,450	10	60	110
SDN Kp. Tengah	8,480	42	252	297
SDN Percontohan Lubang Buaya	3,830	11	66	172
Average				140

Source: JCFM Project

Figure 8.4-2 Estimation of Unit Amount (Public Building: Case Study in Bogor Regency)

Table 8.4-3 Estimation of Unit Amount (Park: Case Study in South Jakarta)

Name of Park	Area (m^2) (a)	Infiltration Well (Number)	Volume for Infiltration Well (m^3) (b)	Unit Amount (m^3/ha) (1)= (b)/(a) x 1,000
Taman Eks SPBU Jl. Mataram	1,929	4	24	124
Taman Eks SPBU Jl. Mataram	1,285	4	24	187
Taman Rumah Dinas Jabatan Wagub	797	2	12	151
Average				150

Source: JCFM Project

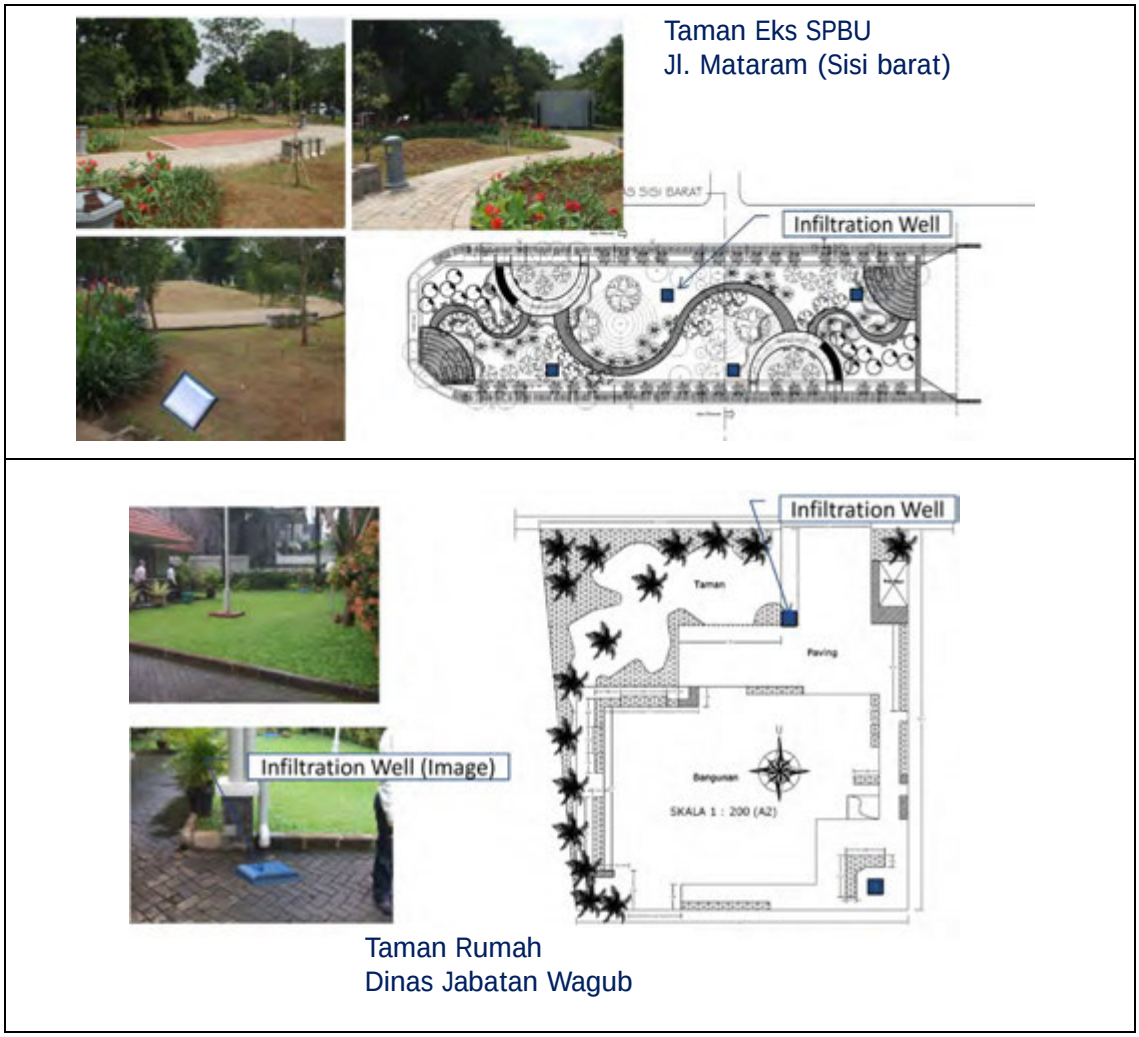


Figure 8.4-3 Layout of Infiltration Facility in Park (Case Study)

- Unit Amount is estimated based on runoff control volume by roof area stipulated in Governor Regulation of DKI Jakarta No. 20/2013.
- Applying 6 m^3 control volume for roof area of 125 m^2, Unit Amount is 288 m^3/ha assuming building coverage ratio of 60 %.

Unit Amount: $V(m^3)/Area(m^2)= 6/(125/0.6)$
$= 288\ m^3/ha \fallingdotseq 280 m^3/ha$

Runoff Control Amount by Roof Area

No.	Roof Area (m^2)	Volume (m^3)
1	= 50	2
2	51 - 99	4
3	100 - 149	6
4	150 - 199	8
5	200 - 299	12
6	300 - 399	16
7	400 - 499	20
8	500 - 599	24
9	600 - 699	28
10	700 - 799	32
11	800 - 899	36
12	900 - 999	40

Figure 8.4-4 Unit Amount of Private Facility

Table 8.4-4 Estimation of Targeted Area for Public Sector by City/Regency

Regencies(Kec, Kota, Kab.)	Present Area (km^2)				Population Growth Rate	Future Area (km^2)			
	Public Offices	Parks	Schools	Total		Public Buildings	Parks	Schools	Total
Jakarta Pusat	0.037	2.037	0.088	2.162	1.303	0.048	2.654	0.115	2.818
Jakarta Timur	0.022	1.363	0.472	1.858	1.303	0.029	1.777	0.615	2.421
Jakarta Selatan	0.061	2.661	1.961	4.683	1.303	0.079	3.467	2.556	6.102
Kota Depok	0.052	0.186	0.924	1.162	1.128	0.059	0.210	1.043	1.311
Kab. Bogor	0.081	0.561	0.232	0.874	1.121	0.090	0.629	0.261	0.980
Kota Bogor	0.046	0.088	0.209	0.343	1.096	0.051	0.096	0.229	0.375
Total in Basin	0.299	6.896	3.887	11.082	1.232	0.357	8.832	4.817	14.006

Table 8.4-5 Estimation of Targeted Area for Private Sector by City/Regency

Regencies	Urbanization Area（km^2）		
	2008 (at Present)	2030 (in future)	Increasing Area
Jakarta Pusat	21.630	21.630	0.000
Jakarta Timur	17.990	20.114	2.124
Jakarta Barat	8.800	8.800	0.000
Jakarta Selatan	71.610	73.374	1.764
Jakarta Utara	9.560	9.560	0.000
Kota Depok	40.930	58.823	17.893
Kab. Bogor	18.300	80.944	62.644
Kota Bogor	33.660	44.756	11.096
Total in Basin	222.480	318.001	95.521

Table 8.4-6 Estimation of Target Volume of Infiltration Facility for Public Sector by City/Regency

Item		Jakarta Pusat	Jakarta Timur	Jakarta Selatan	Kota Depok	Kab. Bogor	Kota Bogor	Total Basin
Target Area (m^2)	Public offices	48,472	29,187	79,222	58,769	90,465	50,690	356,805
	Parks	2,654,195	1,776,582	3,466,680	209,884	628,699	96,135	8,832,174
	schools	114,958	614,843	2,555,651	1,042,517	260,585	228,562	4,817,116
Unit Amount (m^3/ha)	Public Offices	$100m^3$/ha						
	Parks	$150m^3$/ha						
	schools	$140m^3$/ha						
Target Volume (m^3)	Public offices	480	290	790	580	900	500	3,540
	Parks	39,810	26,640	52,000	3,140	9,430	1,440	132,460
	schools	1,600	8,600	35,770	14,590	3,640	3,200	67,400
	Total	41,890	35,530	88,560	18,310	13,970	5,140	203,400

Table 8.4-7 Estimation of Target Volume of Infiltration Facility for Private Sector by City/Regency

Item		Jakarta Pusat	Jakarta Timur	Jakarta Selatan	Kota Depok	Kab. Bogor	Kota Bogor	Total Basin
Target Area (km^2)	Settlement	0.000	1.184	1.646	6.734	51.708	7.781	66.223
	Urban	0.000	0.940	0.118	11.159	10.936	3.315	2.585
	Total	0.000	2.124	1.764	17.893	62.644	11.096	95.521
Unit Amount (m^3/ha)		$280m^3$/ha						
Target Volume (m^3)		0	59,500	49,400	501,000	1,754,000	310,700	2,674,600

Table 8.4-8 Estimation of Target Volume of Infiltration Facility by City/Regency

Item		Jakarta Pusat	Jakarta Timur	Jakarta Selatan	Kota Depok	Kab. Bogor	Kota Bogor	Total Basin
Target Volume (m^3)	Public facilities	41,890	35,530	88,560	18,310	13,970	5,140	203,400
	Private Facilities	0	59,500	49,400	501,000	1,754,000	310,700	2,674,600
	Total	41,890	95,030	137,960	519,310	1,767,970	315,840	2,878,000

8.4.2 Flood Control Effect by Runoff Control Facility

<Summary>

- By installing a number of rainwater storage and infiltration facilities including infiltration well (*Sumur Resapan*) whose total target volume is equivalent to 2,878,000 m^3 in the Ciliwung River Basin, the runoff control volume at Manggarai Water Gate point will be approximately 70 m^3/s.

<Explanation>

In accordance with the following method, the runoff control volume at Manggarai Water Gate point is estimated through the installation of a number of rainwater storage and infiltration facilities in the Ciliwung River Basin with infiltration volume of 2,878,000 m^3 in total (equivalent to the target volume in previous section).

(1) Runoff Calculation

a) It is assumed that most of the rainwater storage and infiltration facilities to be installed in the Ciliwung River Basin are infiltration well (*Sumur Resapan*). In addition, those wells are collectively simplified as one large rainwater infiltration facility which equally infiltrates the rainwater from the ground in the whole basin.

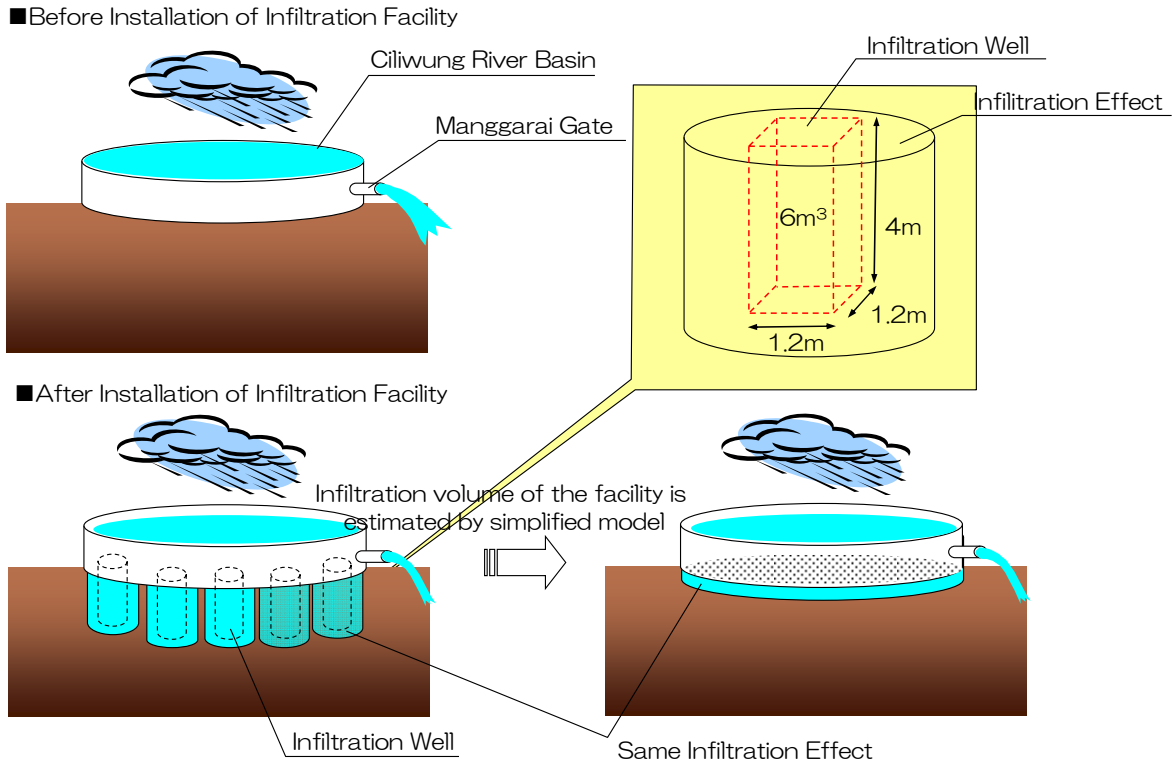


Figure 8.4-5 Conceptual Diagram for Evaluation of Runoff Control Effect by Several Infiltration Wells in the Basin

b) 24-hour infiltration volume by the above simplified facility (V_{p24}) is estimated based on the rainfall amount to be infiltrated from the ground (R_p) and basin area (A) as follows.

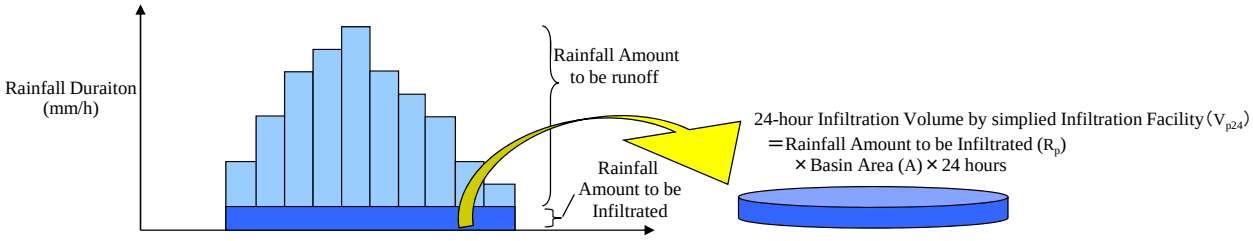


Figure 8.4-6 Estimation of 24-Hour Infiltration Volume by Simplified Rainwater Infiltration Facility

c) Several cases of rainfall amount to be infiltrated are assumed, and the runoff calculation is conducted for each case. Moreover, the relations among the following coefficients are examined: rainfall amount to be infiltrated (R_p), 24-hour infiltration volume by simplified infiltration facility (V_{p24}), runoff control volume at Manggarai Water Gate (Q_r), and controlled volume at Manggarai Water Gate (V_r). The controlled volume at Manggarai Water Gate is equivalent to the 24-hour discharge volume including the occurrence time of peak discharge.

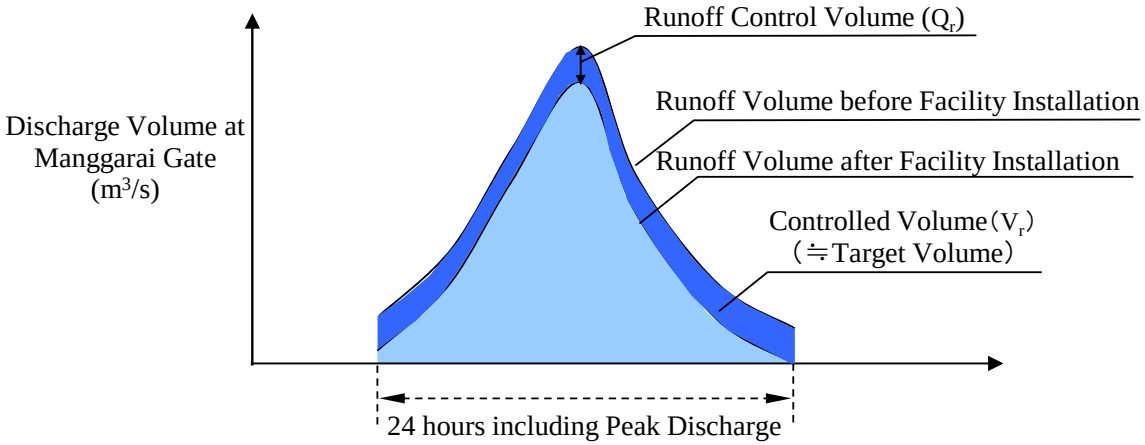


Figure 8.4-7 Conceptual Diagram of Runoff Control Effect by Infiltration Well

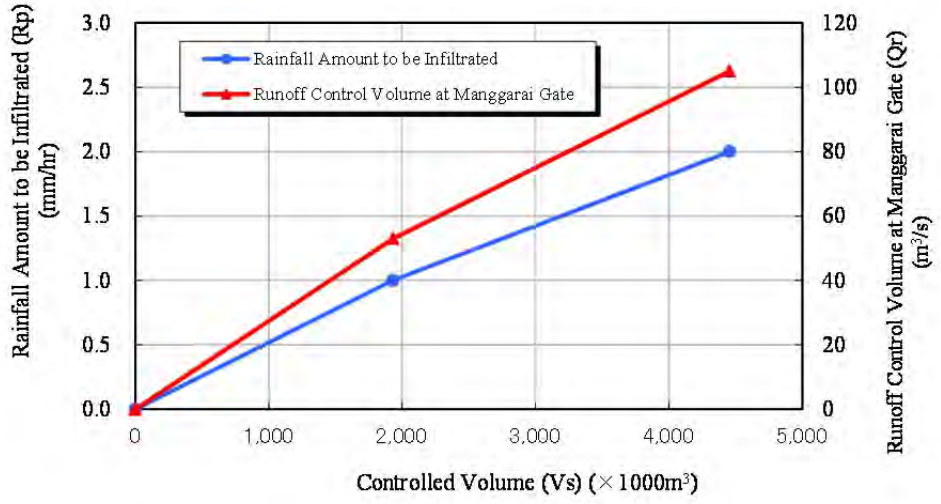


Figure 8.4-8 Relation between Runoff Control Volume at Manggarai Gate Point and Rainfall Amount to be Infiltrated

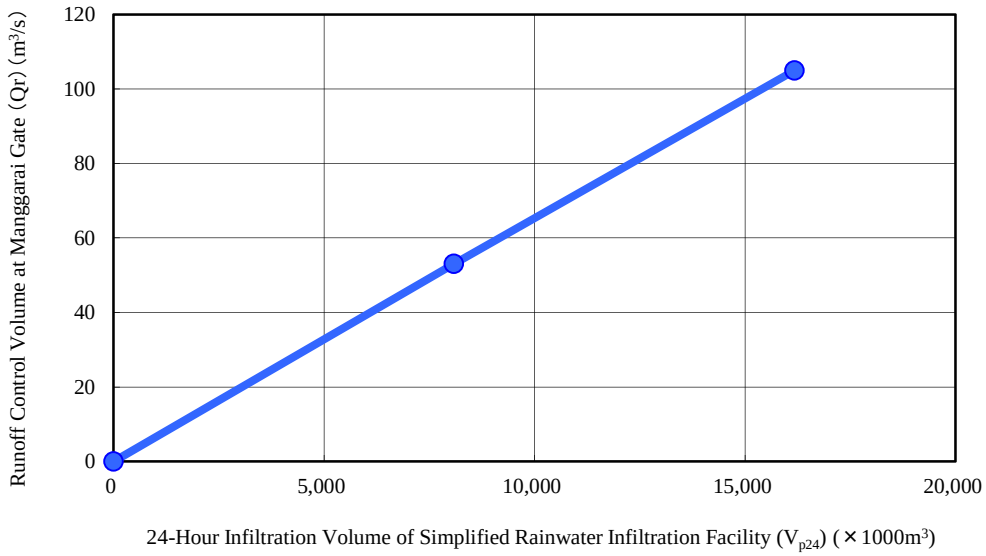


Figure 8.4-9 Infiltration Volume by Simplified Facility and Runoff Control Volume at Manggarai Gate Point

(2) Estimation of Runoff Control Volume

a) In case that the target volume of rainwater storage and infiltration facilities to be installed in the Ciliwung River Basin as set previously (2,878,000 m^3) is filled by the rainwater, it is considered the total controlled volume at Manggarai Water Gate (V_r) will be equivalent to this volume. Therefore, based on Figure 8.4-8 and calculation, the runoff control volume at Manggarai Water Gate (Q_r) is estimated as "Q_r = 72 m^3/s", which is equivalent to 2,878,000 m^3 of runoff control volume (see Table 8.4-9).

(3) Confirmation of Infiltrated Volume by Rainwater Storage and Infiltration Facility

a) With the assumption that all the facilities are infiltration well, based on the average size and infiltration volume, the total infiltration volume from inside of infiltration well to surrounding underground areas is estimated by the following formula.

Total Infiltration Volume (V_f) = 2,878,000 m^3 (target volume) / 6 m^3 (volume of each infiltration well)
x 1.48 m^3 (permeability of each infiltration well*) x 24 hours

* permeability of each infiltration well is surveyed by JCFM project.

b) It is confirmed that the estimated total infiltration volume (V_f) is larger than the 24-hour infiltration volume by simplified rainwater infiltration facility (V_{p24}) which is equivalent to runoff control volume at Manggarai Water Gate (Q_r) estimated based on Figure 8.4-8 (see Table 8.4-9).

Table 8.4-9 Flood Control Effect by Runoff Control Facility

	Target Volume (×1,000m3)	Rainfall Amount to be Infiltrated (Rp) (mm/h)	Runoff Control Volume at Manggarai Gate (Qr) (m3/s)	Required Volume for Infiltrated Rainfall（Rp) (Vp24) (×1000m3)	Total Infiltration Volume (V_f) (×1,000m3)	Total Infiltration Volume (V_{p24}) > Required Infiltration Volume (V_f)
Rainwater Infiltration/Storage Facility	2,878	1.4	72	11,326	17,038	O.K.

8.5 Target for Installation of Storage Facility and Infiltration Facility per Unit Amount

In order to plan the installation of runoff control facility in a catchment area, the total facility volume shall be targeted as 500 m^3/ha.

According to the Japanese standard, the targeted volume for the installation of storage facility and infiltration facility in a developed catchment area is as follows. The targeted volume is set from the viewpoint of the realistic volume in the developed land.

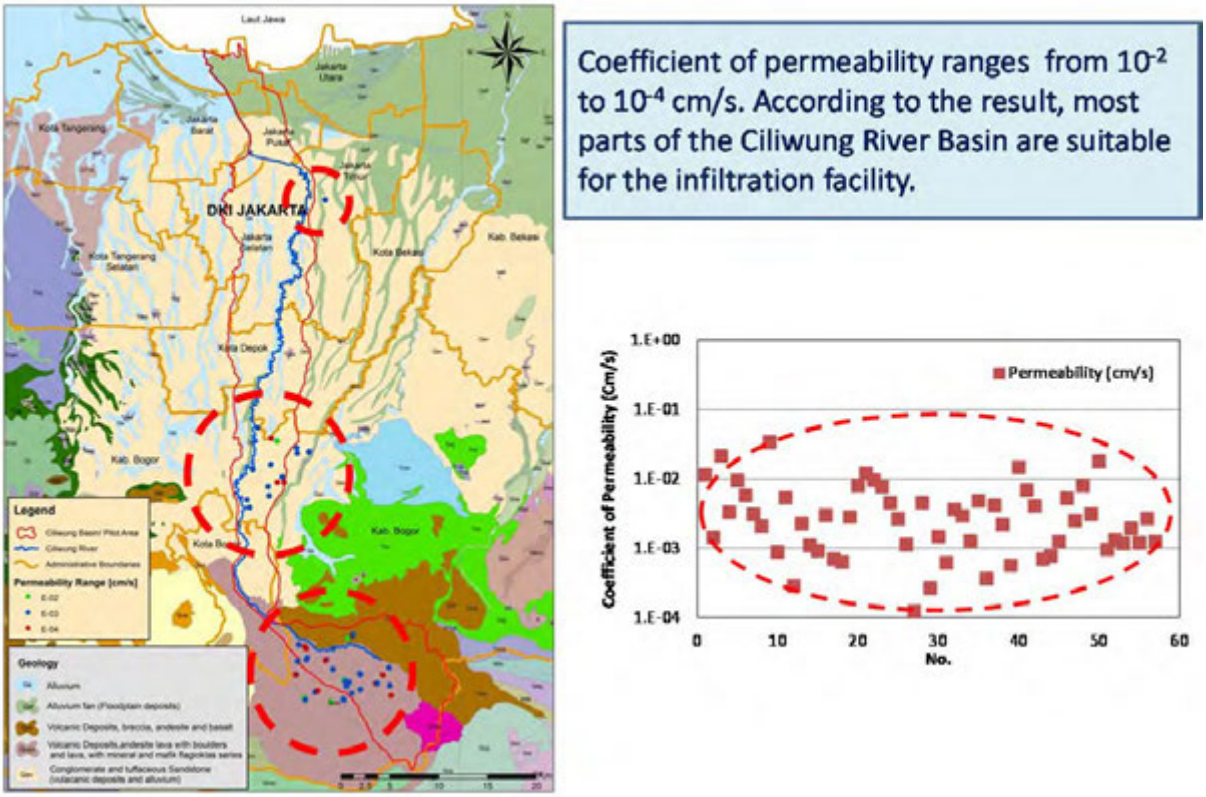
Table 8.5-1 Japanese Standard of Targeted Volume for Storage/Infiltration Facility

Catchment Area (ha)	0.05	0.10	0.30	0.50	1.00	>1.0
River Name						
Draft Guideline by *Cipta Karya* [1)]	1,200 m^3/ha					
Nakagawa&Ayase River	No Regulation	500 m^3/ha				950 m^3/ha
Shingashi River	No Regulation	500 m^3/ha				950 m^3/ha
Sakai River (Kanagawa)	No Regulation	Depend on Regulation for each Municipal/City				
Turumi River	No Regulation	600 m^3/ha				
Shinkawa River	600 m^3/ha					
Sakai River (Aichi)	600 m^3/ha					
Yamato River	No Regulation				300 m^3/ha	585 m^3/ha
Ina River	No Regulation					600 m^3/ha
Neya River	No Regulation	300 m^3/ha	400 m^3/ha			600 m^3/ha

Source:
1) Pedoman Teknis Pengelolaan Genangan Air Hujan pada Lingkungunan Bangunan Gedung (Draft), Directorate General of Human Settlements, 2010
2) Ministry of Land Infrastructure, Transportation and Tourism, Japan

8.6 Applicable Area for Installation of Rainwater Storage and Infiltration Facility

The installation location of infiltration well will be determined through the investigation of groundwater level and permeability in accordance with existing technical standard (Indonesian National Standard: SNI 03-2453-2002 for planning method of rainwater infiltration well in settlement areas). Besides, based on the survey results on the ground permeability in the Ciliwung River Basin conducted by the JCFM Project, it was identified that most areas in the basin are suitable for the installation of rainwater storage and infiltration facility.



Source: JCFM Project

Figure 8.6-1 Result of Permeability Test in Ciliwung River Basin

CHAPTER 9 FLOOD MITIGATION EFFECT BY COMPREHENSIVE FLOOD MANAGEMENT PLAN

9.1 Flood Mitigation Effect by Comprehensive Flood Management Plan

Proposed structural measures as flood control and runoff control measures in the CFMP and its effects at Manggarai Water Gate point are summarized as follows.

Proposed Measures

- Design peak discharge of 720 m^3/s (1/50 years design scale) at the flood control point (immediate upstream of Manggarai Water Gate) will be reduced to 500 m^3/s.
- River improvement between Manggarai Water Gate and Outer Ring Road (L=23.8 km) targeting 500 m^3/s, and additional gates for both Manggarai Water Gate and Karet Water Gate are implemented.
- Diversion tunnel to the East Banjir Canal with diversion capacity of 60 m^3/s is implemented.
- As the flood control measure, construction of the large dams (Ciawi Dam-2 and Cisukabirus Dam: dry dam with total control volume of 130 m^3/s) is proposed.
- As the runoff control measure, rainwater storage and infiltration facility (total runoff control volume of approximately 70 m^3/s) is proposed.

Effect of Measures

- After the implementation of the CFMP, water level at Manggarai Water Gate point will become lower by 1.1 m. By this mean, flood disaster caused by river water flood will be drastically reduced.

Table 9.1-1 Effects of Flood Control and Runoff Control Measures by CFMP

Item	Reduction of Peak Discharge at Manggarai Gate Point
Runoff Control Measure in Basin	Approximately 70 m^3/s
Flood Control Measure in River (Flood Control Dam)	Approximately 100 m^3/s (95-130 m^3/s depends on dam site)
Total	170 m^3/s
Comparison with Required Additional Flood Control Capacity (160 m^3/s)	OK

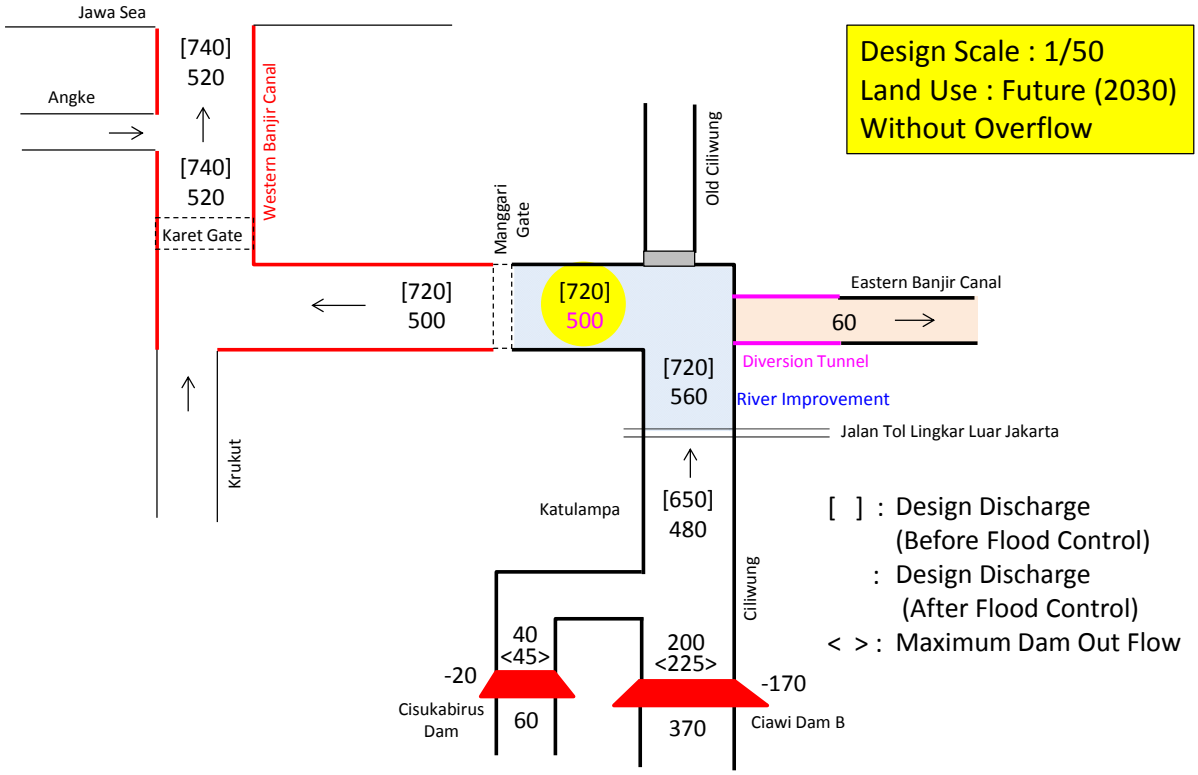


Figure 9.1-1 Design Peak Discharge Allocation of CFMP

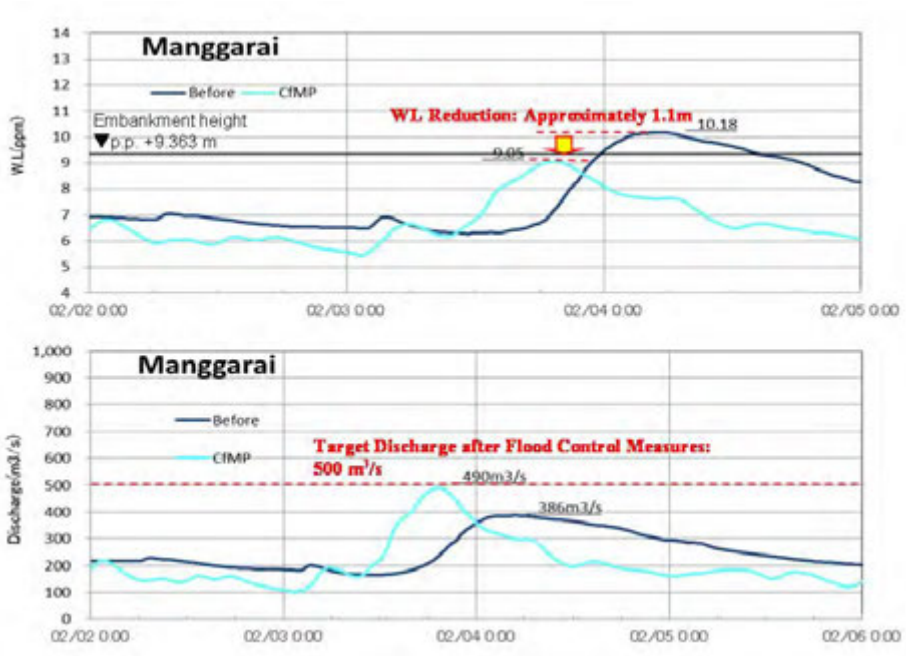


Figure 9.1-2 Flood Control Effect after Implementation of CFMP at Manggarai Gate

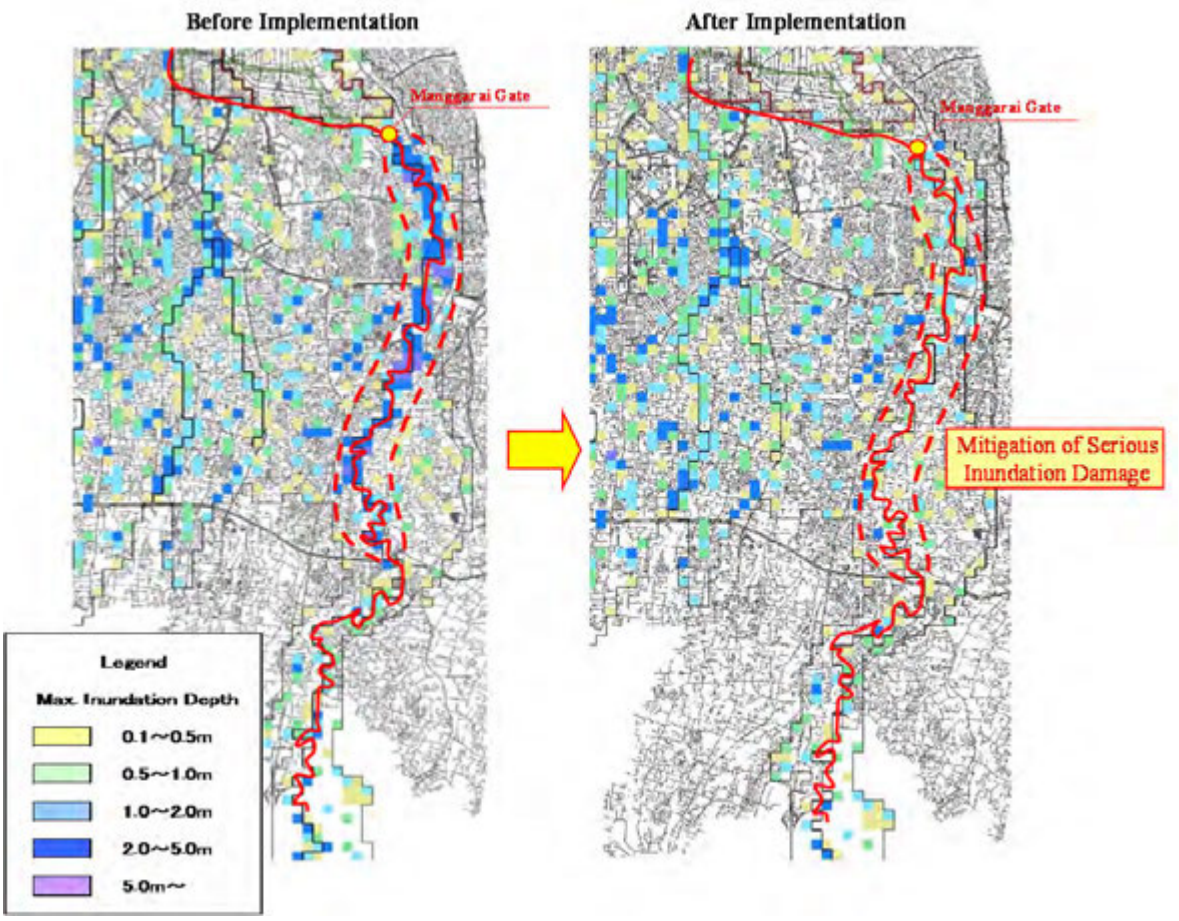


Figure 9.1-3 Mitigation Effect of Inundation after Implementation of CFMP

CHAPTER 10 LAND USE REGULATION BASED ON SPATIAL PLAN

10.1 Necessity of Land Use Regulation for Runoff Control

The unregulated peak discharge in 2030 at Manggarai Water Gate point is estimated by the CFMP based on the available data of spatial plans in 2011 for the examination of structural measures for flood control. Therefore, if the projected urbanization ratio in 2030 exceeds that of the spatial plans, it is necessary to re-estimate the unregulated peak discharge at Manggarai Gate point and to review the plan, location and scale of structural measures based on this re-estimation, which might require additional investment in structural measures.

In order to avoid the above scenario, it is required to regulate properly the land use in the basin in accordance with the spatial plans from the following viewpoints.

- Prevention of unregulated development of urban area and settlement area
- Achievement of targeted areas of open green space
- Preservation of border areas of river and pond (*Situ*) and other protected areas

10.2 Proposal for Smooth Implementation of Land Use Regulation

The existing regulations regarding the formulation of spatial plans, including the Presidential Regulation No. 54/2008 on Spatial Planning in JABODETABEKPUNJUR (Jakarta, Bogor, Depok, Tangerang, Bekasi, Puncak and Cianjur Area), are consistent with the regulations for the preservation of the related protected areas and border areas of river and pond (*Situ*). In addition, those regulations stipulate the necessity to secure a certain area of open green spaces and other non-utilized areas. Therefore, it is recognized that the regional spatial plans prepared by the local governments based on those regulations have effectiveness for the runoff control as well. On the other hand, several issues are identified to disturb the smooth practice of the land use control based on the spatial plans. Thus, for the implementation of the CFMP, the further measures for proper land use control are proposed as follows.

a) Each local government in the Ciliwung River Basin has used different land use classifications in the spatial plan. Therefore, in order to evaluate the land use plan prepared by each local government in a unit of river basin, a common standard of land use classification in JABODETABEKPUNJUR area shall be formulated.
b) It is necessary to complete the formulation of the detailed spatial plans, which is to be used as a base for land use control, promptly.
c) For the clarification of areas to be preserved, the border area of river and pond (*Situ*) shall be clarified.
d) Local governments are required to make further efforts to enhance the consistence of the land use policy in the regional development plans (mid-term regional development plan (RPJMD) and the annual regional development plan (RKPD)) with spatial plans (general spatial plan (RTRW) and detailed spatial plan (RDTR)).
e) Regarding the issuance of the building permits by the local governments, it is necessary to formulate the guidelines and implementation regulations including the following subjects for the strict operation of existing laws and regulations:
    - Procedures regarding the reference of land use plans and the confirmation of rainwater storage and infiltration facility installation
    - Penalty in case of land use change without prior approval
    - Provision of incentive/disincentive to the private sector for the smooth land use control
f) It is necessary to strengthen the monitoring activities to find and correct the undesignated land use.

10.3 Area Classification for Flood Mitigation

In accordance with the topographic conditions and inundation characteristic, the river basin area can be classified in to 3 categories: retention area, retarding area and lowland area. The flood mitigation measures except for the flood control measures in the river and runoff control measures in the basin are proposed as follows.

Table 10.3-1 Area Classification for Flood Mitigation

Area Classification	Description	Flood Mitigation Measure
Retention Area	Area where originally has function to retain the rainwater for a certain period	・Preservation of green space and agricultural area
Retarding Area	Lowland area along the river which frequently suffers from the inundation and functions as retarding basin	・Preservation of green space and agricultural area ・Restriction of embankment ・Dissemination of piloti type building
Lowland Area	Flat area where rainwater tends to be maintained and difficult to be drained to the river	・Dissemination of flood resistance building

In the Ciliwung River Basin, those areas are located as shown in Figure 10.3-1. For the further examination of flood disaster mitigation measures in each area, it will be required to classify the basin area based on large scale topographic map.

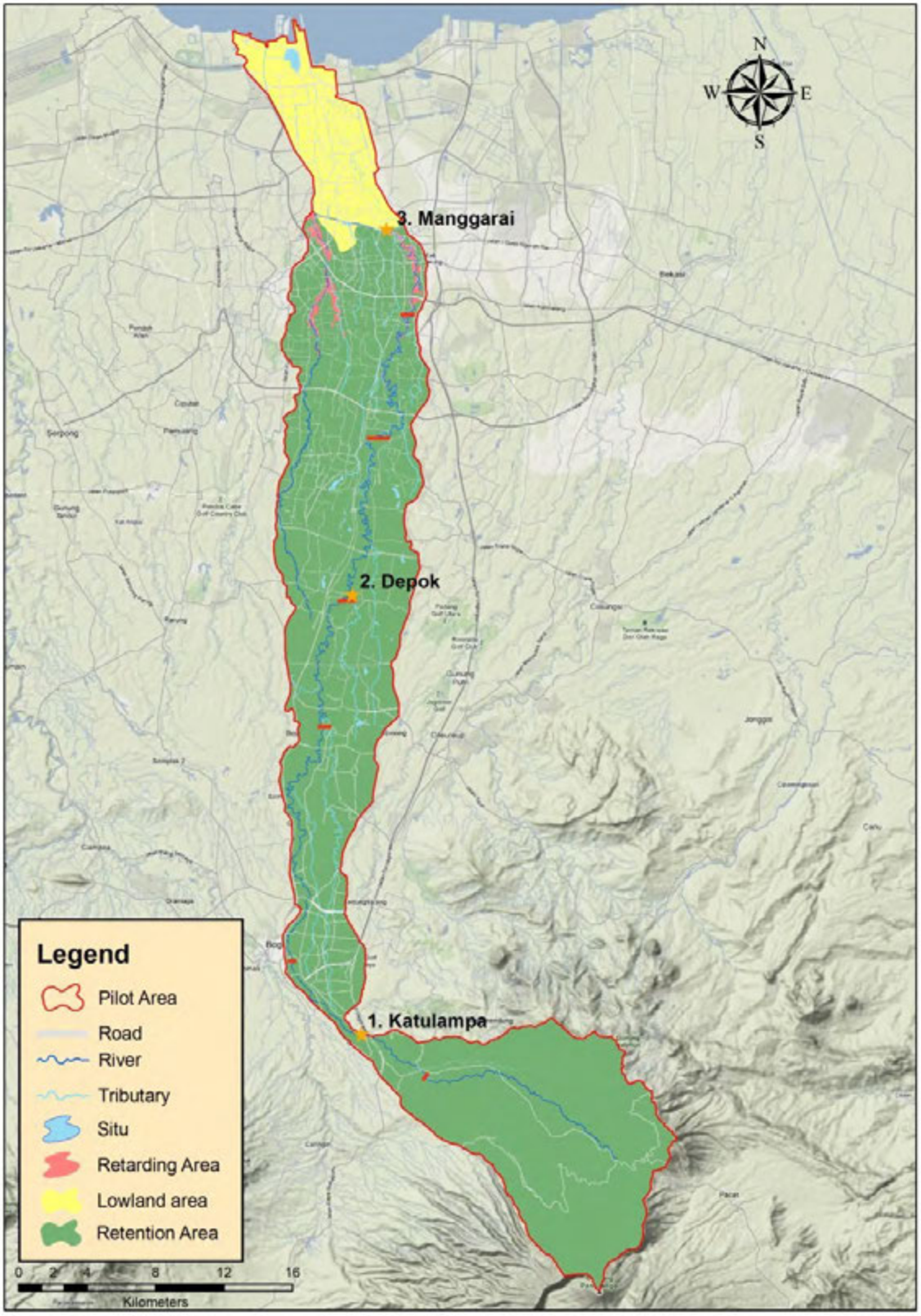


Figure 10.3-1 Area Classification in Ciliwung River Basin

CHAPTER 11 DISASTER MITIGATION MEASURES

11.1 Necessity of Disaster Mitigation Measures

In preparation for the inundation caused by rainfall exceeding the capacity of existing flood control facilities and probable rainfall, it is necessary to take measures to mitigate the flood damages, including the dissemination of disaster information and implementation of proper evacuation.

11.2 Disaster Mitigation Measures

The applicable measures for flood damage mitigation are considered as follows.

- Prior provision of flood disaster information on assumed inundation area, evacuation place, and evacuation route based on flood hazard map
- Provision of information on estimated flood arrival time based on rainfall and water level observation, and implementation of prior evacuation
- Preparation of standard operation procedure (SOP) for evacuation
- Stock of commodity for emergency and evacuation in flood

11.3 Reduction of Flood Safety Level due to Climate Change

Considerably due to the climate change caused by the impact of global warming, the flood risks by excess flood have been increasing. Thus, in JCFM Project, the runoff analysis is conducted based on several scenarios of climate change, and the impact of climate change to the flood safety level after the implementation of the CFMP is evaluated. The results are summarized below.

- Several climate change scenarios are formulated based on socio-economical change reported by 4th Assessment Report of IPCC*. Among those scenarios, the runoff analysis is conducted based on the scenario applied in Jakarta (see Table 11.3-1).
- As a result, in Scenario A1F1, the scenario with the largest impact of climate change (Value on Fossil Energy Resources in Growth-oriented Society Scenario), it is estimated that the flood safety level at Manggarai Water Gate point will reduce from 50 years design scale used for the CFMP to 25 years design scale (see Figure 11.3-1).
- Considering the above scenario, it is necessary to implement the flood damage mitigation measures even after the completion of the structural measures in the CFMP.

* IPCC: Intergovernmental Panel on Climate Change

Table 11.3-1 Climate Change Scenario

Scenario		Application			
		Manila	Bangkok	Ho Chi Minh	**Jakarta**
A1	Growth-oriented Society Scenario				
A1FI	Value on Fossil Energy Resources	●	●	-	●
A1T	Value on Non-Fossil Energy Resources	-	-	-	-
A1B	Value on Balance of Energy Resources	-	-	-	-
A2	Pluralistic Society Scenario	-	-	●	-
B1	Sustainable Development Society Scenario	●	●	-	●
B2	Community Coexistence Scenario	-	-	●	-

Source: JICA, the Simulation Study on Climate Change in Jakarta, Indonesia, May 2012

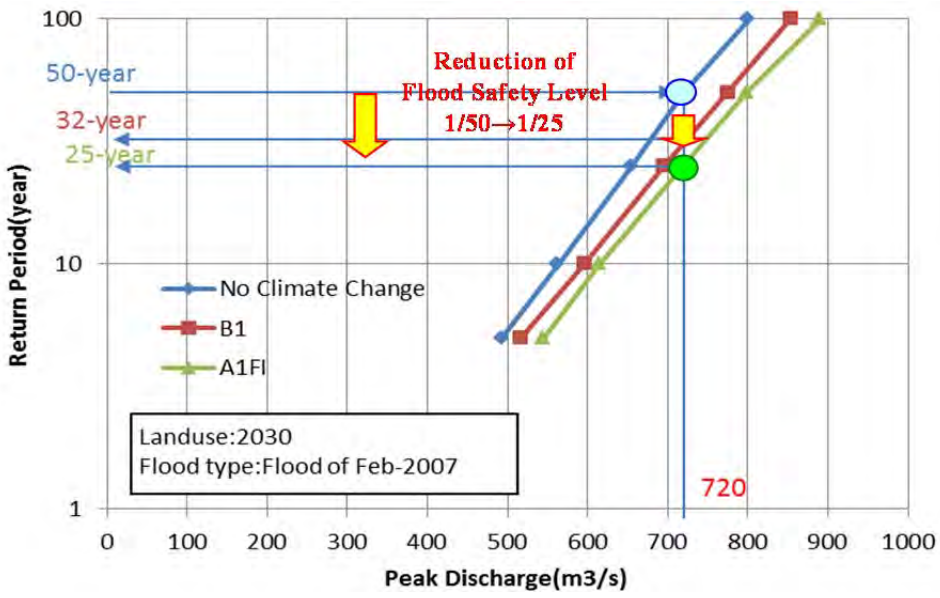


Figure 11.3-1 Decline of Flood Safety Level based on A1F1 Scenario

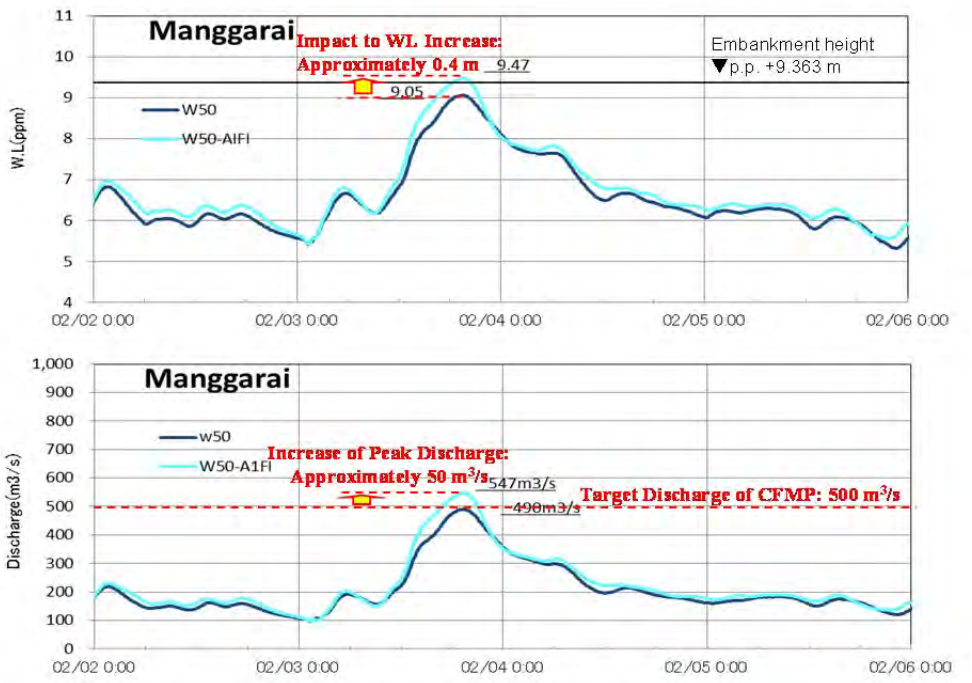


Figure 11.3-2 Impact of Climate Change at Manggarai Gate (A1F1 Scenario)

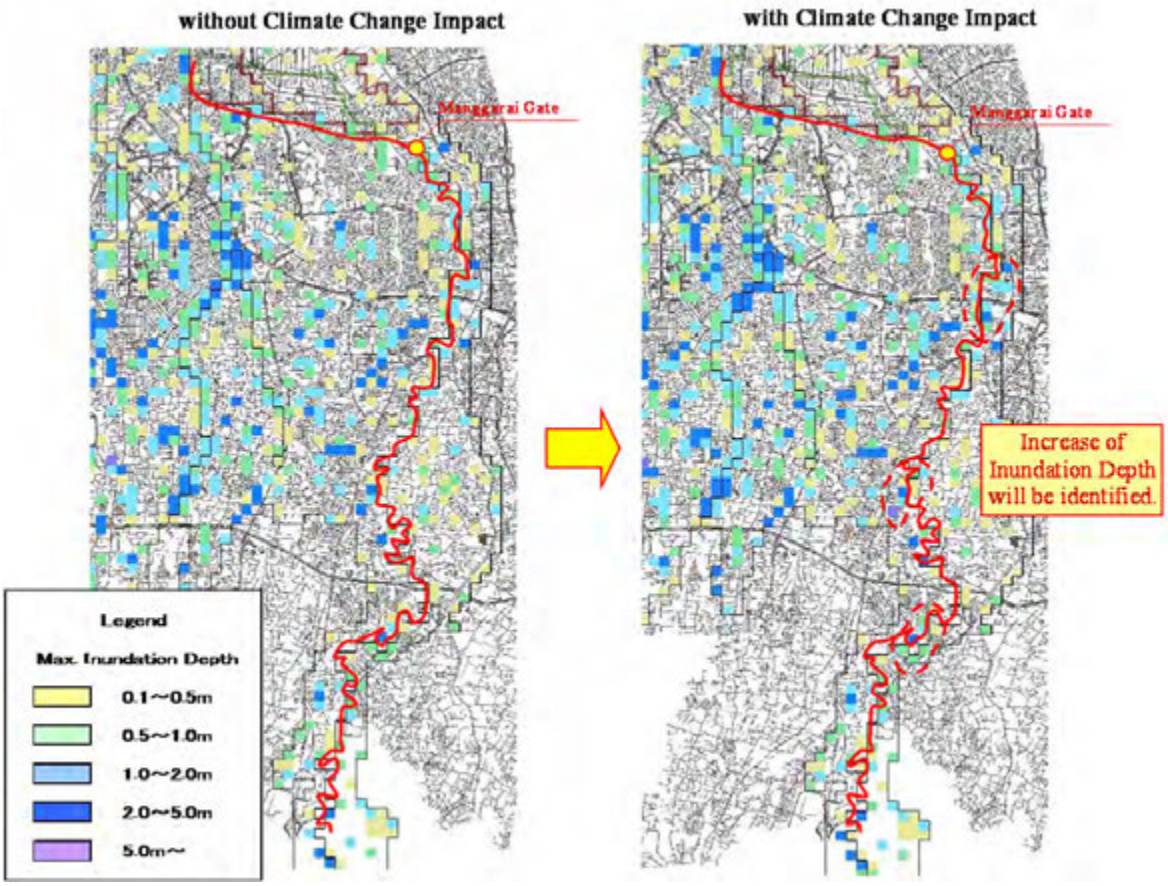


Figure 11.3-3 Impact of Climate Change to Inundation Area (A1F1 Scenario)

CHAPTER 12 COMPREHENSIVE FLOOD MANAGEMENT IN PILOT SUB-BASIN

12.1 Basic Policy for Comprehensive Flood Management in Pilot Sub-Basin

The basic policies for the comprehensive flood management in the pilot sub-basin of the Ciliwung River Basin are as follows:

(1) Design Scale

The design scale is set based on the Flood Control Manual (1993) published by the Ministry of Public Works, which is used for the design scale of the Ciliwung Main River (see Table 3.2-2).

(2) Design Peak Discharge

In the sub-basin of the Ciliwung River, the sufficient data of rainfall, water level and flow discharge are not available at present. Thus, the design peak discharge of the pilot sub-basin is estimated by Rational Formula at the confluence to the Ciliwung River. In addition, inflow volume from other basin through the irrigation channel is considered in the design peak discharge by identifying the flow capacity of the inflow channel and setting the flood inflow volume. Moreover, outflow volume to other basin is taken into account to design peak discharge by recognizing the diverted volume in the flood.

(3) Evaluation of Runoff Control Effect in Sub-Basin

Assuming that the rainfall amount to be infiltrated shown in Table 8.4-9 can be cut by rainwater storage and infiltration facility in the basin, the peak discharge volume at confluence to the Ciliwung River is estimated in consideration of base cut amount of the rainfall. The difference between the design peak discharge and peak discharge volume with base cut is evaluated as runoff control effect in the basin. Besides, the design scale in the sub-basin is set as 10 years probable rainfall which is comparatively high frequency of rainfall. Therefore, the control volume of runoff control facility in sub-basin is maintained as a margin against the excess flood, and it is not considered in the flood control effect for the comprehensive flood management in the pilot sub-basin.

(4) Improvement of Pond (*Situ*)

The flood control effects of the existing ponds (*Situ*) are taken into account in the CFM of the sub-basin. In order to improve the current flood control effects, the possibility for Situ improvement is examined. The flood control effects of Situ before improvement are evaluated by flood control calculation.

(5) River Improvement

The riverbed gradient will be stable for a long time. Therefore, the design riverbed gradient is determined based on the current average riverbed gradient. Since the vertical direction excavation will cause remarkable increase of water level at inflow points to the Ciliwung River and *Situ*, it shall be avoided as long as possible, and the widening of river course is considered as the principle method for river improvement. In this case, in order to avoid the expansion of inundation damage in the surrounding areas of the river course, the river width shall be determined by securing that the high water level is lower than the elevation of the surrounding areas.

If the freeboard is set during the river section without the dike, inundation risk will be higher in the section with the dike. Thus, the freeboard shall not be set during the river section without dike for considering the safety.

12.2 Case Study of Comprehensive Flood Management in Pilot Sub-Basin

Based on the above policies, a case study of the comprehensive flood management was conducted in Sugutamu basin as a pilot sub-basin.

(1) Basic Condition in Sub-Basin

- Target Pilot Sub-Basin: Sugutamu Sub-Basin
- Basin Area: A=13.23 km^2
- Situ in Pilot Sub-Basin: Situ Cilodong at middle-stream and Situ Sidomukti at downstream
- Inflow from other Basin: there is a channel flowing into Situ Cilodong from Situ Cikaret
- Feature of Pilot Sub-Basin: extending from north to south, and relatively high gradient with average river slope of 1/200. Residential buildings are intensively located along the river in urban area, resulting in the narrow river course.

(2) Condition on Design Discharge Calculation

- Design Scale: 1/10 return period
- Runoff Calculation Method: Rational Formula
- Rainfall Intensity: rainfall intensity formula at Damaga Bogor observation point near the pilot sub-basin
- Runoff Coefficient: average runoff coefficient in the pilot sub-basin considering the land use condition
- Inflow from other Pilot Sub-Basin: Inflow from Situ Cikaret through the irrigation channel was taken into account considering flow capacity of the channel.
- Outflow to the other Basin: Outflow volume from Situ Cilodong to other basin is small, so that flood discharge from Situ Cilodong is considered as inflow to Sugutamu basin. The outflow to the other basin is not included.

(3) Outline of Case Study Results

- Since the current river course does not have sufficient flow capacity against the design scale of flood, the significant river improvement is required in all the river section.
- In case of the above river improvement, since the flood flow will not overflow but flow to the downstream, it is recognized that the inflow volume to Situ Sidomukti will increase, and the flood flow will overflow the dike of *Situ* causing the dike break. Originally, *Situ* is established for the water use, so that the scale of *Situ* is not consistent with the river basin area. As measures against overflow, it is necessary to determine the necessary measures including a) removal of *Situ*, b) reconstruction of *Situ* as a dam, c) construction of bypass channel, and d) no river improvement at upstream of *Situ*.
- Through the installation of rainwater storage and infiltration facilities with targeted volume shown in Chapter 8 in Sugutamu basin, the flood control effect against 10 years design flood at confluence to the Ciliwung River is expected as 7.4 m^3/s (equivalent to 5.3 % of design peak discharge).

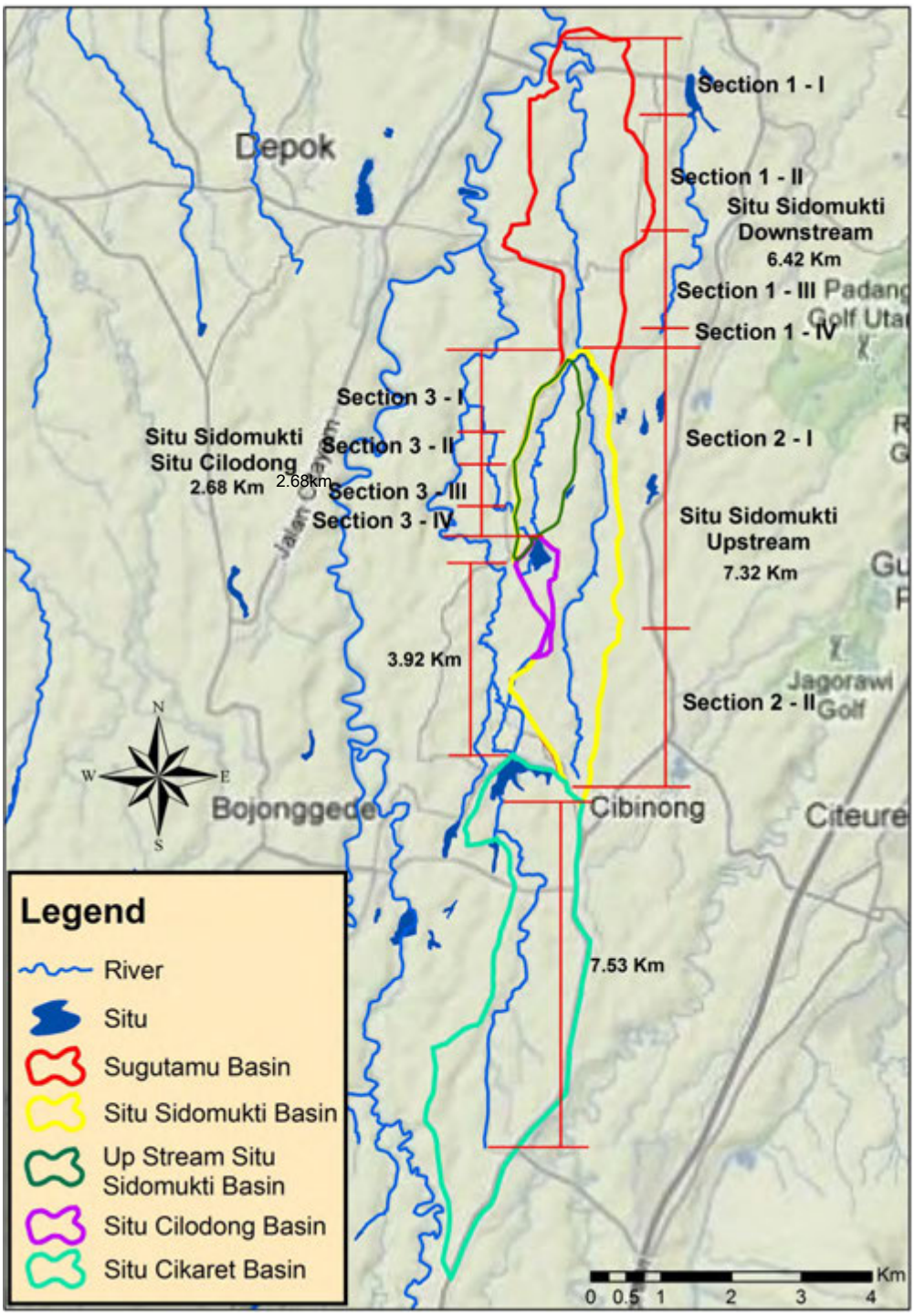


Figure 12.2-1 River Section of Sugutamu Sub-Basin

Table 12.2-1 Design Peak Discharge in Each Return Period at Major Locations

Return Period	Situ Cilodong		Situ Baru			River Junction of Ciliwung
	Inflow	Outflow	Inflow from Situ Cilodong	Infolw from Residual Basins	Outflow	
2	6.7	2.4	14.7	40.9	55.6	110.2
5	7.4	2.7	17.1	47.5	64.7	128.1
10	7.9	3.0	18.7	51.9	70.6	140.0
25	8.4	3.2	20.8	57.4	78.2	154.9
50	8.8	3.4	22.3	61.5	83.8	166.0
100	9.3	3.9	24.1	65.9	90.0	178.0

Design Return Period

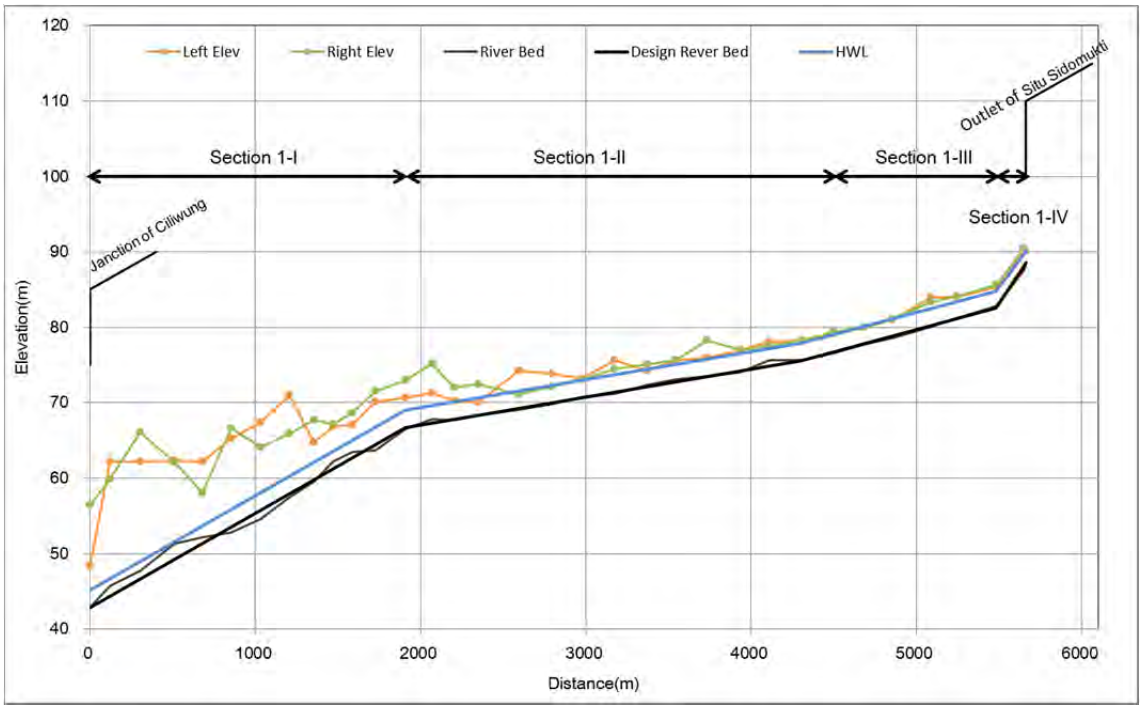


Figure 12.2-2 Longitudinal Profile (Situ Sidomukti Downstream Section)

Section	Design Discharge (m^3/s)	Slope of River Bed	Coefficient of Roughness	River width (m)	Depth (m)
1-I	140	1/80	0.028	16.5	2.5
1-II		1/270			
1-III		1/170		13.5	
1-IV		1/30		12.0	1.5

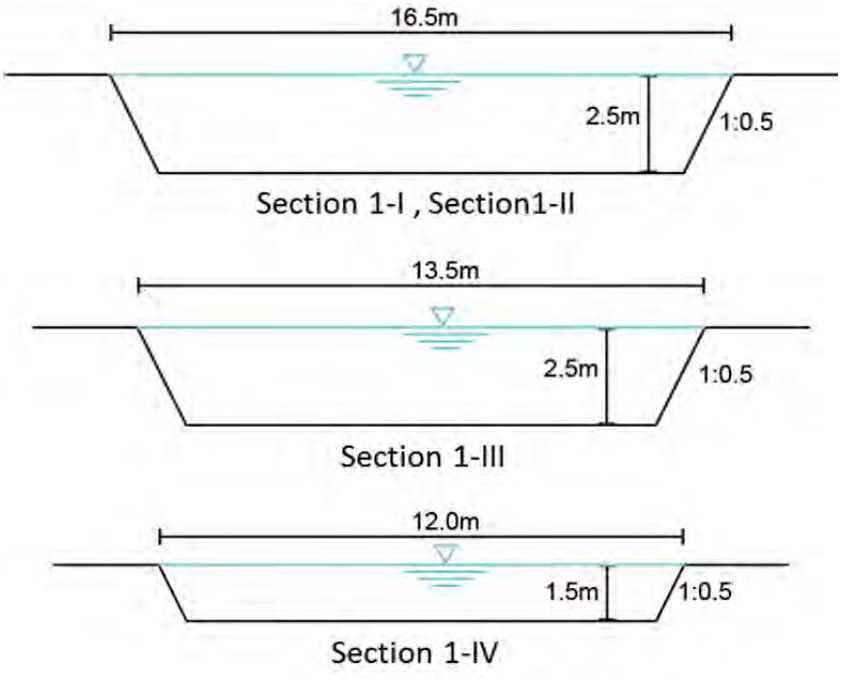


Figure 12.2-3 Cross Section Plan (Situ Sidomukti Downstream Section)

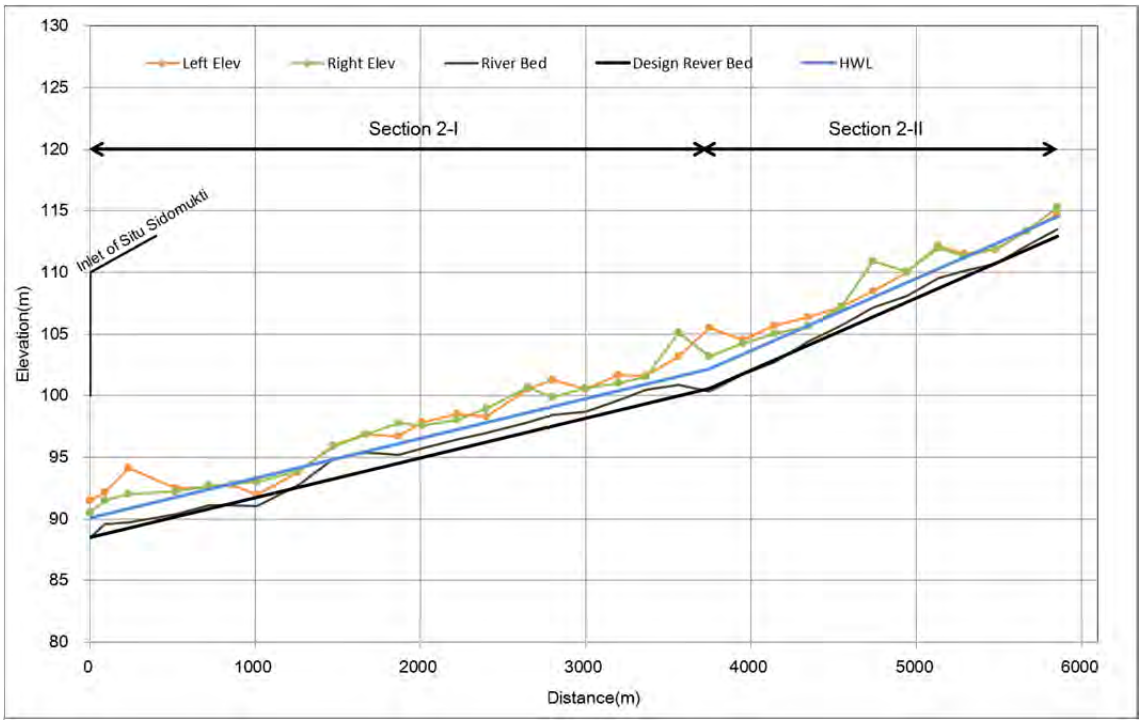


Figure 12.2-4 Longitudinal Profile (Situ Sidomukti Upstream Section)

Section	Design Discharge (m^3/s)	Slope of River Bed	Coefficient of Roughness	River width (m)	Depth (m)
2-I	52	1/310	0.028	13.1	1.6
2-II		1/170		10.1	

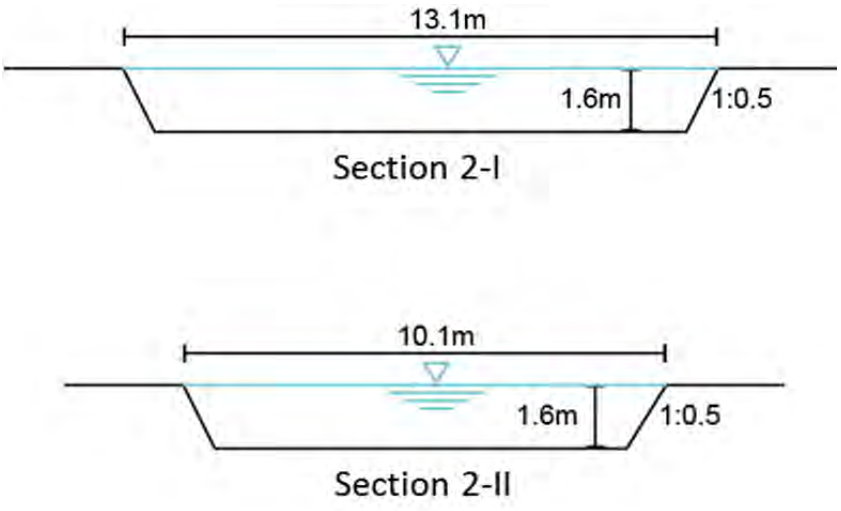


Figure 12.2-5 Cross Section Plan (Situ Sidomukti Upstream Section)

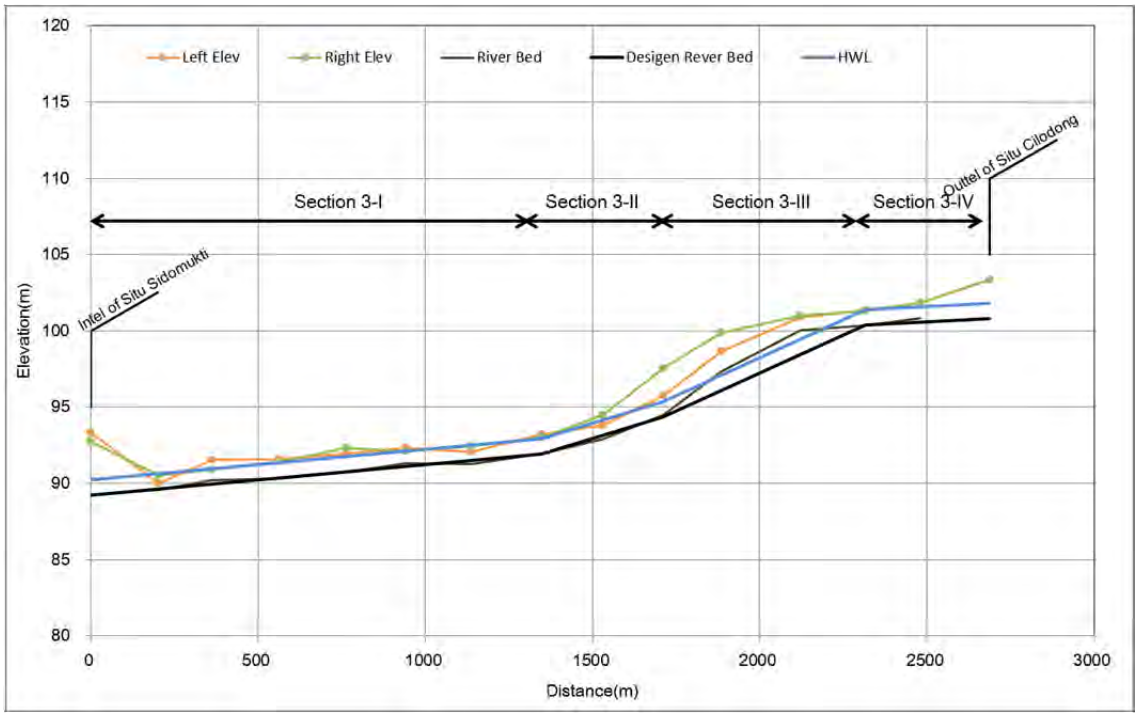


Figure 12.2-6 Longitudinal Profile (from Situ Sidomukti to Situ Cilodong)

Section	Design Discharge (m^3/s)	Slope of River Bed	Coefficient of Roughness	River width (m)	Depth (m)
3-I	19	1/500	0.028	12.0	1.0
3-II		1/150		7.0	
3-III		1/100		6.0	
3-IV		1/400		11.0	

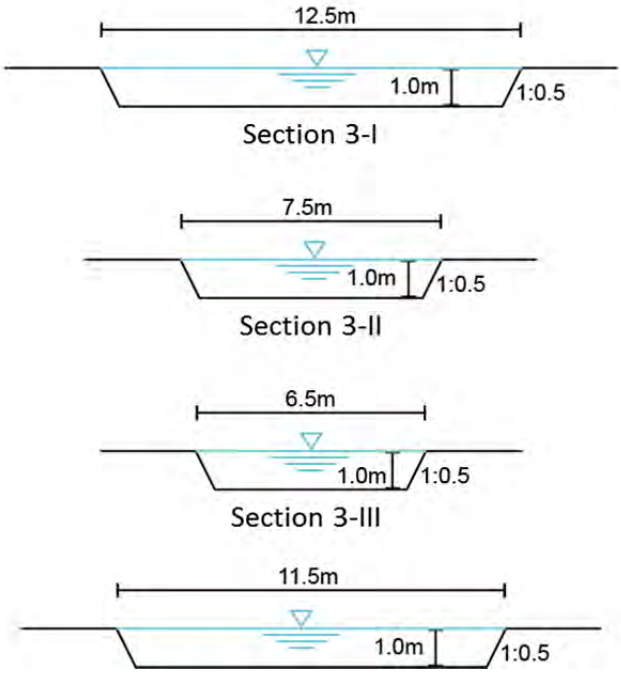


Figure 12.2-7 Cross Section Plan (from Situ Sidomukti to Situ Cilodong)

12.3 Case Study Findings

In accordance with the results of case study, the following concerns are identified for the comprehensive flood management in the pilot sub-basin.

(1) Determination of River Administration Area

- In the case study, several cases where private developer and/or others change the river course without approval are identified. This can be avoided if the river administration area is designated. Therefore, in order to avoid this practice, it is recommendable to set and regulate the river administration area urgently.

(2) Consideration for Improvement of Situ and River at Upstream of Situ

- It is identified that the inflow volume to *Situ* will increase and flood flow will overflow the dike of *Situ* because the flood flow will not inundate but flow to the downstream through the river improvement (Situ Sidomukti). Moreover, there is other case that all flow volume from *Situ* flow to the other basin through the irrigation channel with small flow capacity, resulting in the overflow of irrigation channel during the flood (Situ Cilodong). Improvement of *Situ* and channel connecting the *Situ* needs to be planned at the same time in consideration of peak flood discharge.

CHAPTER 13 COMPREHENSIVE FLOOD MANAGEMENT ACTION PLAN

13.1 Objective

The objective of Comprehensive Flood Management Action Plan (CFMAP) is to determine the role allocation, coordination mechanism, implementation schedule of proposed measures, and others for the acceleration of the implementation of the comprehensive flood management measures in accordance with the Comprehensive Flood Management Plan (CFMP) formulated by JCFM Project in order to mitigate the flood disaster in the Ciliwung River Basin.

13.2 Purpose

To protect the basin from 1/50 years design scale flood within the target year of 2030 (the following 20 years)

The flood control measures in the Ciliwung River Basin were conducted for the mitigation of 1/100 years design scale flood based on the 1997 Master Plan. However, since the construction of Ciliwung Floodway to divert 600 m^3/s discharge to the Cisadane River was not realized due to opposition of local stakeholders, currently 1/25 of flood safety level is set as the tentative target for the flood management in the basin. According to BBWS Ciliwung-Cisadane, the flood control measures based on this tentative target will be completed within a few years.

Considering the economic and social impacts of flood disaster on the people in the basin and capital city of Indonesia, it is ideal to target 1/100 years design scale of flood. However, it seems to require long-term actions for the realization.

In consideration of the above issue, the CFMP formulated by the JCFM Project set the target year as 2030 (approximately for 20 years) in consistent with the planning periods of spatial plans, the Water Resources Management Policy (POLA), and the long-term development plan (RPJP). In addition, the flood safety level is set as 1/50 years design scale which is higher than the current target (1/25). In this case, the assumed unregulated peak discharge at Manggarai Water Gate point in the Ciliwung River is estimated as 720 m^3/s. Through the implementation of comprehensive flood management measures, the design peak discharge is aimed to be reduced to 500 m^3/s.

Besides, against the rainfall exceeding the facility capacity during the course of the implementation of countermeasures and excess design scale rainfall, it is necessary to mitigate the flood damage by disseminating the disaster information on rainfall and water level as well as implementing the evacuation activities properly.

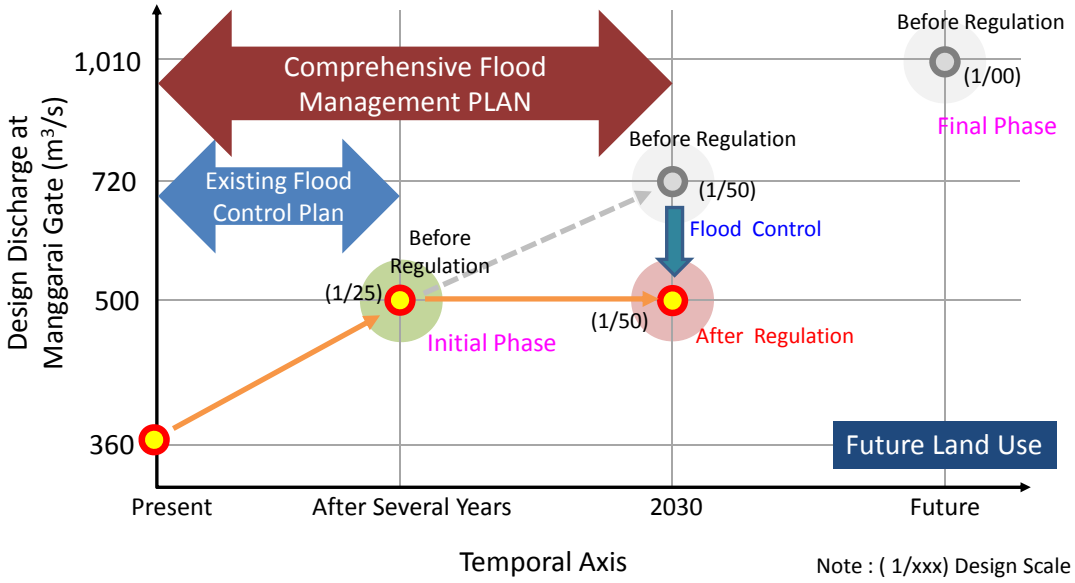


Figure 13.2-1 Target Design Scale in CFMP

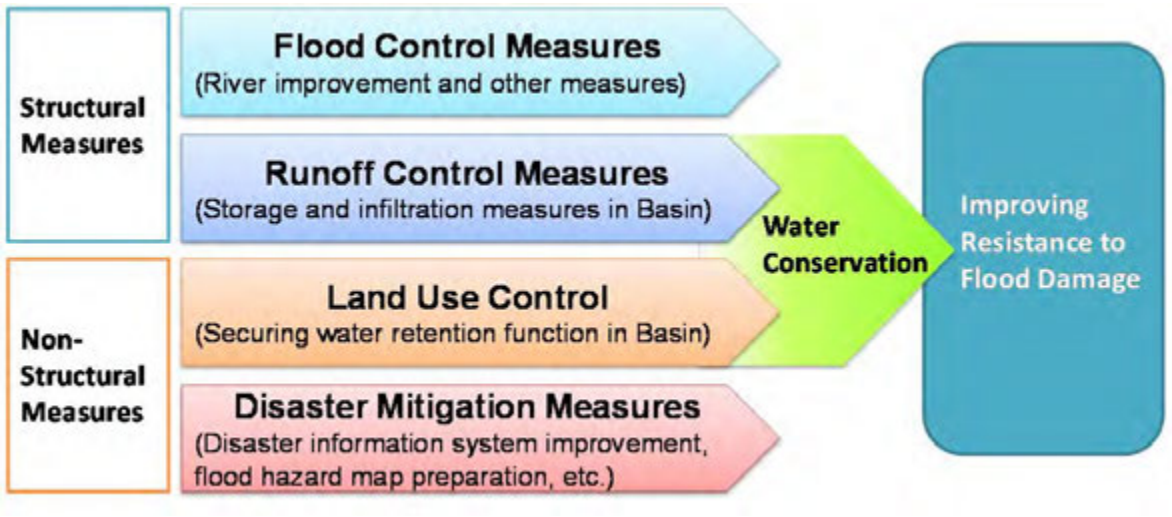


Figure 13.2-2 Composition of Comprehensive Flood Management Measures

13.3 Implementation of CFM Measures in Coordination with related Organizations

For the smooth implementation of proposed comprehensive flood management measures including runoff control and land use regulation in the basin, it is necessary to implement the flood management activities by related organizations in coordination among those organizations based on the clear role allocation.

The major government organizations related to the comprehensive flood management in the Ciliwung River Basin are as follows.

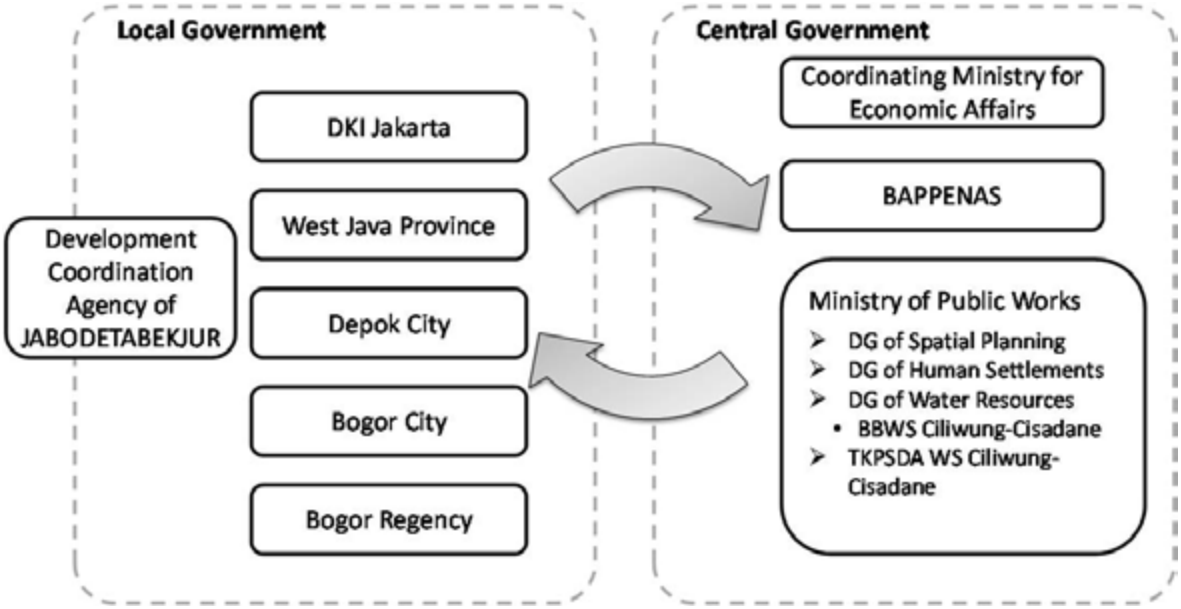


Figure 13.3-1 Major Government Organization related to CFMP

13.4 Role Allocation of Organizations related to Implementation of Comprehensive Flood Management Measure

For the implementation of the comprehensive flood management measures scheduled to be completed by 2030, the role allocation of related organizations in the existing legal framework is summarized in Table 13.4-1. In addition, Figure 13.4-1 shows the relationship of organizations concerned for the implementation of comprehensive flood management measures.

Table 13.4-1 Related Organizations and Role Allocation for Implementation of Comprehensive Flood Management Measure

	Organization	Measure	Role for Implementation of Comprehensive Flood Management
Central Government	Coordination Ministry of Economic Affairs	Coordination	● Inter-organizational and Inter-regional Coordination for the implementation of runoff control measures
	BAPPENAS	Coordination	● Inter-organizational and Inter-regional Coordination for the formulation of development plans
	Directorate General of Water Resources, Ministry of Public Works	Flood Control Measure, Runoff Control Measure, Disaster Mitigation Measure, Coordination/Monitoring	● Formulation and dissemination of policy, laws and technical standards regarding flood control measures, runoff control measures and disaster mitigation measures ● Coordination and monitoring of the projects implemented by BBWS Ciliwung-Cisadane
	TKPSDA WS Ciliwung-Cisadane	Flood Control Measure, Runoff Control Measure, Disaster Mitigation Measure, Coordination/Monitoring	● Formulation of POLA and Rencana, recommendation to Minister of Public Works, analysis and reporting of monitoring and evaluation results on implementation conditions of the above plans
	BBWS Ciliwung-Cisadane	Flood Control Measure, Runoff Control Measure, Disaster Mitigation Measure, Coordination/Monitoring	**<Flood Control Measure: Ciliwung main river, West and East Banjir Canal, tributaries outside DKI Jakarta>** ● Determination of river administration area ● Planning and implementation of river improvement ● Planning and implementation of river dredging ● Planning and implementation of construction of Ciawi dam (large dam) and gate dam ● Planning and implementation of diversion channel to the East Banjir Canal ● Planning and implementation of improvement of Manggarai Water Gate and Karet Water Gate (proliferation of one additional gate) ● Construction and rehabilitation of pump station **<Runoff Control Measure>** ● Planning, implementation and O&M of rainwater storage and infiltration facility ● Rehabilitation of pond (Situ) and planning and implementation of construction of small dams (Dam Parit) **<Disaster Mitigation Measure>** ● Set of flood hazard areas ● Dissemination and empowerment of flood evacuation system **<Coordination/Monitoring>** ● Analysis and reporting of monitoring and evaluation of results of POLA and Rencana as secretariat of the TKPSDA WS Ciliwung-Cisadane
	Directorate General of Spatial Planning, Ministry of Public Works	Land Use Regulation	● Formulation and dissemination of policy, laws and technical standards regarding formulation of spatial planning

	Organization	Measure	Role for Implementation of Comprehensive Flood Management
Central Government	Directorate General of Human Settlements, Ministry of Public Works	Runoff Control Measure	● Formulation and dissemination of policy, laws and technical standards regarding urban drainage and inland water drainage facility
	Development Cooperation Agency of JABODETABEKJUR	Coordination	● Coordination of project plans and implementation of subsidy in JABODETABEKJUR (including subsidy for installation of runoff control facility)
DKI Jakarta	Regional Development Planning Agency (BAPPEDA)	Coordination/Monitoring	● Coordination regarding formulation of regional development plans (long-term, mid-term and annual plans) ● Reflecting runoff control measures in the regional development plans (formalization) ● Monitoring of flood control measures and runoff control measures conducted by related organizations ● Organizing the project evaluation reports prepared by related organizations ● Reporting monitoring results to the TKPSDA WS Ciliwung-Cisadane
	Public Works Agency	Flood Control Measure, Runoff Control Measure, Disaster Mitigation Measure	**<Flood Control Measure>** ● Planning, implementation and O&M of tributary river improvement ● Planning and implementation of tributary river dredging ● O&M or river facility **<Runoff Control Measure>** ● Planning, implementation and O&M of runoff control facility ● Planning, implementation and O&M of pond (*Situ*) **<Disaster Mitigation Measure>** ● Set of flood hazard areas ● Dissemination and empowerment of flood evacuation system ● Planning and implementation for enhancement of flood fighting framework
	Spatial Planning Agency	Land Use Regulation	● Formulation of spatial plans ● Land use regulation through assessment and issuance of building permit (*IMB*)
	Regional Environmental Management Agency	Runoff Control Measure	● Coordination and monitoring for installation of infiltration well (*Sumur Resapan*) in public development land through the Environmental Impact Assessment (*AMDAL*) process
	Industry and Energy Agency	Runoff Control Measure	● Installation of infiltration well (*Sumur Resapan*) ● Monitoring of installation of infiltration well (*Sumur Resapan*) in private development land
	Building Supervision and Controlling Agency	Land Use Regulation	● Technical assistance for assessment of building permit (*IMB*)

	Organization	Measure	Role for Implementation of Comprehensive Flood Management
West Java Province	Regional Development Planning Agency (BAPPEDA)	Coordination/Monitoring	● Coordination regarding formulation of regional development plans (long-term, mid-term and annual plans) ● Feedback of runoff control measures in regional development plans (formalization) ● Monitoring of flood control measures and runoff control measures conducted by related organizations ● Organizing the project evaluation reports formulated by related organizations ● Reporting monitoring results to the TKPSDA WS Ciliwung-Cisadane
	Water Resources Management Agency	Runoff Control Measure, Disaster Mitigation Measure	**<Runoff Control Measure>** ● Planning, implementation and O&M of runoff control facility ● Planning, implementation and O&M of pond (*Situ*) **<Disaster Mitigation Measure>** ● Set of flood hazard areas ● Dissemination and empowerment of flood evacuation system ● Planning and implementation for enhancement of flood fighting framework
	Housing and Settlement Agency	Land Use Regulation	● Formulation of spatial plans ● Assessment and issuance of building permit (*IMB*) ● Promotion of installation of rainwater storage and infiltration facility (by financial cooperation from DKI Jakarta)
	Forest Management Office in Citarum-Ciliwung River Basin	Runoff Control Measure	● Forest conservation for maintaining retention function ● Planning and dissemination of runoff control measures
Bogor Regency	Regional Development Planning Agency (BAPPEDA)	Coordination/Monitoring	● Coordination regarding formulation of regional development plans (long-term, mid-term and annual plans) ● Reflecting runoff control measures in the regional development plans (formalization) ● Monitoring of flood control measures and runoff control measures conducted by related organizations ● Organizing the project evaluation reports prepared by related organizations ● Reporting monitoring results to the TKPSDA WS Ciliwung-Cisadane
	Highways and Irrigation Agency	Runoff Control Measure, Disaster Mitigation Measure	**<Runoff Control Measure>** ● Planning, implementation and O&M of runoff control facility ● Planning, implementation and O&M of pond (*Situ*) **<Disaster Mitigation Measure>** ● Set of flood hazard areas ● Dissemination and empowerment of flood evacuation system ● Planning and implementation for enhancement of flood fighting framework

	Organization	Measure	Role for Implementation of Comprehensive Flood Management
Bogor Regency	Building and Settlement Agency	Land Use Regulation	● Formulation of spatial plans ● Land use regulation through assessment and issuance of building permit (*IMB*) ● Promotion of installation of rainwater storage and infiltration facility (by financial cooperation from DKI Jakarta)
	Regional Environmental Management Agency	Runoff Control Measure	● Coordination and monitoring for installation of infiltration well (*Sumur Resapan*) in public development land through the Environmental Impact Assessment (*AMDAL*) process
Bogor City	Regional Development Planning Agency (BAPPEDA)	Coordination/Monitoring	● Coordination regarding formulation of regional development plans (long-term, mid-term and annual plans) ● Reflecting runoff control measures in regional development plans (formalization) ● Monitoring of flood control measures and runoff control measures conducted by related organizations ● Organizing the project evaluation reports prepared by related organizations ● Reporting monitoring results to the TKPSDA WS Ciliwung-Cisadane
	Highways and Water Resources Agency	Runoff Control Measure, Disaster Mitigation Measure	**<Runoff Control Measure>** ● Planning, implementation and O&M of runoff control facility ● Planning, implementation and O&M of pond (*Situ*) **<Disaster Mitigation Measure>** ● Set of flood hazard areas ● Dissemination and empowerment of flood evacuation system ● Planning and implementation for enhancement of flood fighting framework
	Building and Settlement Agency	Land Use Regulation	● Formulation of spatial plans ● Land use regulation through assessment and issuance of building permit (*IMB*) ● Promotion of installation of rainwater storage and infiltration facility (by financial cooperation from DKI Jakarta)
	Regional Environmental Management Agency	Runoff Control Measure	● Coordination and monitoring for installation of infiltration well (*Sumur Resapan*) in public development land through the Environmental Impact Assessment (*AMDAL*) process

	Organization	Measure	Role for Implementation of Comprehensive Flood Management
Depok City	Regional Development Planning Agency (BAPPEDA)	Coordination/Monitoring	● Coordination regarding formulation of regional development plans (long-term, mid-term and annual plans) ● Reflecting runoff control measures in the regional development plans (formalization) ● Monitoring of flood control measures and runoff control measures conducted by related organizations ● Organizing the project evaluation reports prepared by related organizations ● Reporting monitoring results to the TKPSDA WS Ciliwung-Cisadane
	Highways and Water Resources Agency	Runoff Control Measure, Disaster Mitigation Measure	**<Runoff Control Measure>** ● Planning, implementation and O&M of runoff control facility ● Planning, implementation and O&M of pond (*Situ*) **<Disaster Mitigation Measure>** ● Set of flood hazard areas ● Dissemination and empowerment of flood evacuation system ● Planning and implementation for enhancement of flood fighting framework
	Building and Settlement Agency	Land Use Regulation	● Formulation of spatial plans ● Land use regulation through assessment and issuance of building permit (*IMB*) ● Promotion of installation of rainwater storage and infiltration facility (by financial cooperation from DKI Jakarta)
	Regional Environmental Management Agency	Runoff Control Measure	● Coordination and monitoring for installation of infiltration well (*Sumur Resapan*) in public development land through the Environmental Impact Assessment (*AMDAL*) process

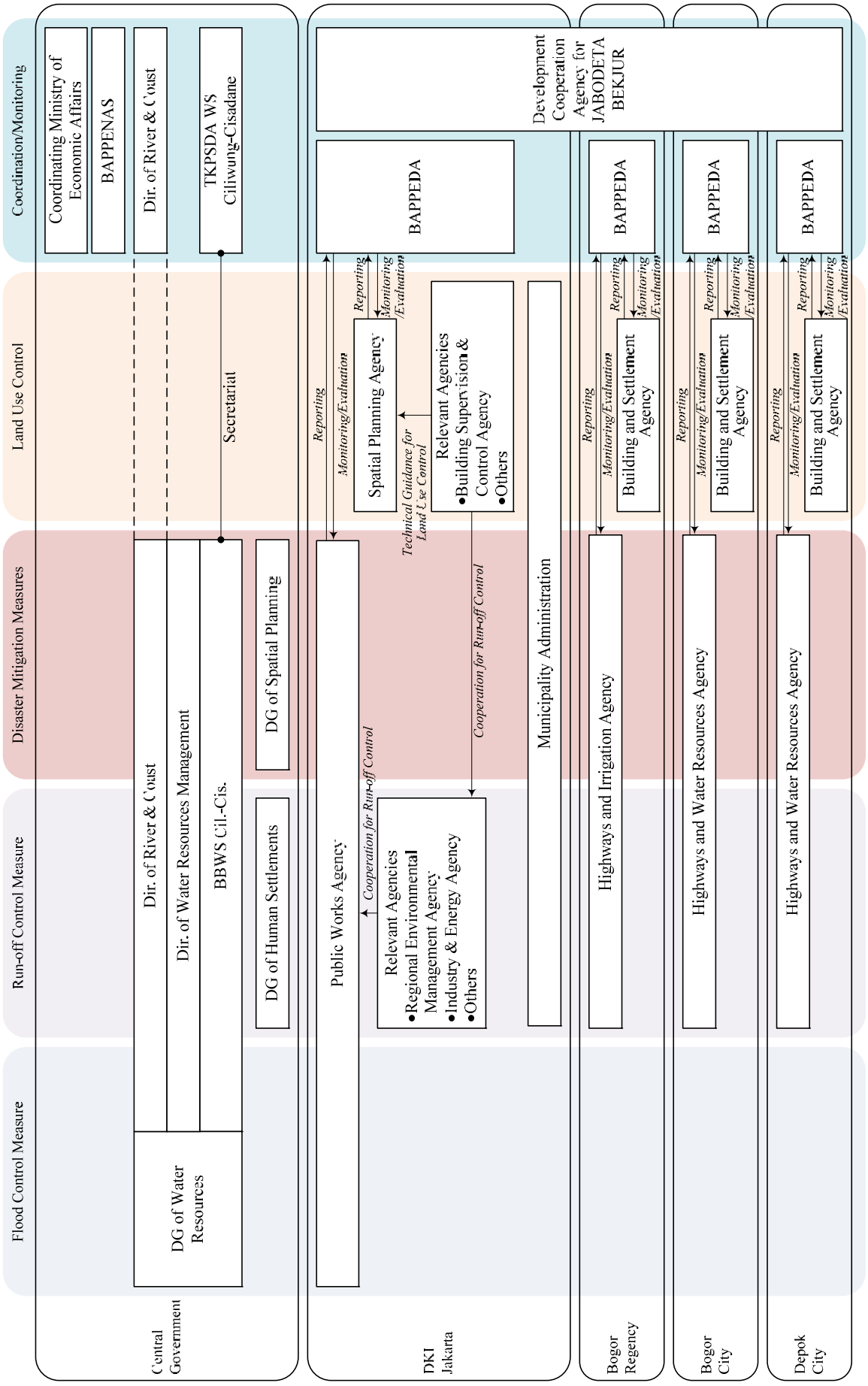


Figure 13.4-1 Relationship of Organizations related to Implementation of Comprehensive Flood Management Measures

13.5 Flood Damage Mitigation Effect after Implementation of CFMAP

Through the implementation of all the proposed measures in the CFMP based on the CFMAP, the peak discharge with 1/50 years design flood at Manggarai Water Gate point will be less than 500 m^3/s, and the water level in the river course will decline approximately by 1.1 m comparing to that of before implementation. Therefore, it is expected that the flood damage caused by overflow from the river will be drastically mitigated.

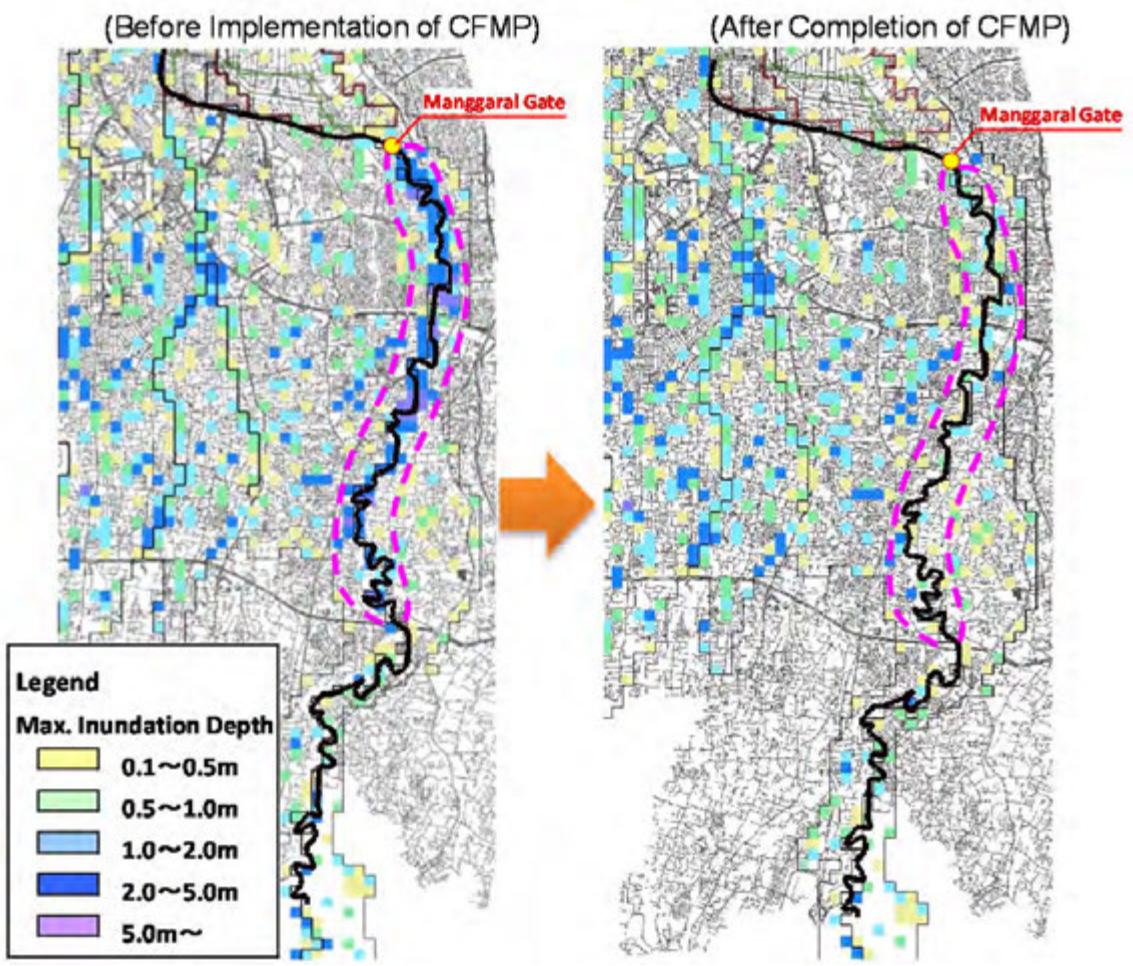


Figure 13.5-1 Flood Damage Mitigation after Implementation of CFMP

13.6 Monitoring

The main objectives of monitoring are as follows.

- To review and revise the project plan by confirming the progress of required measures and identifying the differences between the planned and actual progress
- To clarify the flood damage mitigation effect in accordance with the progress of required measures
- To confirm whether the urbanization ratio exceeds the targeted ratio or not since the targeted urbanization ratio is the basis for the setting of design peak discharge in the basin

Organizations and role allocation related to the implementation, assistance and monitoring of the comprehensive flood management measures are summarized below.

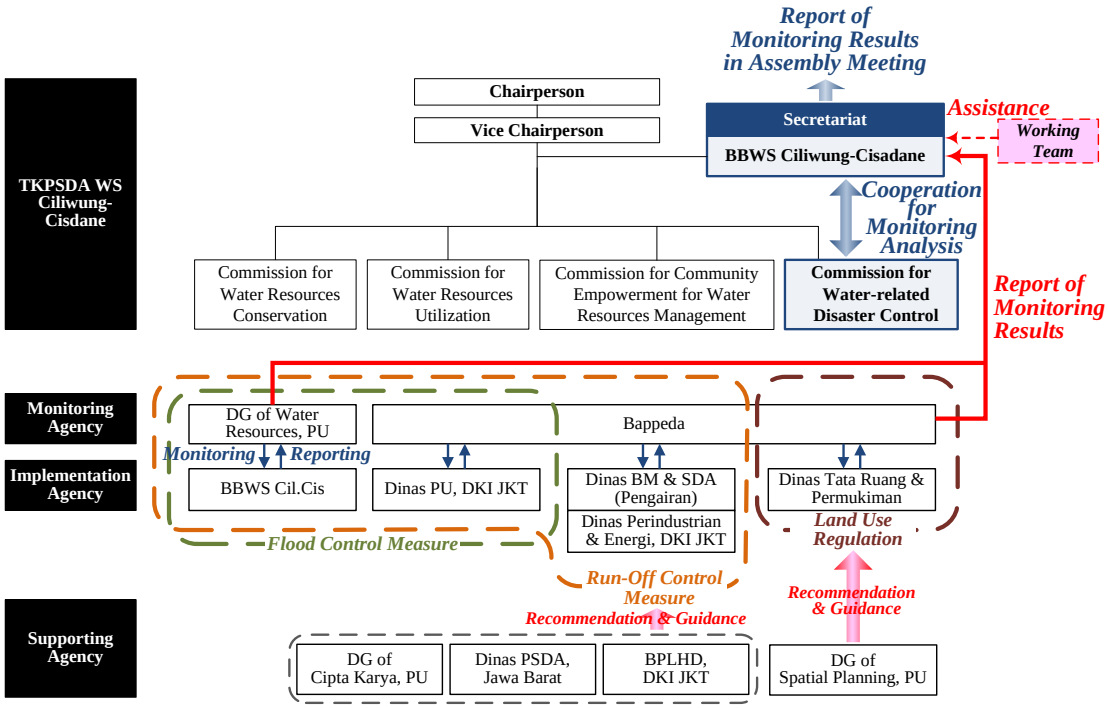


Figure 13.6-1 Proposed Monitoring Mechanism in TKPSDA WS Ciliwung-Cisadane

<Implementing Agency>

- The central and local government agencies which implement the flood control measures, runoff control measures, land use regulation and disaster mitigation measures will plan and conduct the projects of each measure based on the CFMP/CFMAP.

<Supporting Agency>

- Supporting agencies will provide technical supports to the above implementing agencies for the smooth and effective implementation of each measure.

<Monitoring Agency>

- Monitoring agencies will monitor and evaluate the progress and achievement of project of each measure conducted by implementing agency, and report the monitoring and evaluation results to the secretariat of TKPSDA WS Ciliwung-Cisadane.

<TKPSDA WS Ciliwung-Cisadane>

- BBWS Ciliwung-Cisadane, as secretariat of the TKPSDA WS Ciliwung-Cisadane, will receive the monitoring and evaluation results from monitoring agencies, and analyze those results in the unit of river basin.
- BBWS Ciliwung-Cisadane will report the monitoring and evaluation results in the assembly meeting of the TKPSDA WS Ciliwung-Cisadane.

◆ **Commission for Water-related Disaster Control**

- Commission for Water-related Disaster Control will assist the analysis of monitoring and evaluation results by the secretariat of the TKPSDA WS Ciliwung-Cisadane.

The implementation schedule, monitoring item, responsible organization, reporting mechanism, and monitoring and evaluation method are explained in the “Monitoring Guideline for the Comprehensive Flood Management” document attached.

13.7 Review/Revise of CFMP and CFMAP

In case analysis of urbanization in the Ciliwung River Basin based on monitoring result identifies that the urbanization ratio as of 2030 exceeds the used ratio (71 % of urbanization), the runoff analysis should be conducted based on the new urbanization level, to estimate the design peak discharge at Manggarai Water Gate point, and to review and revise the planning, location and scale of the structural measures.

In addition, in case it is recognized that the actual progress of the required measures for the CFM is far from the planned progress, it is necessary to identify the critical factors for the delay, and to review and revise the CFMAP as well.

CHAPTER 14 RECOMMENDATION FOR IMPLEMENTATION OF COMPREHENSIVE FLOOD MANAGEMENT

The JCFM Project makes the following recommendations for the implementation of the comprehensive flood management by the government of Indonesia.

14.1 Overall Recommendation

(1) Input of the CFMP to POLA and Rencana in Ciliwung-Cisadane River Basin

In order to enable the local governments in the Ciliwung-Cisadane River Basin to implement the runoff control measures cooperatively and sustainably, it is necessary to reflect the implementation policy, strategy and target volumes described in the CFMP in POLA and Rencana.

(2) Continuous Effort for Enhancement of Cooperateive Scheme among Organizations concerned

For the smooth implementation of comprehensive flood management, especially runoff control measures and land use regulation in the Ciliwung River Basin, the coordination and cooperation among the related organizations are required. Therefore, it is expected that the coordination and discussion platform for working-level officers established by the JCFM Project as counterpart team will be maintained by the government of Indonesia even after the completion of the JCFM Project.

(3) Application of Comprehensive Flood Management Measures to other Basin

There are other basins which face the flood risk increase due to urbanization. Therefore, it is expected to apply the comprehensive flood management policy and strategy proposed by the JCFM Project to the other basins.

14.2 Implementation of Comprehensive Flood Management Measure

(1) Legal Framework

In order to support the implementation of the comprehensive flood management measures by the implementing sectors of the local governments, the following subjects need to be urgently formulated for the strict operation of legal framework.

- Detailed spatial plans
- Determination of administration area of river and pond (*Situ*)
- Operation procedures for the reference to detailed spatial plans and the confirmation of installation of rainwater storage and infiltration facility in the process of building permits
- Regardign the securing and preservation of open green space and various protection areas, penatly agaist the illegal building owner to promote the removal of existing buildings, and local regulations and guidelines clearly stipulating the compensation for the building with building permit
- Provision of subsidy and construction equipment/materials to accelerate the installation of rainwater storage and infiltration facility in the existing settlement area and new development area, and local regulations and guidelines clearly stipulating the incentive for the above, such as tax incentive and others
- Local regulations and guidelines clearly stipulating the penatly in case of the destruction or backfill of constructed rainwater storage and infiltration facility as well as land use change of those facility areas
- Legislatives stipulating the administration authority, secured funtion, operation and maintenance, penatly agaist the shape distortion without approval of the irrigation channel which loses its original function and is currently used as drainage channel due to the rapid urbanizaiton

(2) Administration System

In order to promote the implementation of comprehensive flood management measures in cooperation among related organizations of local governments, the position or division specially mandated for the urban flood control shall be established in the local government organizations.

Moreover, the administration system shall be established for the realization of the following subjects.

- Smooth implementaiton of the land use supervision and regulation for the identification and correction of undesignated land use by private sector
- Solid waste collection and management system with sufficient capacity to contribute to the restriction of throwing the solid waste into the river and pond (*Situ*)

(3) Maintenance of Function of West Banjir Canal

As a result of evaluation of the January, 2013 flood damage, it is indicated that the dredged riverbed rose again due to the deposit of solid waste mainly at the downstream of Manggarai Water Gate in the West Banjir Canal. Thus, depending on the necessity, it is necessary to recognize the flow capacity through the regular river section survey and to dredge the riverbed.

In addition, it is strongly recommended that the required heightening and shifting works shall be conducted by reviewing the logitudinal and cross sectional locations among dike, parapet and bridge which are related to high water level.

(4) Urgent Construction of Flood Control Facility

In order to mitigate the flood disaster in the Ciliwung River Basin in the future, it is inevitable to construct the flood control facility having flood control effects of at least 100 m^3/s. For the urgent realization of dam construciton in Ciawi area, it is strongly recommended to conduct the detail topographic survey and geotechnical investigations (including active fault investigation, landslide survey and analysis, boring survey and analysis).

(5) Promotion of Rainwater Storage and Infiltration Facility

In order to promote the installation of rainwater storage and infiltration facility by private sector voluntarily as bottom-up approach, the further dissemination and encouragement activities, such as the formulatoin of handbook clearly describing the necessity, effectiveness, structure, installation method, ready-made product and subsidy mechanism based on technical standards, shall be conducted.

APPENDIX-1

MONITORING GUIDELINE
FOR
COMPREHENSIVE FLOOD MANAGEMENT

Monitoring Guideline
For
Comprehensive Flood Management

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CHAPTER 1 BASIC POLICY FOR MONITORING

1.1 Objective of Monitoring

The main objectives of monitoring are as follows.

- To review and revise the project plan by confirming the progress of required measures and identifying the differences between the planned and actual progress
- To confirm whether the urbanized area ratio exceeds the targeted ratio or not since the targeted urbanized area ratio is the basis for the setting of design peak discharge in the basin
- To clarify the flood damage mitigation effect in accordance with the progress of required measures

For the implementation of the comprehensive flood management (CFM), the flood control measures in the river as well runoff control, land use regulation and disaster mitigation measures shall be planned and carried out in the river basin unit. Moreover, since various local government organizations are related to the CFM, it is required to establish the implementation mechanism in coordination and collaboration among those organizations.

Therefore, by confirming the project progress conducted by the central and local governments based on CFMP, evaluating the project effects and identifying the issues regarding the project implementation, it is necessary to take necessary measures to solve identified issues including the revision and cancellation of project plans.

Moreover, those monitoring and evaluation activities are expected to promote and enhance the inter-organizational and inter-regional coordination among related organizations.

1.2 Legal Framework on Monitoring

1.2.1 Government Regulation No. 39/2006 and No. 8/2008

Government Regulation No. 39/2006 on Formulation, Monitoring and Evaluation Procedure of Development Plan and Government Regulation No. 8/2009 on Formulation, Monitoring and Evaluation Procedure of Regional Development Plan stipulate the following subjects regarding the monitoring and evaluation:

- Role allocation of monitoring and evaluation of project implementation based on the development plans prepared by central and local governments
- Formulation and submission of Accountability Report on Performance of Government Agencies (*Laporan Akuntabilitas Kinerja Instansi Pemerintah* or LAKIP)

The monitoring items and responsible organization are described below.

Table 1.2-1 Project Monitoring and Evaluation based on Government Regulations

Monitoring Item	Monitoring on Project Progress	Monitoring Agency
● Project input (financial input) ● Project progress (project schedule, progress and issues) ● Project output (physical output) ● Project outcome (project objectives) ● Benefit by the project (benefit for the society) ● Impact by the project (impact to the society)	Implementation Agency	Central Government ● Ministry of Public Works Local Government: ● BAPPEDA

Source: Government Regulation No. 39/2006, Government Regulation No. 8/2008

Based on both regulations, the monitoring and evaluation system has been established to monitor the physical progress of the project annually.

1.2.2 Government Regulation No. 15/2010

According to the Law No. 26/2007 on Spatial Planning and Management and Government Regulation No. 15/2010 on Implementation of Spatial Planning and Management, the formulation of the following spatial plans is required.

- General Spatial Plan: to describe the spatial structure, land use plan and implementation strategy in administration area
- Detailed Spatial Plan: to be utilized as a base for development management (restriction and induction) including zoning regulation, development permit, provision of incentive/disincentive, and others

In order to identify the conditions and to solve the issues on the spatial utilization and management based on those spatial plans, it is required to conduct regular monitoring and review the plans every 5 years.

1.2.3 Minister of Public Works Regulation No. 22/2009

In the Minister of Public Works Regulation No. 22/PRT/M/2009 on Technical Guidance and Procedure for Preparation of POLA, the draft of the following monitoring items, frequency and indicators are stipulated to monitor the flood control measures in POLA.

Table 1.2-2 Draft Monitoring Framework in Minister Regulation

Monitoring Item	Frequency	Indicator
● Frequency of flood occurrence ● Inundation area	Every 5 years	Change of inundation area

Source: Minister of Public Works Regulation No. 22/2009

The above items are set to monitor the chronological change of inundation conditions.

1.3 Basic Policy on Monitoring of CFMP

As mentioned above, the existing legal framework stipulates the necessity of monitoring and evaluation. Therefore, in accordance with those regulations, sustainable monitoring system can be established through the implementation of monitoring and evaluation of the CFMP/CFMAP.

However, the implementation of the CFM in the Ciliwung River Basin is the first trial. Moreover, the central government is mandated to manage the Ciliwung Main River and West/East Banjir Canal, and Ciliwung River Basin covers administration areas of 2 provinces and 3 regencies/cities. Under this complicated condition, for the implementation of the CFM, the comprehensive measures including the flood control measures as well as the runoff control measures, land use regulation and disaster mitigation measures shall be conducted. In addition, since various organizations are related, the inter-organizational and inter-regional coordination is required. Thus, for the next 20 years as target years of the CFMP, it is necessary to enhance the cooperative relations among those organizations and to improve the monitoring and evaluation items and mechanism gradually.

Therefore, as the first step, this guideline describes the minimum standards of chronological monitoring items and method, as well as the most applicable monitoring mechanism under the existing legal framework.

CHAPTER 2 MONITORING ITEM AND METHOD

2.1 Monitoring Item

Based on the above monitoring policies, the following 3 items shall be monitored.

Table 2.1-1 Monitoring Item

Objective	Item
To review and revise the project plan by confirming the progress of required measures and identifying the differences between the planned and actual progress	Progress of CFM Measure
To confirm whether the urbanization ratio exceeds the targeted ratio or not since the targeted urbanization ratio is the basis for the setting of design peak discharge in the basin	Urbanized Area Ratio
To clarify the flood damage mitigation effect in accordance with the progress of required measures	Inundation Condition

2.2 Progress of CFM Measure

The structural measures proposed in the CFMP/CFMAP are as follows.

Table 2.2-1 CFM Measure (Structural Measure)

Measure	Facility	Description
Flood Control Measure	River Improvement	River Improvement: 500m^3/s、L=23.8km (Manggarai Gate to Outer Ring Road)
	Gate	Improvement of Manggarai Gate (one additional gate)
		Improvement of Karet Gate (one additional gate)
	Diversion Tunnel	Connecting diversion tunnel to East Banjir Canal (diversion volume: 60m^3/s)
	Dam	Ciliwung Main River in Ciawi area, dry dam type, dam height of H=40 m, control volume of 130 m^3/s
		Ciliwung tributary in Cisukabirus area, dry dam type, dam height of H=30 m, control volume of 130 m^3/s
Runoff Control Measure	Runoff Control Measure	Installation of rainwater storage and infiltration facility (public sector and private sector)

Both for flood control measure and runoff control measure, the monitoring method is described below.

2.2.1 Progress of Flood Control Measure

Flood control measures proposed in the CFMP/CFMAP for the Ciliwung River Basin will be mainly carried out by BBWS Ciliwung-Cisadane. Thus, the monitoring of implementation progress is conducted by this organization.

<Data/Information Collection>

- Information on annual flood control plan is collected based on the project plan documents.
- Information on the progress of annual flood control project is collected based on the project completion documents. In addition, LAKIP can be utilized as well.

<Explanation>

Collected data and information on the plan and progress of flood control measures is summarized below.

Table 2.2-2 Collected Data/Information on Flood Control Measure

Measure	Plan	Progress
River Improvement	● Planned section and length ● Planned completion year	● Completed section and length ● Completion year
Gate Improvement	● Work plan ● Planned completion year	● Work progress ● Completion year
Diversion Tunnel	● Planned section ● Planned completion year	● Work progress ● Completion year
Dam Construction	● Construction plan ● Planned completion year	● Construction progress ● Completion year

The monitoring items on the above flood control measures can be collected based on the project plan documents on those measures. Moreover, as long as available, the drawings showing the work sections and locations shall be collected.

The annual progress of flood control measures can be confirmed with the completion documents prepared by the contractors. Moreover, if possible, the drawings showing the completed sections and locations shall be collected. In addition, the necessary information in LAKIP can be utilized.

<Analysis Method: Indicator>

- River Improvement, Diversion Tunnel: progress rate to total planned length
- Gate Improvement: completion rate to total planned locations
- Dam Construction: work progress rate to total work plan

<Explanation>

The progress rate is estimated based on collected data.

(Example: River Improvement)
Progress Rate (%) = Length of Completed River Section (km) / Length of Total Planned Section (km)

<Monitoring Evaluation>

Monitoring evaluation sheet shall be prepared based on collected data and analysis.

<Explanation>

Based on the collected data and analysis, the monitoring evaluation sheet shall be prepared, and the difference between the planned value and actual value shall be confirmed. Those data can be utilized as basic information to review and revise the CFMP/CFMAP.

As an example, the monitoring evaluation sheet (draft) for river improvement is shown below.

FY 2015: Progress of River Improvement

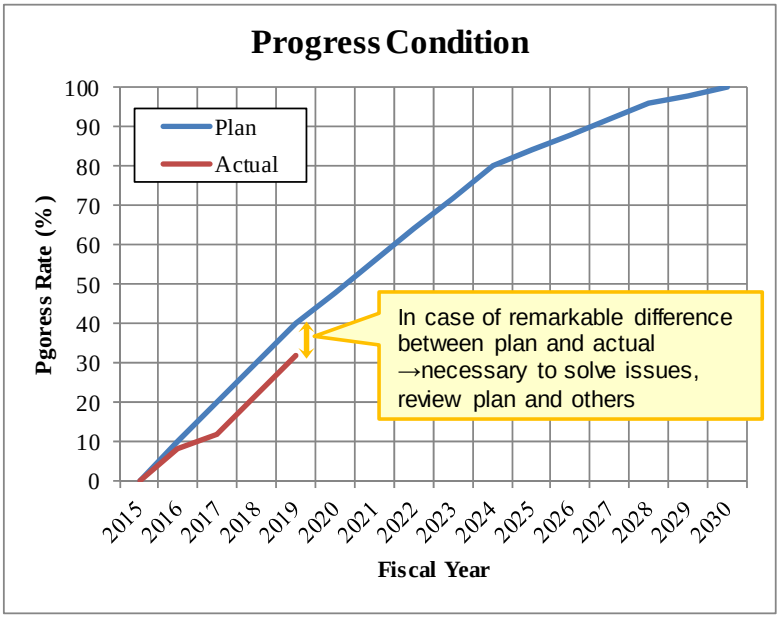
River Basin	Ciliwung River Basin			
River Name	Ciliwung River			
	Length of Section Plan (km)	Progress (%)	Length of Section Progress (km)	Progress (%)
Plan	23.8	100.0	–	–
Progress until Last Year	7.1	29.8	5.9	24.8
Completed Section in this Year	2.4	10.1	4.8	20.2
Accumulated	9.5	39.9	10.7	45.0
Progress				

Figure 2.2-1 Monitoring Evaluation Sheet (Draft): River Improvement

By visualizing the progress of measures and sharing the progress conditions in the above monitoring evaluation sheet, it is useful to identify and solve the issues and to review the plans immediately.

<Organization in charge of Progress Monitoring>

The monitoring of the project progress shall be conducted by BBWS Ciliwung-Cisadane which is the implementation agency for flood control measures in the Ciliwung River, and this organization will report the result to the monitoring agency.

<Reporting Schedule of Monitoring Result>

Monitoring result shall be reported once a year.

<Explanation>

The monitoring result shall be reported to the TKPSDA WS Ciliwung-Cisadane once a year. Besides, the reporting schedule will be determined based on the annual meeting schedule of the TKPSDA WS Ciliwung-Cisadane.

2.2.2 Progress of Runoff Control Measure

(1) Runoff Control Measure in Public Sector

<Data/Information Collection>

- The information on the installation plan of the rainwater storage and infiltration facility is collected based on the target volume in each local government described in the CFMP.
- The progress of the installed facility in the Ciliwung River Basin is confirmed based on the project completion documents. In addition, LAKIP can be utilized as well.

<Explanation>

As shown in Table 2.2-3 below, the target volume for the installation of rainwater storage and infiltration facility in each local government in public sector is set in the CFMP by 2030. Based on those volumes, local government shall prepare the project plans and install the facility by 2030.

Table 2.2-3 Estimation of Target Volume of Infiltration Facility by City/Regency

Item		Jakarta Pusat	Jakarta Timur	Jakarta Selatan	Kota Depok	Kab. Bogor	Kota Bogor	Total Basin
Target Volume (m^3)	Public facilities	41,890	35,530	88,560	18,310	13,970	5,140	203,400
	Private Facilities	0	59,500	49,400	501,000	1,754,000	310,700	2,674,600
	Total	41,890	95,030	137,960	519,310	1,767,970	315,840	2,878,000

Source: Comprehensive Flood Management Plan (Draft), JICA, October 2013

Regarding the progress of installed facility, the following information shall be collected from the project completion documents. Moreover, the necessary information in LAKIP can be utilized.

- Number of Installed Rainwater Storage and Infiltration Facility (drawing documents as well)
- Volume of Installed Rainwater Storage and Infiltration Facility (m^3)

<Analysis Method: Indicator>

Progress rate to total target volume in each local government

<Explanation>

The progress rate of installed volume can be estimated with the following formula.

Progress Rate (%) = Installed Volume (m^3) / Target Volume (m^3)

<Monitoring Evaluation>

Monitoring evaluation sheet shall be prepared based on collected data and analysis.

<Explanation>

Based on the collected data and analysis, the monitoring evaluation sheet shall be prepared, and the difference between the planned value and actual value shall be confirmed and utilized as basic information to review and revise the CFMP/CFMAP.

As an example, the monitoring evaluation sheet (draft) for the installation of rainwater storage and infiltration facility in the public sector is shown below.

FY 2015: Progress of Runoff Control Measure (Pubic Sector)

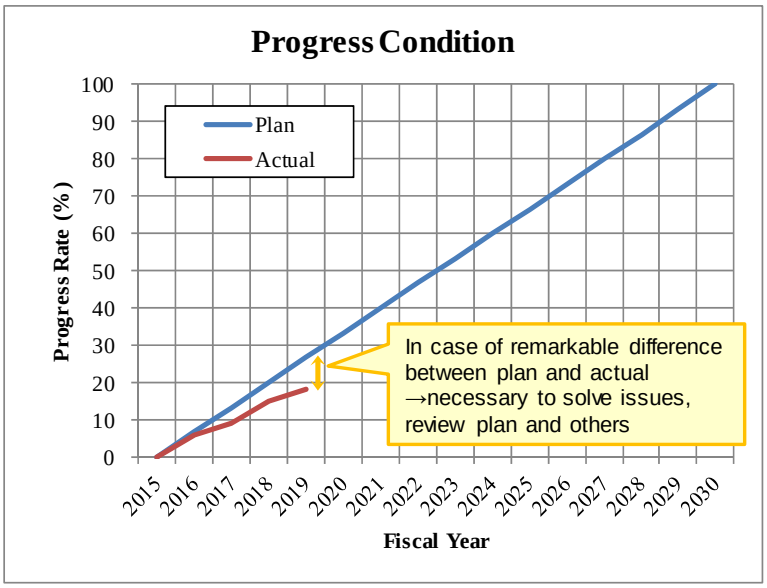
River Basin	Ciliwung River Basin			
Regency/City	Jakarta Timur			
	Installed Volume Plan (m^3)	Progress (%)	Installed Volume Progress (m^3)	Progress (%)
Plan	35,530	100.0	–	–
Progress until Last Year	7,100	20.0	5,330	15.0
Completed Volume in this Year	2,390	6.7	4,970	14.0
Accumulated	9,490	26.7	10,300	29.0
Progress				

Figure 2.2-2 Monitoring Evaluation Sheet (Draft): Rainwater Storage and Infiltration Facility (Public Sector)

<Organization in charge of Progress Monitoring>

The monitoring of the project progress shall be conducted by the responsible agencies for the installation of rainwater storage and infiltration facility in each local government, and those organizations will report the result to the monitoring agencies.

<Explanation>

The responsible organization in each local government is listed below.

Table 2.2-4 Organization for Monitoring in Each Local Government (Runoff Control Measure: Public Sector)

Local Government	Implementation Organization
DKI Jakarta	Public Works Agency (collecting necessary information/data from other related organizations)
Depok City	Highways and Water Resources Agency
Bogor Regency	Highways and Irrigation Agency
Bogor City	Highways and Water Resources Agency

Regional Environmental Management Agency and Industry and Energy Agency of DKI Jakarta have made efforts to promote the installation of rainwater storage and infiltration facilities including infiltration well (*Sumur Resapan*) and infiltration pond in the public facility areas. Therefore, through the information sharing and cooperation with those organizations, the progress of installed facility shall be monitored.

<Reporting Schedule of Monitoring Result>

Monitoring result shall be reported once a year.

<Explanation>

The monitoring result shall be reported to the TKPSDA WS Ciliwung-Cisadane once a year. Besides, the reporting schedule will be determined based on the annual meeting schedule of the TKPSDA WS Ciliwung-Cisadane.

(2) Runoff Control Measure in Private Sector

<Data/Information Collection>

- The information on the installation plan of the rainwater storage and infiltration facility is collected based on the target volume in each local government described in the CFMP (see in Table 2.2-4 above).
- The progress of the installed facility in the Ciliwung River Basin is confirmed based on the installation plan described in the application of building permits (*Izin Mendirikan Bangunan* or IMB) which is also used for the monitoring of urbanized area ratio.

<Explanation>

The target volume for the installation of rainwater storage and infiltration facility in the private sector described in the CFMP is set based on the urbanized area ratio as of 2030 (approximately 71 %) mentioned below. Thus, if the urbanization is not accelerated as projected, the target volume for the private sector will be reduced since it is assumed that the land use will not change and runoff volume will not increase.

Therefore, the monitoring on the installed volume in the private sector shall be conducted in coordination with the monitoring on the urbanized area ratio.

Regarding the progress of installed facility, the following information shall be collected from the application of the building permits. Moreover, if available, the drawing documents indicating the installation locations shall be collected as well.

- Number of Planned Rainwater Storage and Infiltration Facility (drawing documents as well)
- Volume of Installed Rainwater Storage and Infiltration Facility (m^3)

<Analysis Method: Indicator>

Progress rate to total target volume in each local government area

<Explanation>

The progress rate of installed volume can be estimated with the following formula.

Progress Rate (%) = Planned Installation Volume (m^3) / Target Volume (m^3)

<Monitoring Evaluation>

Monitoring evaluation sheet shall be prepared based on the collected data and analysis.

<Explanation>

Based on the collected data and analysis, the monitoring evaluation sheet shall be prepared, and the difference between the planned value and actual value shall be confirmed. Moreover, the difference from the urbanized area ratio shall be confirmed also (refer to 2.3).

As an example, the monitoring evaluation sheet (draft) for the installation of rainwater storage and infiltration facility in the private sector is shown below.

FY 2015: Progress of Runoff Control Measure (Private Sector)

River Basin	Ciliwung River Basin			
Regency/City	Jakarta Timur			
	Installed Volume Plan (m^3)	Progress (%)	Installed Volume Progress (m^3)	Progress (%)
Plan	59,500	100.0	–	–
Progress until Last Year	11,900	20.0	8,900	15.0
Completed Volume in this Year	4,000	6.7	8,300	13.9
Accumulated	15,900	26.7	17,200	28.9

Progress

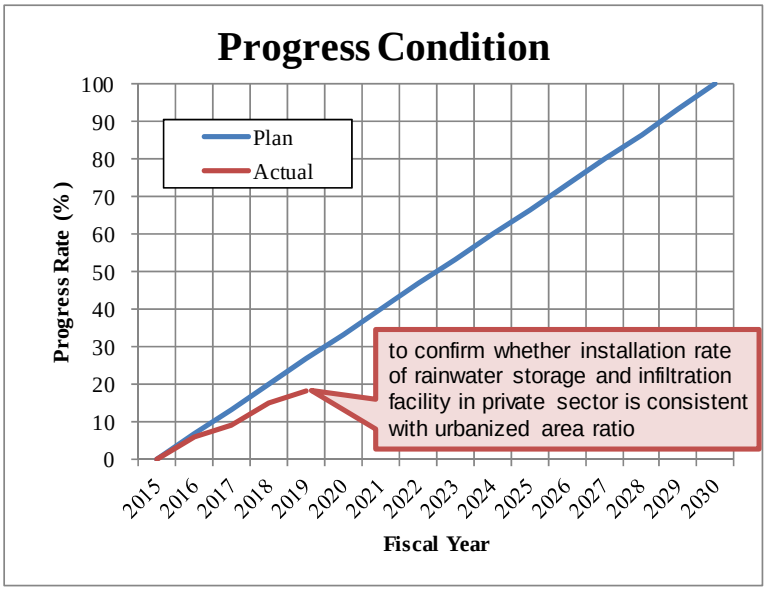


Figure 2.2-3 Monitoring Evaluation Sheet (Draft): Rainwater Storage and Infiltration Facility (Private Sector)

<Organization in charge of Progress Monitoring>

The monitoring of the installed volume shall be conducted by the authorized agencies for the issuance of building permits in each local government, and those organizations will report the result to the monitoring agencies.

<Explanation>

The organization for monitoring urbanized area ratio in each local government is listed below.

Table 2.2-5 Organization for Monitoring in Each Local Government (Runoff Control Measure: Private Sector)

Local Government	Implementation Organization
DKI Jakarta	Building Supervision and Controlling Agency (collecting information from municipality level)*
Depok City	Building and Settlement Agency
Bogor Regency	Building and Settlement Agency
Bogor City	Building and Settlement Agency

* Since the authorized organization is different between province and municipality depending on the development scale, the provincial government shall collect the information from the organization in charge in municipality level.

For the confirmation of land use change, it is necessary to share the information on land use among the Regional Development Planning Agency (BAPPEDA) which formulates the spatial plans as well as implementation agencies of spatial plans. Thus, organization in charge of building permits shall initiate to cooperate with other organizations.

Moreover, in DKI Jakarta, in the application and approval process of Environmental Impact Assessment (EIA or AMDAL), Regional Environmental Management Agency functions as coordinator among related organizations such as Building Supervision and Controlling Agency and Spatial Planning Agency, and those organizations accelerate and supervise the installation of rainwater storage and infiltration facility in cooperation. Thus, by sharing information among those organizations, the monitoring shall be conducted.

<Reporting Schedule of Monitoring Result>

Monitoring result shall be reported once a year.

<Explanation>

The monitoring result shall be reported to the TKPSDA WS Ciliwung-Cisadane once a year. Besides, the reporting schedule will be determined based on the annual meeting schedule of the TKPSDA WS Ciliwung-Cisadane.

2.3 Urbanized Area Ratio

The urbanized area ratio in 2030 is projected in spatial plans of local government as approximately 71 %, and this figure is utilized for the estimation of design peak discharge in the CFMP. Therefore, if it is identified that the urbanized area ratio in Ciliwung River Basin will exceed this figure during the monitoring period, it is necessary to review and revise the CFMP/CFMAP. This means, the urbanized area ratio is quite important and critical indicator.

<Data/Information Collection>

- Information on river basin border and flood prone area is collected.
- Based on the land use condition in 2008 and projected land use in 2030, the trend of urbanized area ratio is monitored.
- The location and scale of land development are confirmed based on IMB.

<Explanation>

River basin border can be clarified based on the river basin map prepared by BBWS Ciliwung-Cisadane.

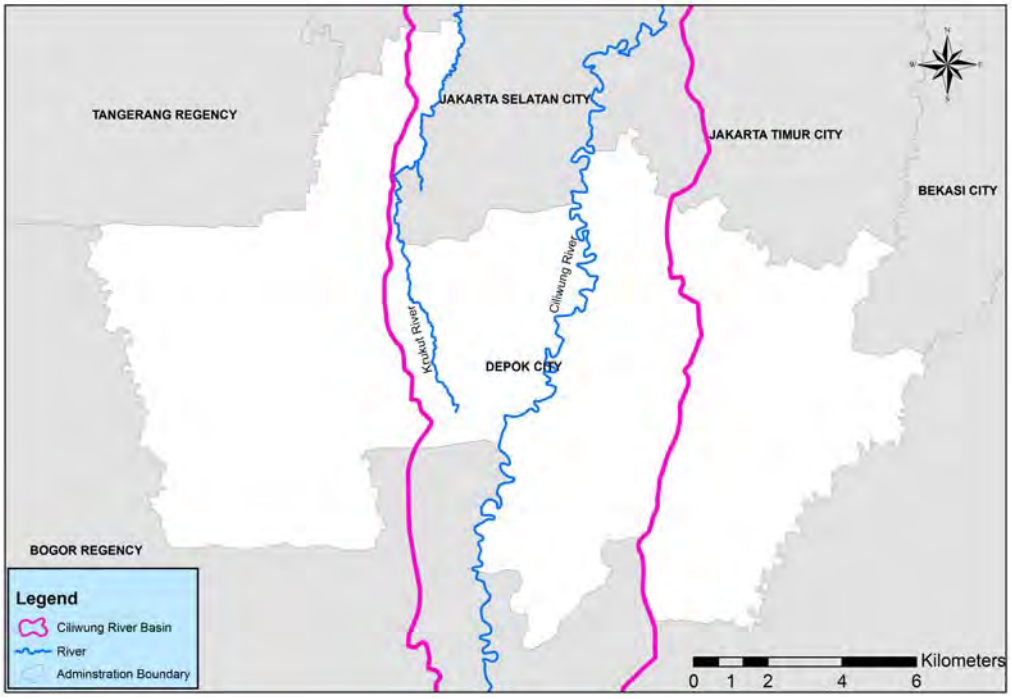


Figure 2.3-1 River Basin Map of Ciliwung River Basin in Depok City (Example)

The land use condition in 2008 and projected land use in 2030 are prepared in the spatial plans of the local governments in the Ciliwung River Basin. Thus, land use map in 2008 and 2030 prepared based on the above can be utilized to identify the land use change until 2030 (i.e., for the next 20 years) which is the target year of the CFMP. The urbanized area in this term is specified as the total area of urban area, settlement area, and road and railway area as classified in the general spatial plan.

Moreover, in order to identify the change of urbanized area ratio, the locations and scale of land development in Ciliwung River Basin shall be specified based on the information in the application of IMB.

<Analysis Method: Indicator>

Based on the information of land development in IMB, the urbanized area ratio shall be calculated.

<Explanation>

Based on the information in IMB, the change of urbanized area ratio from 2008 shall be calculated by using the land use map in the general spatial plan.

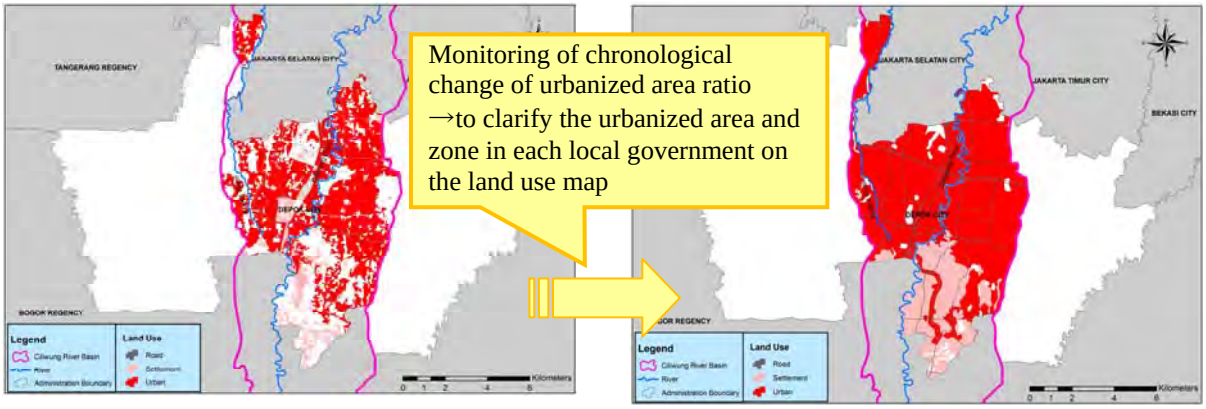
<Monitoring Evaluation>

Based on the collected data and monitoring results, the chronological change of urbanized area ratio shall be estimated and land use map shall be updated based on it.

<Explanation>

Based on the collected data and monitoring results, the annual and accumulated urbanized area ratio shall be calculated. Moreover, the difference comparing to the projected urbanized area ratio in 2003 (approximately 71 %) shall be evaluated. In addition, by visualizing the ratio in land use map, the remarkable urbanized area can be identified. That information will be utilized for the further land use regulation in the river basin.

As an example in Depok City, the land use map for the monitoring of urbanized area ratio is shown below.



Urbanized Area as of Year 2008 Urbanized Area as of Year 2030 (Projected)

Item	Area (km²)	Ratio (%)	Increased Area from 2008 (km²)
River Basin Area	xxx	xx.x	xxx
Urbanized Area: Year 2008	xxx	xx.x	xxx
Urbanized Area: Year xxx	xxx	xx.x	xxx
Urbanized Area: Year 2030	xxx	xx.x	xxx

Figure 2.3-2 Land Use Map for Monitoring Urbanized Area Ratio (Depok City)

<Organization in charge of Monitoring>

The monitoring of the urbanized area ratio shall be conducted by the authorized agencies for the issuance of building permits in each local government, and those organizations will report the result to the monitoring agencies.

<Explanation>

The organization for monitoring inundation conditions in each local government is listed below.

Table 2.3-1 Organization for Monitoring in Each Local Government (Urbanized Area Ratio)

Local Government	Implementation Organization
DKI Jakarta	Building Supervision and Controlling Agency (necessary information will be collected from related municipality organizations)*
Depok City	Building and Settlement Agency
Bogor Regency	Building and Settlement Agency
Bogor City	Building and Settlement Agency

* Since the authorized organization is different between province and municipality depending on the development scale, the provincial government shall collect the information from the organization in charge in municipality level.

For the confirmation of land use change condition, it is necessary to share the information on land use among the Regional Development Planning Agency (BAPPEDA) which formulates the spatial plans as well as implementation agencies of spatial plans. Thus, organization in charge of building permits shall cooperate with other organizations.

<Reporting Schedule of Monitoring Result>

Monitoring result shall be reported once a year.

<Explanation>

The monitoring result shall be reported to the TKPSDA WS Ciliwung-Cisadane once a year. Besides, the reporting schedule will be determined based on the annual meeting schedule of the TKPSDA WS Ciliwung-Cisadane.

2.4 Inundation Condition

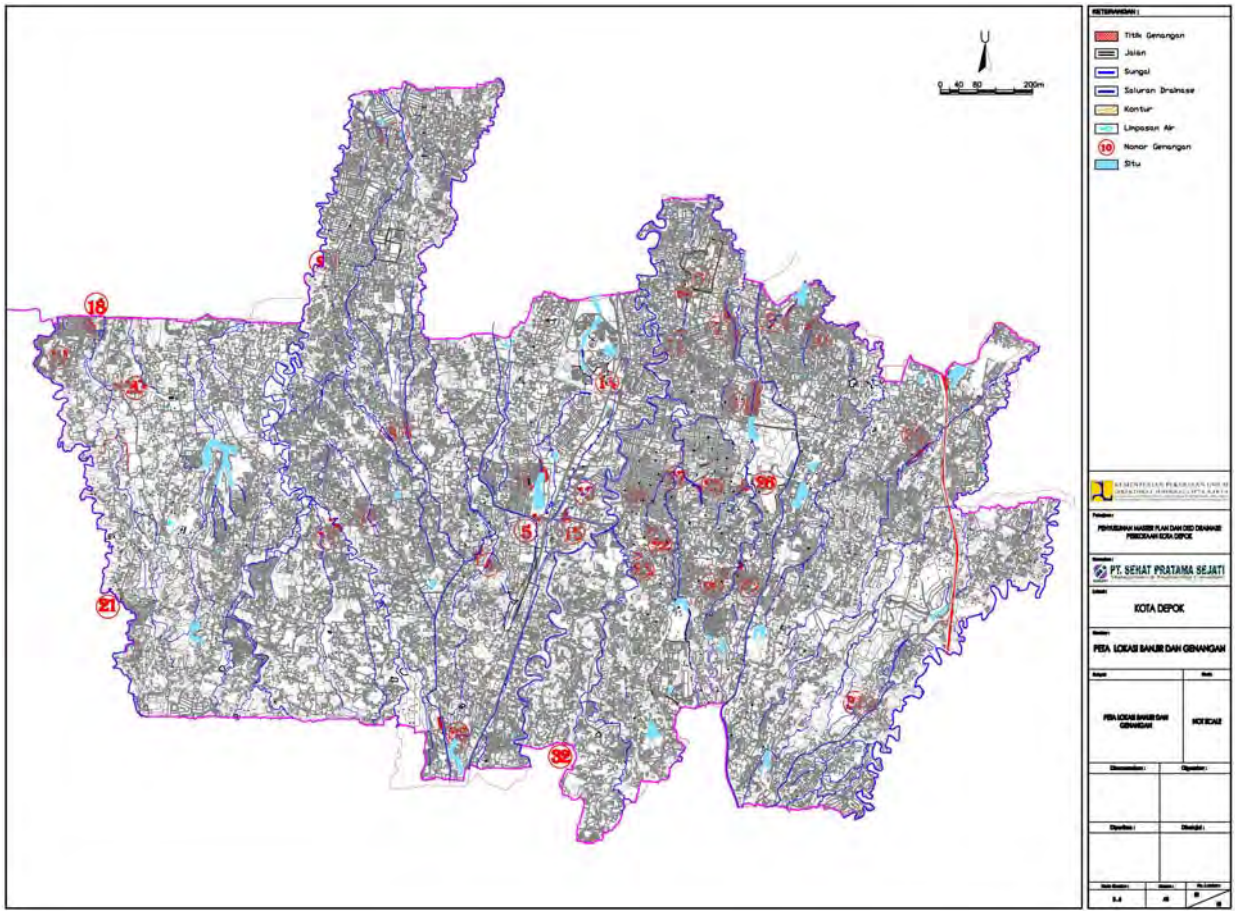
<Data/Information Collection>

- Information on river basin border and flood prone area shall be collected.
- Number of inundation occurrence shall be counted at the selected monitoring points in the flood prone area every year.

<Explanation>

River basin border can be clarified based on the basin map prepared by BBWS Ciliwung-Cisadane.

Based on the river basin map, the flood risk map shall be prepared to specify the flood prone area. Moreover, monitoring points shall be determined based on the flood risk map.



Source: Final Report of *Master Plan dan DED Drainase Perkotaan Kota Depok (Paket PJD 01)*, December 2010

Figure 2.4-1 Flood Risk Map in Depok City (Example)

At the selected monitoring points, the inundation conditions in each rainfall are checked. Those monitoring data shall be calculated and the annual inundation occurrence shall be counted.

<Analysis Method: Indicator>

By visualizing the inundation occurrence monthly with graph, the frequency of inundation occurrence shall be confirmed.

<Explanation>

The monthly inundation occurrence shall be confirmed and shown by graph. The inundation shall be counted in each rainy season in principle from November to April. However, in case of the flood

occurrence in other period, the flood conditions shall be surveyed and monitored as well.

<Monitoring Evaluation>
Monitoring evaluation sheet shall be prepared based on collected data and analysis.

<Explanation>

Based on the collected data and analysis, the monitoring evaluation sheet shall be prepared, and the annual inundation conditions shall be confirmed.

As an example, the monitoring evaluation sheet (draft) for the confirmation of inundation conditions is shown below.

Inundaiton Condition

River Basin	Ciliwung River Basin	
Regency/City	Jakarta Timur	
Monitoring Point		
Coordinates	X=	Y=

Inundation Frequency								
Year	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Other	Total
2013	0	2	3	3	1	1		10
2014	0	2	3	4	1	0		10
2015	0	1	3	3	1	0		8
2016								0
2017								0
2018								0
2019								0
2020								0
2021								0
2022								0
xxxx								0

Change of Inundation Frequency

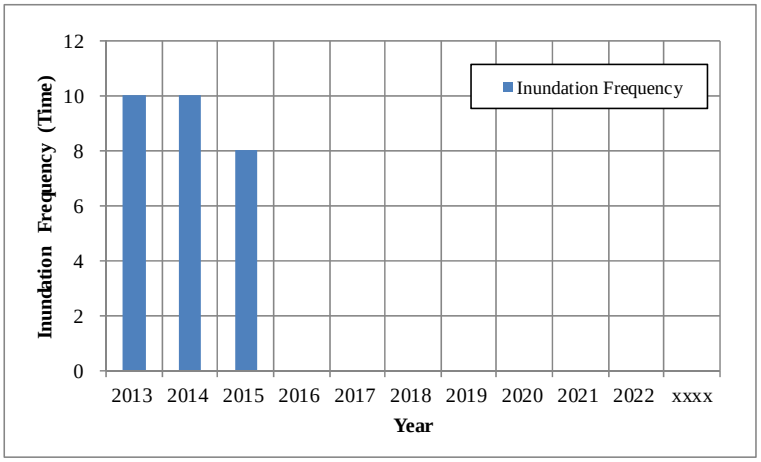


Figure 2.4-2 Monitoring Evaluation Sheet (Draft): Inundation Condition

<Organization in charge of Monitoring>
The monitoring of the inundation conditions shall be conducted by the authorized agencies for the implementation of flood control measures and/or runoff control measures in each local government, and those organizations will report the result to the monitoring agencies.

<Explanation>

The organization for monitoring inundation conditions in each local government is listed below.

Table 2.4-1 Organization for Monitoring in Each Local Government (Inundation Conditions)

Local Government	Implementation Organization
DKI Jakarta	Public Works Agency
Depok City	Highways and Water Resources Agency
Bogor Regency	Highways and Irrigation Agency
Bogor City	Highways and Water Resources Agency

<Reporting Schedule of Monitoring Result>

Monitoring result shall be reported once a year.

<Explanation>

The monitoring result shall be reported to the TKPSDA WS Ciliwung-Cisadane once a year. Besides, the reporting schedule will be determined based on the annual meeting schedule of the TKPSDA WS Ciliwung-Cisadane.

CHAPTER 3 MONITORING MECHANISM

3.1 Basic Policy for Establishment of Monitoring Mechanism

In order to implement the proper monitoring and to share the monitoring results among the related organizations effectively, the monitoring mechanism is proposed based on the following basic policies.

- For the implementation of the CFMP/CFMAP, it is required to conduct the proposed measures in the comprehensive and integrated manner in the Ciliwung River Basin including the flood control measures as well as the runoff control, land use regulation and disaster mitigation measures. Thus, the inter-organizational and inter-regional monitoring mechanism shall be established.
- Moreover, for the sustainable monitoring mechanism, it is effective to utilize the coordination body with legal background.
- Thus, TKPSDA WS Ciliwung-Cisadane is the main agency for the monitoring and evaluation of comprehensive flood management measures since it is established in accordance with the Minister of Public Works Regulation No. 242/2013. In addition, it is effective and practical to gather all the monitoring results to the secretariat of TKPSDA WS Ciliwung-Cisadane, which is BBWS Ciliwung-Cisadane.
- On the other hand, BAPPEDA is mandated to coordinate among the organizations and to supervise and monitor the project implementation in each local government. Therefore, in coordination with BAPPEDA in Ciliwung River Basin, the secretariat of TKPSDA WS Ciliwung-Cisadane will collect and analyze the monitoring results.
- It is necessary to approach to establish the cooperative relationship with the other organizations which are not the member of TKPSDA WS Ciliwung-Cisadane.

3.2 Proposed Monitoring Mechanism

The monitoring mechanism based on the above policies is shown in Figure 3.2-1.

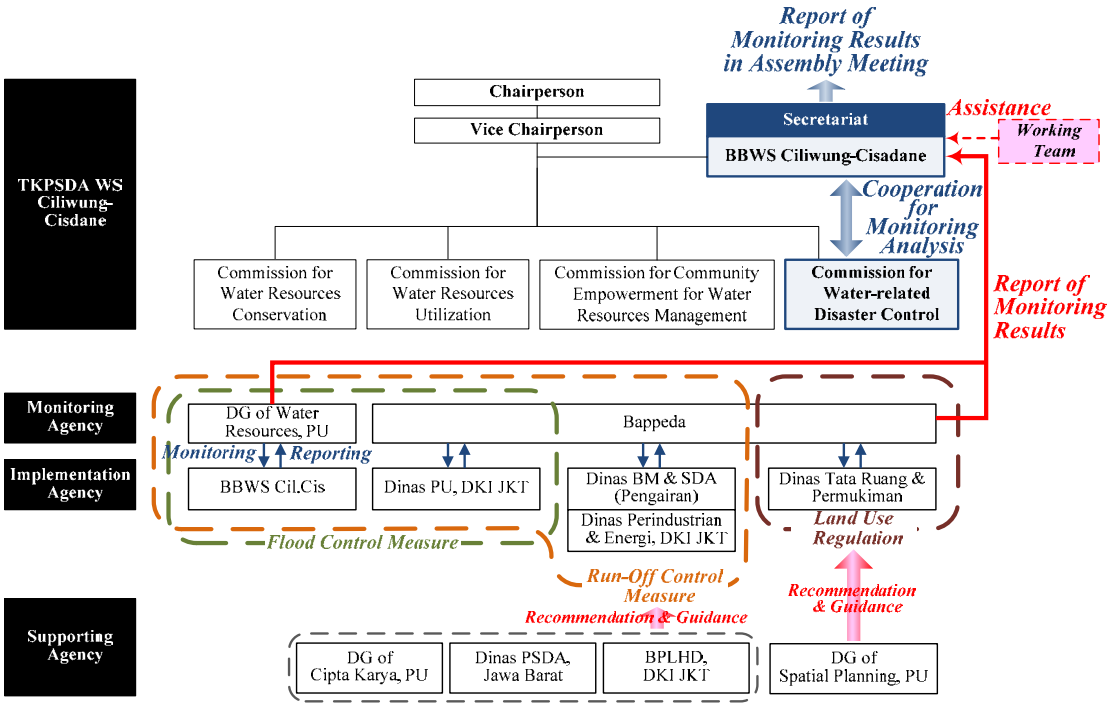


Figure 3.2-1 Monitoring Mechanism by utilizing TKPSDA WS Ciliwung-Cisadane

The role of each organization is as follows.

<Implementation Agency>

- The central and local government agencies which implement the flood control measures, runoff control measures, land use regulation and disaster mitigation measures will plan and conduct the projects of each measure based on the CFMP/CFMAP.

<Supporting Agency>

- Supporting agencies will provide technical supports to the above implementation agencies for the smooth and effective implementation of each measure.

<Monitoring Agency>

- Monitoring agencies will monitor and evaluate the progress and achievement of project of each measure conducted by implementation agency, and report the monitoring and evaluation results to the secretariat of the TKPSDA WS Ciliwung-Cisadane.

<TKPSDA WS Ciliwung-Cisadane>

- BBWS Ciliwung-Cisadane, as secretariat of the TKPSDA WS Ciliwung-Cisadane, will receive the monitoring and evaluation results from monitoring agencies, and analyze those results in the unit of river basin.
- BBWS Ciliwung-Cisadane will report the monitoring and evaluation results in the assembly meeting of TKPSDA WS Ciliwung-Cisadane.

◆ **Commission for Water-related Disaster Control**

- Commission for Water-related Disaster Control will assist the analysis of monitoring and evaluation results by the secretariat of the TKPSDA WS Ciliwung-Cisadane.

APPENDIX-2-1

STIPULATION
FOR
ESTABLISHMENT AND OPERATION
OF
COMPREHENSIVE FLOOD MANAGEMENT
COMMITTEE
FOR
CILIWUNG RIVER BASIN
(Indonesian Version)

PENETAPAN PEMBENTUKAN DAN PELAKSANAAN COMPREHENSIVE FLOOD MANAGEMENT COMMITTEE UNTUK DAS CILIWUNG

BAB I
KETENTUAN UMUM
Pasal 1

Dalam Ketetapan ini, yang dimaksud dengan:

1. Daerah aliran sungai adalah suatu wilayah daratan yang merupakan satu kesatuan dengan sungai dan anak-anak sungainya, yang berfungsi menampung, menyimpan, dan mengalirkan air yang berasal dari curah hujan ke danau atau ke laut secara alami, yang batas di darat merupakan pemisah topografis dan batas di laut sampai dengan daerah perairan yang masih terpengaruh aktivitas daratan.
2. Pemerintah pusat, selanjutnya disebut Pemerintah, adalah Presiden Republik Indonesia yang memegang kekuasaan pemerintahan negara Republik Indonesia sebagaimana dimaksud dalam Undang-Undang Dasar Negara Republik Indonesia Tahun 1945.
3. Comprehensive Flood Management Plan (CFMP) adalah rencana langkah – langkah strategis, menyeluruh dan terpadu yang dilakukan dalam rangka pengelolaan banjir di sungai dan daerah aliran sungai, secara struktural dan non-struktural.
4. Comprehensive Flood Management Action Plan (CFMAP) adalah rencana tindak implementasi kegiatan – kegiatan berdasarkan Comprehensive Flood Management Plan (CFMP).
5. Comprehensive Flood Management Committee (CFMC) DAS Ciliwung adalah wadah koordinasi konsultasi untuk mendiskusikan langkah – langkah terpadu pengelolaan banjir dan peningkatan peran dari instansi-instansi terkait di DAS Ciliwung.
6. Pemerintah Daerah adalah Gubernur, Bupati atau Walikota dan pegawai pemerintahan daerah sebagai unsur dari administrasi pemerintah daerah.

BAB II
KOMITE PENGELOLAAN BANJIR TERPADU (KPBT)
Pasal 2

Sesuai dengan Minutes of Meeting tanggal 7 Juli 2010, Record of Discussion bulan Agustus 2010 dan Minutes of Meeting tanggal 15 Desember 2010 antara Japan International Cooperation Agency (JICA) dengan Pemerintah Indonesia mengenai “The Project for Capacity Development of Jakarta Comprehensive Flood Management” (selanjutnya disebut dengan “JICA Technical Cooperation Project”), the Comprehensive Flood Management Committee for Ciliwung River Basin (CFMC) dibentuk sebagai wadah koordinasi konsultasi untuk pengelolaan banjir terpadu wilayah sungai Ciliwung.

Pasal 3

CFMC sebagaimana dimaksud pada Pasal 2 adalah mengkoordinasikan instansi terkait Pemerintah Pusat dan Pemerintah Daerah dalam rangka pelaksanan CFMP/CFMAP melalui:

(1) Koordinasi antar instansi–instansi terkait untuk mempercepat langkah–langkah terpadu pengelolaan banjir di Sungai Ciliwung dan mengintegrasikan langkah-langkah pengelolaan wilayah sungai termasuk didalamnya peraturan tentang perubahan tata guna lahan dan pembangunan, pengendalian aliran permukaan, dan langkah-langkah lain yang diperlukan dalam pengelolaan DAS Ciliwung,
(2) Formulasi, autorisasi, dan review CFMP/ CFMAP serta penetapan pembagian peran dan fungsi setiap instansi terkait dalam pelaksanaan CFMP/CFMAP,
(3) Diskusi mengenai formulasi dan penguatan aspek legal dalam rangka pelaksanaan CFMP/CFMAP,
(4) Pembentukan mekanisme pemantauan dan feedback dalam pelaksanaan CFMP/CFMAP, dan,
(5) Evaluasi, implementasi dan realisasi CFMP/CFMAP.

Pasal 4

(1) Struktur Organisasi CFMC terdiri dari:
   a. Ketua
   b. Wakil Ketua
   c. Sekretaris
   d. Anggota
   e. Satuan Kerja
(2) Ketua CFMC dijabat oleh Kepala Bappeda DKI Provinsi Jakarta (lihat Annex-1).
(3) Wakil Ketua CFMC dijabat oleh Kepala Dinas PU Provinsi DKI Jakarta (lihat Annex-1).
(4) Sekretaris CFMC dijabat oleh Kepala Bidang Program dan Perencanaan Umum, BBWS Ciliwung-Cisadane, Ditjen. SDA, Kementerian Pekerjaan Umum (lihat Annex-1).
(5) Dibawah CFMC, Satuan-satuan Kerja dibentuk untuk memberikan dukungan teknis ke Sekretariat.

Pasal 5

(1) Anggota CFMC dipilih dari anggota TKPSDA WS Ciliwung-Cisadane yang berhubungan dengan perencanaan dan pelaksanaan pengelolaan banjir terpadu di DAS Ciliwung (lihat Annex-1).
(2) Anggota Satuan Kerja adalah instansi dari setiap counterpart sesuai yang tercantum dalam naskah Kerja Sama Teknik JICA (lihat di Annex-2 sampai Annex-5).

Pasal 6

(1) Untuk melaksanakan fungsi CFMC sebagaimana yang dimaksud pada Pasal 2, tugas pokok dan fungsi Ketua adalah sebagai berikut:
   a. Memimpin sidang CFMC dan mengkoordinasikan pembahasan CFMP/ CFMAP,
   b. Memformulasi dan mengesahkan kesimpulan rapat CFMP/ CFMAP berdasarkan pembahasan pada sidang – sidang CFMC, dan
   c. Membuat dan mempercepat mekanisme pemantauan dan umpan balik pada pelaksanaan CFMP/ CFMAP.
(2) Untuk melaksanakan fungsi CFMC sebagaimana yang ditetapkan pada Pasal 2, tugas dan fungsi Wakil Ketua adalah sebagai berikut:
   a. Melaksanakan tugas-tugas Ketua CFMC apabila Ketua berhalangan hadir,
   b. Mengkoordinasi diskusi CFMP/ CFMAP yang dilaksanakan CFMC dan,
   c. Supervisi dan mengawasi kinerja Sekretariat dan Satuan Kerja CFMC.

Pasal 7

(1) Untuk membantu Ketua dan Wakil Ketua CFMC, harus ditunjuk Sekretaris CFMC.
(2) Sekretaris CFMC bertanggung jawab dan bertugas:
   a. Mendukung kinerja tugas dan fungsi CFMC,
   b. Memfasilitasi pengaturan sidang CFMC,
   c. Menyiapkan bahan-bahan yang diperlukan untuk pembahasan sidang-sidang CFMC,
   d. Pemantauan pencapaian dan perkembangan CFMP/CFMAP oleh anggota CFMC, dan,
   e. Membuat notulen/ catatan hasil sidang CFMC.

Pasal 8

(1) Untuk memberikan dukungan teknis kepada Sekretariat CFMC, perlu ditetapkan Satuan Kerja.
(2) Satuan Kerja terdiri atas 4 unit:
   a. Satuan Kerja Comprehensive Flood Management Plan (CFMP)
   b. Satuan Kerja Spatial Planning
   c. Satuan Kerja Run-off Control
   d. Satuan Kerja Coordination and Monitoring
(3) Tugas dan fungsi Satuan Kerja CFMP adalah sebagai berikut:
   a. Melaksanakan survei teknis dan analisa untuk formulasi, peninjauan, kajian evaluasi, umpan balik dan revisi CFMP/ CFMAP termasuk survei sistem sungai dan kondisi genangan, analisa hidrologi dan hidrolik, analisa genangan banjir, analisa debit rencana,perencanaan

tata letak fasilitas pengendali banjir, dan analisa-analisa terkait lainnya yang diperlukan.
   b. Membantu Sekretaris dalam mempersiapkan bahan-bahan yang diperlukan untuk sidang-sidang CFMC mengenai CFMP/ CFMAP.

(4) Tugas dan fungsi Satuan Kerja Spatial Planning adalah:
   a. Melaksanakan survei teknis dan analisa penggunaan lahan dan peraturan pembangunan pada tata ruang untuk formulasi, peninjauan, umpan balik dan revisi CFMP/ CFMAP termasuk analisa aspek hukum untuk penggunaan lahan dan peraturan pembangunan, segmentasi lahan dan zonasi sesuai dengan CFMP/ CFMAP, dan,
   b. Membantu Sekretaris menyiapkan bahan-bahan yang dibutuhkan untuk sidang-sidang CFMC mengenai penataan ruang pada CFMP/ CFMAP..

(5) Tugas dan fungsi Satuan Kerja Run-off Control adalah:
   a. Melaksanakan survei teknis yang dibutuhkan serta analisa perencanaan dan pelaksanaan pengendalian aliran permukaan (run-off control) untuk formulasi, peninjauan, evaluasi, umpan balik, dan revisi CFMP/ CFMAP termasuk analisa MENGENAI survei sistem sungai, kondisi genangan dan kondisi penggunaan lahan pada saat ini, perencanaan fasilitas pengendali aliran permukaan, pemantauan dampak pengendalian aliran permukaan dan aspek legal dan dasar hukum yang dibutuhkan untuk pengaturan pengendalian aliran permukaan sesuai dengan CFMP/ CFMAP, dan,
   b. Membantu Sekretaris menyiapkan bahan-bahan yang dibutuhkan untuk sidang-sidang CFMC mengenai pengendalian aliran permukaan di CFMP/CFMAP.

(6) Tugas dan fungsi Satuan Kerja Coordination and Monitoring adalah:
   a. Membantu Sekretaris memfasilitasi operasional pelaksanaan sidang-sidang CFMC,
   b. Membantu Sekretaris dalam upaya memotivasi dan mendorong instansi terkait untuk melaksanakan kegiatannya sebagaimana yang telah ditetapkan di CFMP/CFMAP,
   c. Membantu Sekretaris dalam memantau pencapaian dan perkembangan CFMP/ CFMAP para anggota CFMC, dan,
   d. Membantu Sekretaris menyiapkan bahan-bahan yang dibutuhkan untuk sidang-sidang CFMC.

BAB III
TATA TERTIB SIDANG
Pasal 9

(1) CFMC wajib melaksanakan sidang paling tidak satu (1) kali dalam setahun.
(2) Sidang CFMC sebagaimana yang dimaksud ayat (1) diatas dipimpin oleh Ketua CFMC.
(3) Apabila Ketua berhalangan hadir, maka sidang akan dipimpin oleh Wakil Ketua CFMC mewakili Ketua CFMC.
(4) Dalam melaksanakan sidang-sidang CFMC, apabila diperlukan CFMC dapat mengundang narasumber yang terkait dan relevant dengan upaya pengelolaan banjir terpadu di DAS Cilwiung diluar anggota CFMC.
(5) Bahan-bahan yang diperlukan untuk sidang-sidang CFMC akan disiapkan oleh Sekretaris dibantu oleh Satuan Kerja.

BAB IV
PROSEDUR SIDANG
Pasal 10

(1) Setiap anggota wajib mengisi daftar hadir pada setiap sidang CFMC.
(2) Apabila anggota CFMC tidak dapat menghadiri sidang, maka dapat diwakilkan berdasarkan penugasan dari anggota yang bersangkutan.

BAB V
NOTULEN, CATATAN DAN LAPORAN SIDANG
Pasal 11

(1) Disetiap sidang CFMC, Notulen dan/ atau Catatan sidang wajib dibuat oleh Sekretaris dan ditandatangani oleh Ketua atau oleh Sekretaris CFMC atas nama Ketua.
(2) Notulen dan/ atau Catatan sidang harus mencakup keseluruhan pembahasan dalam sidang termasuk namun tidak terbatas hal-hal berikut:
    a. Tanggal dan tempat sidang
    b. Ketua, Wakil Ketua dan Sekretaris sidang
    c. Peserta sidang yang menandatangani daftar hadir pada sidang
    d. Agenda sidang
    e. Kegiatan-kegiatan yang dibahas dalam sidang
    f. Informasi lainnya yang perlu dicatat
(3) Notulen dan/ atau Catatan sidang yang disiapkan oleh Sekretaris harus dibagikan ke seluruh anggota CFMC setelah pelaksanaan sidang.

Annex-1-1: Daftar Anggota Comprehensive Flood Management Committee for Ciliwung River Basin

No.	Position/Name of Organization	Position	Location
1.	Director General of Water Resources, Ministry of Public Works *Direktur Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Executing Agency of JICA Project/ Honorary Member	DKI Jakarta
2.	Director of River and Coast, Directorate General of Water Resources, Ministry of Public Works *Direktur Sungai dan Pantai, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Project Director of JICA Project/ Honorary Member	DKI Jakarta
3.	Head of Ciliwung-Cisadane River Basin Main Office *Kepala Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Project Manager of JICA Project/ Honorary Member	DKI Jakarta
4.	Head of Sub-directorate of Region II, Directorate of River and Coast, Directorate General of Water Resources, Ministry of Public Works *Kasubdit. Wilayah II, Direktorat Sungai dan Pantai, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Coordinator of JICA Project/ Honorary Member	DKI Jakarta
5.	Head of Regional Development Planning Agency, DKI Jakarta Province *Kepala Badan Perencanaan Pembangunan Daerah Provinsi DKI Jakarta*	Chairperson	DKI Jakarta
6.	Head of Public Works Agency, DKI Jakarta Province *Kepala Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Vice Chairperson	DKI Jakarta
7.	Head of Program and General Planning Division, Ciliwung-Cisadane River Basin Main Office *Kepala Bidang Program dan Perencanaan Umum, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Coordinator of JICA Project/Secretary	DKI Jakarta
8.	Director of Water Resources and Irrigation, Ministry of National Development Planning/National Development Planning Agency (BAPPENAS) *Direktur Pengairan dan Irigasi, Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional*	Member	DKI Jakarta
9.	Head of Spatial Planning Agency, DKI Jakarta Province *Kepala Dinas Tata Ruang Provinsi DKI Jakarta*	Member	DKI Jakarta
10.	Head of Regional Development Planning Agency, West Java Province *Kepala Badan Perencanaan Pembangunan Daerah Provinsi Jawa Barat*	Member	Bandung City
11.	Head of Water Resources Management Agency, West Java Province *Kepala Dinas Pengelolaan Sumber Daya Air Provinsi Jawa Barat*	Member	Bandung City
12.	Head of Water Resources Utilization Office in Ciliwung-Cisadane River Basin, West Java Province *Kepala Balai Pendayagunaan Sumber Daya Air Wilayah Sungai Ciliwung-Cisadane Provinsi Jawa Barat*	Member	Bogor City
13.	Regional Secretary, Bogor Regency *Sekretaris Daerah Kabupaten Bogor*	Member	Bogor Regency
14.	Head of Human Settlement and Spatial Planning Agency, Bogor City *Kepala Dinas Cipta Karya dan Tata Ruang Kota Bogor*	Member	Bogor City
15.	Head of Highways and Water Resources Agency, Depok City *Kepala Dinas Bina Marga dan Sumber Daya Air Pemerintah Kota Depok*	Member	Depok City

Annex-1-2: Daftar Narasumber Comprehensive Flood Management Committee for Ciliwung River Basin

No.	Position/Name of Organization	Position	Location
1.	Head of Watershed Management Office, Ministry of Forestry *Kepala Balai Pengelolaan DAS Citarum-Ciliwung, Kementerian Kehutanan*	Resource Person	Bogor City
2.	Head of Agriculture Agency, West Java Province *Kelapa Dinas Pertanian Tanaman Pangan Provinsi Jawa Barat*	Resource Person	Bandung City
3.	Head of Forestry Agency, West Java Province *Kepala Dinas Kehutanan Provinsi Jawa Barat*	Resource Person	Bandung City
4.	Head of Regional Development Planning Agency, Bogor Regency *Kepala Badan Perencanaan Pembangunan Daerah Kabupaten Bogor*	Resource Person	Bogor Regency
5.	Head of Regional Development Planning Agency, Bogor City *Kepala Badan Perencanaan Pembangunan Daerah Kota Bogor*	Resource Person	Bogor City
6.	Head of Regional Development Planning Agency, Depok City *Kepala Badan Perencanaan Pembangunan Daerah Kota Depok*	Resource Person	Depok City

Annex-2: Daftar Anggota Satuan Kerja Comprehensive Flood Management Plan

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Chairperson	DKI Jakarta
2.	Counterpart, Directorate General of Water Resources, Ministry of Public Works *Counterpart, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Public Works Agency, DKI Jakarta Province *Counterpart, Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Member	DKI Jakarta
4.	Counterpart, Highways and Water Resources Agency, Bogor Regency *Counterpart, Dinas Bina Marga dan Pengairan Kabupaten Bogor*	Member	Bogor Regency
5.	Counterpart, Highways and Water Resources Agency, Depok City *Counterpart, Dinas Bina Marga dan Sumber Daya Air Pemerintah Kota Depok*	Member	Depok City

Annex-3: Daftar Anggota Satuan Kerja Spatial Planning

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Building Management and Settlement Agency, Bogor Regency *Counterpart, Dinas Tata Bangunan dan Pemukiman Kabupaten Bogor*	Chairperson	Bogor Regency
2.	Counterpart, Directorate General of Spatial Planning, Ministry of Public Works *Counterpart, Direktorat Jenderal Penataan Ruang, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Member	DKI Jakarta
4.	Counterpart, Directorate General of Human Settlement, Ministry of Public Works *Counterpart, Direktorat Jenderal Cipta Karya, Kementerian Pekerjaan Umum*	Member	DKI Jakarta
5.	Counterpart, Spatial Planning Agency, DKI Jakarta Province *Counterpart, Dinas Tata Ruang Provinsi DKI Jakarta*	Member	DKI Jakarta

No.	Position/Name of Organization	Position	Location
6.	Counterpart, Highways and Water Resources Agency, Bogor City *Counterpart, Dinas Bina Marga dan Sumber Daya Air Kota Bogor*	Member	Bogor City
7.	Counterpart, Building Management and Settlement Agency, Depok City *Counterpart, Dinas Tata Bangunan dan Pemukiman Kota Depok*	Member	Depok City

Annex-4: Daftar Anggota Satuan Kerja Run-Off Control

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Chairperson	DKI Jakarta
2.	Counterpart, Directorate General of Water Resources, Ministry of Public Works *Counterpart, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Directorate General of Human Settlement, Ministry of Public Works *Counterpart, Direktorat Jenderal Cipta Karya, Kementerian Pekerjaan Umum*	Member	DKI Jakarta
4.	Counterpart, Public Works Agency, DKI Jakarta Province *Counterpart, Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Member	DKI Jakarta
5.	Counterpart, Housing and Settlement Agency, West Java Province *Counterpart, Dinas Permukiman dan Perumahan Provinsi Jawa Barat*	Member	Bandung City

Annex-5: Daftar Anggota Satuan Kerja Coordination and Monitoring

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Development Cooperation Agency of JABODETABEKJUR *Counterpart, BKSP JABODETABEKJUR*	Chairperson	DKI Jakarta
2.	Counterpart, Directorate General of Water Resources, Ministry of Public Works *Counterpart, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Member	DKI Jakarta
4.	Counterpart, Directorate General of Spatial Planning, Ministry of Public Works *Counterpart, Direktorat Jenderal Penataan Ruang, Kementerian Pekerjaan Umum*	Member	DKI Jakarta
5.	Counterpart, Directorate General of Human Settlement, Ministry of Public Works *Counterpart, Direktorat Jenderal Cipta Karya, Kementerian Pekerjaan Umum*	Member	DKI Jakarta
6.	Counterpart, Public Works Agency, DKI Jakarta Province *Counterpart, Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Member	DKI Jakarta
7.	Counterpart, Water Resources Management Agency, West Java Province *Counterpart, Dinas Pengelolaan Sumber Daya Air Provinsi Jawa Barat*	Member	Bandung City

APPENDIX-2-2

STIPULATION
FOR
ESTABLISHMENT AND OPERATION
OF
COMPREHENSIVE FLOOD MANAGEMENT
COMMITTEE
FOR
CILIWUNG RIVER BASIN
(English Translation)

STIPULATION FOR ESTABLISHMENT AND OPERATION OF COMPREHENSIVE FLOOD MANAGEMENT COMMITTEE FOR CILIWUNG RIVER BASIN

CHAPTER I
GENERAL PROVISION
Article 1

In this Stipulation, the meaning of:

1. River Basin is a unit of land area being as one unit with river and its tributaries, functioning for accommodating, storing, and flowing the water originated from rainfall to lake or to sea naturally, which its boundary on the land is as a topographic separator and boundary in the sea up to the waters area which it's still affected by the land activities.
2. Central Government, hereinafter called the Government, is the President of the Republic of Indonesia who is handling the governmental authority of the Republic of Indonesia as meant in the Basic Constitution of the Republic of Indonesia 1945.
3. Comprehensive Flood Management Plan (CFMP) is a plan of flood control taken measures for both river and basin as one by means of structural and non-structural manners.
4. Comprehensive Flood Management Action Plan (CFMAP) is a plan of activities to achieve the Comprehensive Flood Management Plan (CFMP).
5. Comprehensive Flood Management Committee for Ciliwung River Basin (CFMC) is a consultative coordination body for discussing flood control measures and roles among related agencies in Ciliwung river basin.
6. Local Government is Governor, Regent or mayor and local personnel as the element of local governmental administration.

CHAPTER II
COMPREHENSIVE FLOOD MANAGEMENT COMMITTEE (CFMC)
Article 2

In accordance with the Minutes of Meetings dated 7 July, 2010, Record of Discussion dated August, 2010 and Minutes of Meetings dated 15 December, 2010 between Japan International Cooperation Agency (JICA) and the Government of Indonesia regarding the Project for Capacity Development of Jakarta Comprehensive Flood Management (hereinafter called as the "JICA Technical Cooperation Project"), the Comprehensive Flood Management Committee for Ciliwung River Basin (CFMC) is established as a consultative coordination body for comprehensive flood management in Ciliwung river basin.

Article 3

The CFMC as stipulated in Article 2 is coordinating the related Central Government and Local Government agencies for the implementation of the CFMP/CFMAP through:

(1) Coordination of relevant agencies for accelerating flood management measures in the Ciliwung river and for integrating basin management measures including zoning rules, land use regulations, land development regulations, run-off control, and other necessary measures in the Ciliwung river basin,
(2) Formulation, authorization and review of the CFMP/CFMAP and determination of the role allocation of each relevant institution for implementation of the CFMP/CFMAP,
(3) Discussion on the formulation and enforcement of legal basis for the implementation of the CFMP/CFMAP,
(4) Establishment of monitoring and feedback mechanisms in the implementation of the CFMP/CFMAP, and,
(5) Evaluation, implementation and realization of the CFMP/CFMAP.

Article 4

(1) Organization Structure of the CFMC consists of:
   a. Chairperson
   b. Vice Chairperson
   c. Secretary
   d. Member
   e. Work Unit

(2) Chairperson of the CFMC is held by the Head of Regional Development Planning Agency of DKI Jakarta Province (see in Annex-1).

(3) Vice Chairperson of the CFMC is held by the Head of Public Works Agency of DKI Jakarta Province (see in Annex-1).

(4) Secretary of the CFMC is held by the Head of Program and General Planning Division, Ciliwung-Cisadane River Basin Main Office, Directorate General of Water Resources, Ministry of Public Works (see in Annex-1).

(5) Under the CFMC, Working Units are established to provide technical support to the Secretary.

Article 5

(1) Member of the CFMC is nominated from the member of TKPSDA WS Ciliwung-Cisadane which is associated with planning and implementation of the comprehensive flood management in Ciliwung river basin (see in Annex-1).

(2) Member of Working Unit is occupied by the counterpart agencies of JICA Technical Cooperation Project (see in from Annex-2 to Annex-5).

Article 6

(1) To carry out the functions of the CFMC as stipulated in Article 2, the duties and functions of the Chairperson are:
   a. To lead the meetings of the CFMC and to coordinate the discussion on the CFMP/CFMAP,
   b. To formulate and approve the CFMP/CFMAP based on the discussion in the meetings of the CFMC, and,
   c. To establish and accelerate monitoring and feedback mechanisms of implementation of the CFMP/CFMAP.

(2) To carry out the functions of the CFMC as stipulated in Article 2, the duties and functions of the Vice Chairperson are:
   a. To carry out task of Chairperson of CFMC in case the Chairperson is absent,
   b. To coordinate the discussion on the CFMP/CFMAP in the CFMC, and,
   c. To supervise the performance of the Secretary and Working Unit of the CFMC.

Article 7

(1) To assist the Chairperson and Vice Chairperson of the CFMC, the Secretary of the CFMC shall be appointed.

(2) The Secretary of the CFMC is in charge of:
   a. Supporting the performance of tasks and functions of the CFMC,
   b. Facilitating the arrangement of the CFMC meetings,
   c. Preparing the necessary materials for the discussion of CFMC meetings,
   d. Monitoring the achievement and progress of CFMP/CFMAP by the member of CFMC, and,
   e. Keeping the records of the discussion in CFMC meetings.

Article 8

(1) To provide the technical supports to the Secretary of the CFMC, the Working Unit shall be established.

(2) The Working Unit consists of the following four (4) units:
   a. Working Unit on Comprehensive Flood Management Plan (CFMP)
   b. Working Unit on Spatial Planning
   c. Working Unit on Run-off Control

d. Working Unit on Coordination and Monitoring

(3) The duties and functions of the Working Unit on CFMP are:
   a. To conduct the required technical survey and analysis for the formulation, implementation, review, evaluation, feedback and revision of the CFMP/CFMAP including survey on river system and inundation conditions, hydrological and hydraulic analysis, flood inundation analysis, design discharge analysis, layout planning of flood control facilities, and other necessary analysis, and,
   b. To assist the Secretary for the preparation of the necessary materials for the CFMC meetings regarding the CFMP/CFMAP.

(4) The duties and functions of the Working Unit on Spatial Planning are:
   a. To conduct the required technical survey and analysis on the land use and development regulations in the spatial planning for the formulation, implementation, review, evaluation, feedback and revision of the CFMP/CFMAP including analysis on legal basis for land use regulation, land development regulation, land segmentation and spatial zoning in line with the CFMP/CFMAP, and,
   b. To assist the Secretary for the preparation of the necessary materials for the CFMC meetings regarding the spatial planning in the CFMP/CFMAP.

(5) The duties and functions of the Working Unit on Run-off Control are:
   a. To conduct the required technical survey and analysis on the planning and implementation of run-off control for the formulation, implementation, review, evaluation, feedback and revision of the CFMP/CFMAP including analysis on survey on river system, inundation conditions and current land use conditions, run-off control facility planning, monitoring of the run-off control effects, and required legal basis for the run-off control in line with the CFMP/CFMAP, and,
   b. To assist the Secretary for the preparation of the necessary materials for the CFMC meetings regarding the run-off control in the CFMP/CFMAP.

(6) The duties and functions of the Working Unit on Coordination and Monitoring are:
   a. To assist the Secretary for facilitating the operation of the CFMC meetings,
   b. To assist the Secretary for motivating the related agencies to carry out their own activities stipulated in the CFMP/CFMAP,
   c. To assist the Secretary for monitoring the progress and achievement of CFMP/CFMAP by the member of CFMC, and,
   d. To assist the Secretary for the preparation of the necessary materials for the CFMC meetings.

CHAPTER III
DISCIPLINE OF MEETING
Article 9

(1) The CFMC shall hold the meeting at least once (1) a year.
(2) The CFMC meeting as mentioned in paragraph (1) above is chaired by the Chairperson of the CFMC.
(3) In case that the Chairperson of the CFMC is absent, the meeting will be chaired by the Vice Chairperson of the CFMC instead of the Chairperson.
(4) For conducting the CFMC meetings, the CFMC can invite the resource persons related to the comprehensive flood management in Ciliwung river basin from the out of the Member of the CFMC, if needed.
(5) Any required materials for the CFMC meetings shall be prepared by the Secretary with supports of the Working Units.

CHAPTER IV
PROCEDURE OF MEETING
Article 10

(1) Each Member shall sign on the attendance list of the CFMC meetings.

(2) In case the Member of the CFMC is not able to attend the meetings, the representative of the Member shall be designated by the Member concerned.

CHAPTER V
MINUTES, RECORD AND REPORT OF MEETING
Article 11

(1) In each meeting of the CFMC, the Minutes and/or Records of the meeting shall be created by the Secretary and signed by the Chairperson or the Secretary of the CFMC on behalf of the Chairperson.

(2) The Minutes and/or Records of the meetings shall contain the whole course of the discussions in the meetings including but not limited to:
   a. Date and place of the meeting
   b. Chairperson, Vice Chairperson and Secretary of the meetings
   c. Participants of the meetings who signed on the attendance list of the meetings
   d. Agenda of the meetings
   e. Events discussed in the meetings
   f. Any other information needed to be recorded

(3) The Minutes and/or Records of meetings prepared by the Secretary of the CFMC shall be distributed to all the Members of the CFMC after completion of the meetings.

Annex-1-1: List of Members of Comprehensive Flood Management Committee for Ciliwung River Basin

No.	Position/Name of Organization	Position	Location
1.	Director General of Water Resources, Ministry of Public Works *Direktur Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Executing Agency of JICA Project/ Honorary Member	DKI Jakarta
2.	Director of River and Coast, Directorate General of Water Resources, Ministry of Public Works *Direktur Sungai dan Pantai, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Project Director of JICA Project/ Honorary Member	DKI Jakarta
3.	Head of Ciliwung-Cisadane River Basin Main Office *Kepala Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Project Manager of JICA Project/ Honorary Member	DKI Jakarta
4.	Head of Sub-directorate of Region II, Directorate of River and Coast, Directorate General of Water Resources, Ministry of Public Works *Kasubdit. Wilayah II, Direktorat Sungai dan Pantai, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Coordinator of JICA Project/ Honorary Member	DKI Jakarta
5.	Head of Regional Development Planning Agency, DKI Jakarta Province *Kepala Badan Perencanaan Pembangunan Daerah Provinsi DKI Jakarta*	Chairperson	DKI Jakarta
6.	Head of Public Works Agency, DKI Jakarta Province *Kepala Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Vice Chairperson	DKI Jakarta
7.	Head of Program and General Planning Division, Ciliwung-Cisadane River Basin Main Office *Kepala Bidang Program dan Perencanaan Umum, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Coordinator of JICA Project/Secretary	DKI Jakarta
8.	Director of Water Resources and Irrigation, Ministry of National Development Planning/National Development Planning Agency (BAPPENAS) *Direktur Pengairan dan Irigasi, Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional*	Member	DKI Jakarta
9.	Head of Spatial Planning Agency, DKI Jakarta Province *Kepala Dinas Tata Ruang Provinsi DKI Jakarta*	Member	DKI Jakarta
10.	Head of Regional Development Planning Agency, West Java Province *Kepala Badan Perencanaan Pembangunan Daerah Provinsi Jawa Barat*	Member	Bandung City
11.	Head of Water Resources Management Agency, West Java Province *Kepala Dinas Pengelolaan Sumber Daya Air Provinsi Jawa Barat*	Member	Bandung City
12.	Head of Water Resources Utilization Office in Ciliwung-Cisadane River Basin, West Java Province *Kepala Balai Pendayagunaan Sumber Daya Air Wilayah Sungai Ciliwung-Cisadane Provinsi Jawa Barat*	Member	Bogor City
13.	Regional Secretary, Bogor Regency *Sekretaris Daerah Kabupaten Bogor*	Member	Bogor Regency
14.	Head of Building and Settlement Agency, Bogor City *Kepala Dinas Tata Bangunan dan Pemukiman Kota Bogor*	Member	Bogor City
15.	Head of Highways and Water Resources Agency, Depok City *Kepala Dinas Bina Marga dan Sumber Daya Air Pemerintah Kota Depok*	Member	Depok City

Annex-1-2: List of Resource Person of Comprehensive Flood Management Committee for Ciliwung River Basin

No.	Position/Name of Organization	Position	Location
16.	Head of Watershed Management Office, Ministry of Forestry *Kepala Balai Pengelolaan DAS Citarum-Ciliwung, Kementerian Kehutanan*	Resource Person	Bogor City
17.	Head of Agriculture Agency, West Java Province *Kelapa Dinas Pertanian Tanaman Pangan Provinsi Jawa Barat*	Resource Person	Bandung City
18.	Head of Forestry Agency, West Java Province *Kepala Dinas Kehutanan Provinsi Jawa Barat*	Resource Person	Bandung City
19.	Head of Regional Development Planning Agency, Bogor Regency *Kepala Badan Perencanaan Pembangunan Daerah Kabupaten Bogor*	Resource Person	Bogor Regency
20.	Head of Regional Development Planning Agency, Bogor City *Kepala Badan Perencanaan Pembangunan Daerah Kota Bogor*	Resource Person	Bogor City
21.	Head of Regional Development Planning Agency, Depok City *Kepala Badan Perencanaan Pembangunan Daerah Kota Depok*	Resource Person	Depok City

Annex-2: List of Members of Working Unit on Comprehensive Flood Management Plan

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Chairperson	DKI Jakarta
2.	Counterpart, Directorate General of Water Resources, Ministry of Public Works *Counterpart, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Public Works Agency, DKI Jakarta Province *Counterpart, Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Member	DKI Jakarta
4.	Counterpart, Highways and Water Resources Agency, Bogor Regency *Counterpart, Dinas Bina Marga dan Pengairan Kabupaten Bogor*	Member	Bogor Regency
5.	Counterpart, Highways and Water Resources Agency, Depok City *Counterpart, Dinas Bina Marga dan Sumber Daya Air Pemerintah Kota Depok*	Member	Depok City

Annex-3: List of Members of Working Unit on Spatial Planning

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Building Management and Settlement Agency, Bogor Regency *Counterpart, Dinas Tata Bangunan dan Pemukiman Kabupaten Bogor*	Chairperson	Bogor Regency
2.	Counterpart, Directorate General of Spatial Planning, Ministry of Public Works *Counterpart, Direktorat Jenderal Penataan Ruang, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Member	DKI Jakarta
4.	Counterpart, Directorate General of Human Settlement, Ministry of Public Works *Counterpart, Direktorat Jenderal Cipta Karya, Kementerian Pekerjaan Umum*	Member	DKI Jakarta

No.	Position/Name of Organization	Position	Location
5.	Counterpart, Spatial Planning Agency, DKI Jakarta Province *Counterpart, Dinas Tata Ruang Provinsi DKI Jakarta*	Member	DKI Jakarta
6.	Counterpart, Highways and Water Resources Agency, Bogor City *Counterpart, Dinas Bina Marga dan Sumber Daya Air Kota Bogor*	Member	Bogor City
7.	Counterpart, Building Management and Settlement Agency, Depok City *Counterpart, Dinas Tata Bangunan dan Pemukiman Kota Depok*	Member	Depok City

Annex-4: List of Members of Working Unit on Run-Off Control

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Chairperson	DKI Jakarta
2.	Counterpart, Directorate General of Water Resources, Ministry of Public Works *Counterpart, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Directorate General of Human Settlement, Ministry of Public Works *Counterpart, Direktorat Jenderal Cipta Karya, Kementerian Pekerjaan Umum*	Member	DKI Jakarta
4.	Counterpart, Public Works Agency, DKI Jakarta Province *Counterpart, Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Member	DKI Jakarta
5.	Counterpart, Housing and Settlement Agency, West Java Province *Counterpart, Dinas Permukiman dan Perumahan Provinsi Jawa Barat*	Member	Bandung City

Annex-5: List of Members of Working Unit on Coordination and Monitoring

No.	Position/Name of Organization	Position	Location
1.	Counterpart, Development Cooperation Agency of JABODETABEKJUR *Counterpart, BKSP JABODETABEKJUR*	Chairperson	DKI Jakarta
2.	Counterpart, Directorate General of Water Resources, Ministry of Public Works *Counterpart, Direktorat Jenderal Sumber Daya Air, Kementerian Pekerjaan Umum*	Vice Chairperson	DKI Jakarta
3.	Counterpart, Ciliwung-Cisadane River Basin Main Office *Counterpart, Balai Besar Wilayah Sungai Ciliwung-Cisadane*	Member	DKI Jakarta
4.	Counterpart, Directorate General of Spatial Planning, Ministry of Public Works *Counterpart, Direktorat Jenderal Penataan Ruang, Kementerian Pekerjaan Umum*	Member	DKI Jakarta
5.	Counterpart, Directorate General of Human Settlement, Ministry of Public Works *Counterpart, Direktorat Jenderal Cipta Karya, Kementerian Pekerjaan Umum*	Member	DKI Jakarta
6.	Counterpart, Public Works Agency, DKI Jakarta Province *Counterpart, Dinas Pekerjaan Umum Provinsi DKI Jakarta*	Member	DKI Jakarta
7.	Counterpart, Water Resources Management Agency, West Java Province *Counterpart, Dinas Pengelolaan Sumber Daya Air Provinsi Jawa Barat*	Member	Bandung City