

CHAPTER 8

**CONSTRUCTION PLAN AND COST ESTIMATE
FOR URGENT FLOOD CONTROL PLAN**

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8.1 General

The construction works for urgent flood control plan consist of mainly river dredging including cut-off channels, bank protection and bridge improvement. Reaches to be improved are the Citarum River (main) of 31.2 km long between Curug Jompong and Sapan, and its tributary Cisangkuy River of 7.4 km long.

8.2 Construction Plan

8.2.1 Basis of Construction Plan

The construction plan for execution of the urgent project is prepared based on the following considerations :

- (1) Since the urgent project should be carried out during in a limited period, a package contract system by international tendering is to be adopted.
- (2) Yearly workable days are assumed to be 235 days based on the rainfall records in the past five (5) years. Daily working hour is assumed to be eight (8) hours.
- (3) All construction works except the river dredging of soft rock layer are to be basically carried out by the standard construction methods and equipments. This will facilitate in equipment maintenance and supply of spare parts as well.
- (4) The Citarum River improvement works are to be divided into three (3) sections because of long improvement length of 31.2 km and varying soil characteristics as shown in Fig. 8.1 and Fig. 8.2.

- (5) Major works are planned to be carried out by mechanical power, however, in order to enhance employment opportunity man power will be utilized to the maximum extent whenever possible.

8.2.2 Construction Plan

Construction method of major works are planned as follows :

- (1) Dredging of the existing river channels of 4.351 million m³ in volume is planned to be carried out by pump dredger in combination with bulldozer and backhoe.
- (2) Cut-off channels of 1.839 million m³ in volume in the downstream stretches of Dayeuh Kolot are planned to be dredged by a ripper bulldozer and backhoe with ripper. For the dredging of other cut-off channels, of a volume of 0.763 million m³, the same method as that of above item (1) will be adopted.
- (3) Materials dredged are to be used for reclamation to low-lying area near river course or to spoil bank area by dredger or dump truck.
- (4) Bank protection of 6.1 km long is planned to be executed by man power.

8.2.3 Construction Schedule

The construction schedule is prepared based on the following assumptions (See Fig. 8.3).

- (1) Loan agreement will be completed by September 1989.
- (2) Detailed design including ground survey will be commenced in April 1990 and completed by September 1991.
- (3) Tendering will be started in March 1991, and will be completed by September 1992.

- (4) Main civil works will be commenced in October 1992 and completed by September 1995 with a construction period of three (3) years.
- (5) Prior to the execution of construction works, land acquisition will be started in October 1991.
- (6) Preparatory works of the flood plain management will be performed during detailed design stage.

8.3 Cost Estimate

8.3.1 Basis of Cost Estimate

The estimation of the project cost, consisting of (1) direct cost (civil work and flood warning system costs), (2) indirect cost (land acquisition and house resettlement compensation, administration and engineering service costs), and (3) contingency (physical contingency and price escalation) was carried out based on the following conditions:

- (1) The estimates are made on the assumption that all construction works will be contracted to general contractors by international tendering.
- (2) All base costs are expressed under the economic conditions that prevailed in November 1987.
- (3) The exchange rate of currencies are considered as follows:
$$\text{US\$1.00} = \text{Rp.1,655} = \text{¥135}$$
- (4) The cost is to be classified into foreign and local currency portions.
- (5) Administration cost is assumed at 5% of the total cost of civil work, flood warning system, and land acquisition and house resettlement compensation.

- (6) Engineering services cost is assumed at 11% of the total cost of civil work, flood warning system, and land acquisition and house resettlement compensation.
- (7) A physical contingency is assumed to be 10% of the total cost of civil work, flood warning system, land acquisition and house resettlement compensation, and administration, and engineering service.
- (8) Annual price escalation is considered to be 3% for foreign currency (F/C) and 8% for local currency (L/C).

8.3.2 Project Cost and Implementation Schedule

Civil work, flood warning system, and land acquisition and house compensation are estimated based on the unit price. For estimating the unit construction cost of civil works, site expense at 20% of direct civil work cost, and contractor's overhead, profit and tax at 20% of the total of direct civil work cost and site expenses are considered.

The project cost of the proposed urgent flood control plan amounts to Rp.81,465.2 million (Rp.101,742.3 million, including price escalation) as shown below.

PROJECT COST

Cost Item	L/C (10 ⁶ Rp)	F/C (10 ³ US\$)	Equiv.Total (10 ⁶ Rp)
A. Direct Cost	9,381.3	28,784.2	57,019.2
(1) Civil Work	(9,128.9)	(28,172.2)	(55,754.0)
(2) Flood Warning System	(252.4)	(612.0)	(1,265.2)
B. Indirect Cost	10,970.7	3,667.3	17,040.1
(1) Land Acquisition/Compensation	(6,645.0)	(-)	(6,645.0)
(2) Administration	(3,183.2)	(-)	(3,183.2)
(3) Engineering Service	(1,142.5)	(3,667.3)	(7,211.9)
C. Physical Contingency	2,035.2	3,245.2	7,405.9
Total (1)	22,387.2 (27.5%)	35,696.7 (72.5%)	81,465.2 (100%)
D. Price Escalation	10,324.1	6,014.0	20,277.1
Total (2)	32,711.3 (32.2%)	41,710.7 (67.8%)	101,742.3 (100%)

Breakdown of the construction cost, civil work cost, flood warning system cost, and land acquisition and house resettlement cost are given in Table 8.1, Table 8.2 to Table 8.3, Table 8.4, and Table 8.5 respectively.

Based on the construction schedule as shown in Fig. 8.3, the annual disbursement schedule is prepared as given in Table 8.6.

8.3.3 Operation and Maintenance Cost

The operation and maintenance cost at full operation stage of the facilities, after completion of the project, is assumed to be annually 0.5% (285 million Rp./year) of the total construction cost of civil works and warning system equipment at the November 1987 price.

Table 8.1 BREAKDOWN OF CONSTRUCTION COST OF URGENT PROJECT

(1987 Price)				
	Item	L/C 10 ⁶ Rp	F/C 10 ³ US\$	Equiv. Total 10 ⁶ Rp
I	Civil Work			
	A Existing River			
	(a) Preparatory Work	428.0	1,449.3	2,826.5
	(b) Dredging			
	(1) Common Soil (i)	1,124.6	4,983.5	9,372.4
	(2) Stiff Soil (i)	508.2	2,480.3	4,613.1
	(3) Soft Rock	1,383.8	8,611.4	15,635.7
	(c) Bank Clearing/Grubbing	16.0	20.2	49.4
	(d) Bank Protection	2,078.2	1,609.8	4,742.4
	(e) Bridge Improvement			
	Strengthening (Gabion)	5.9	22.4	43.0
	New Construction	231.0	386.6	870.8
	(f) Maintenance/Connection Rd.	1.9	1.7	4.7
	(f) Miscellaneous	308.1	1,029.0	2,011.2
	Sub-total	6,085.7	20,594.2	40,169.2
	B Cut-off Channel			
	(a) Preparatory Work	214.6	534.0	1,098.4
	(b) Dredging			
	(1) Common Soil			
	Common Soil (i)	308.5	1,367.0	2,570.9
	Common Soil (ii)	290.3	653.9	1,372.5
	(2) Stiff Soil			
	Stiff Soil (i)	24.1	117.8	219.1
	Stiff Soil (ii)	924.3	2,085.1	4,375.1
	(3) Soft Rock	506.5	1,328.6	2,705.3
	(c) New Bridge Construction	611.7	1,108.8	2,446.8
	(d) Maintenance/Connection Rd.	16.6	14.5	40.6
	(e) Miscellaneous	146.6	368.3	756.1
	Sub-total	3,043.2	7,578.0	15,584.8
	C Total	9,128.9	28,172.2	55,754.0
II	Flood Warning System	252.4	612.0	1,265.2
III	Land Acquisition/Compensation			
	A Land Acquisition			
	(a) Existing River	3,750.0	-	3,750.0
	(b) Cut-off Channel	1,810.0	-	1,810.0
	B House Resettlement			
	(a) Existing River	685.0	-	685.0
	(b) Cut-off Channel	400.0	-	400.0
	C Total	6,645.0	-	6,645.0
IV	Total 1	16,026.3	28,784.2	63,664.2
V	Administration	3,183.2	-	3,183.2
VI	Engineering Services	1,142.5	3,667.3	7,211.9
VII	Physical Contingency	2,035.2	3,245.2	7,405.9
VIII	Total 2	22,387.2	35,696.7	81,465.2
IX	Price Escalation	10,324.1	6,014.0	20,277.1
X	Grand Total	32,711.3	41,710.7	101,742.3

Note: Common soil (i) and Stiff soil (i): dredged by pump dredger
 Common soil (ii) and Stiff soil (ii): dredged by backhoe and bulldozer

Table 8.2 BREAKDOWN OF CIVIL WORK COST FOR CITARUM RIVER OF URGENT PROJECT

Item	Quantity		Local Currency (Rp.)		Foreign Currency (US\$)		Equivalent Total (Rp. 10^6)
	Unit	Amount	Unit Cost	Amount (10^6)	Unit Cost	Amount (10^3)	
A Existing River							
(a) Preparatory Work							
(b) Dredging							
(1) Common Soil (i)	10^3 m3	2,369	422	399.5	1.87	1,374.1	2,673.6
(2) Stiff Soil (i)	10^3 m3	674	754	999.7	1.87	4,430.0	8,331.4
(3) Soft Rock	10^3 m3	935	1,480	508.2	3.68	2,480.3	4,613.1
(c) Bank Clearing/Grubbing	m2	118,800	135	16.0	0.17	20.2	49.4
(d) Bank Protection	m	6,100	340,680	2,078.2	263.90	1,609.8	4,742.4
(e) Bridge Improvement							
Strengthening (Gabion)	place	4	1,468,378	5.9	5,593.25	22.4	43.0
(f) Maintenance/Connection Rd.	m	250	7,752	1.9	6.72	1.7	4.7
(g) Miscellaneous	L.s.			269.7		927.5	1,804.7
Sub-total				5,662.9		19,477.4	37,898.0
B Cut-off Channel							
(a) Preparatory Work							
(b) Dredging							
(1) Common Soil	10^3 m3	1,032		212.0		522.5	1,076.7
Common Soil (i)	10^3 m3	654	422	276.0	1.87	1,223.0	2,300.1
Common Soil (ii)	10^3 m3	378	768	290.3	1.73	653.9	1,372.5
(2) Stiff Soil	10^3 m3	1,147					
Stiff Soil (i)	10^3 m3	32	754	24.1	3.68	117.8	219.1
Stiff Soil (ii)	10^3 m3	1,115	829	924.3	1.87	2,085.1	4,375.1
(3) Soft Rock	10^3 m3	346	1,464	506.5	3.84	1,328.6	2,705.3
(c) New Bridge Construction	m2 (place)	2,016	303,415	611.7	550.00	1,108.8	2,446.8
(d) Maintenance/Connection Rd.	m	2,150	7,752	16.6	6.72	14.5	40.6
(e) Miscellaneous	L.s.			143.1		352.7	726.8
Sub-total				3,004.6		7,406.9	15,263.0
C Total				8,667.5		26,884.3	53,161.0

Note: Common soil (i) and Stiff soil (i): dredged by pump dredger
Common soil (ii) and Stiff soil (ii): dredged by backhoe and bulldozer

Table 8.3 BREAKDOWN OF CIVIL WORK COST FOR CISANGKUY RIVER OF URGENT PROJECT

Item	Quantity		Local Currency (Rp.)		Foreign Currency (US\$)		Equivalent Total (Rp. 10^6)
	Unit	Amount	Unit Cost	Amount (10^6)	Unit Cost	Amount (10^3)	
A Existing River							
(a) Preparatory Work	10^3 m3	373		28.5		75.2	152.9
(b) Dredging			422	124.9	1.87	553.5	1,041.0
(c) New Bridge Construction	m2 (place)	1,024 (4)	225,552	231.0	377.51	386.6	870.8
(d) Miscellaneous	L.s.			38.4		101.5	206.5
Sub-total				422.8		1,116.8	2,271.2
B Cut-off Channel							
(a) Preparatory Work				2.6		11.5	21.7
(b) Dredging	10^3 m3	77	422	32.5	1.87	144.0	270.8
(c) Miscellaneous				3.5		15.6	29.3
Sub-total				38.6		171.1	321.8
C Total				461.4		1,287.9	2,593.0

Table 8.4 BREAKDOWN OF COST FOR FLOOD FORECASTING AND WARNING SYSTEM OF URGENT PROJECT

(1987 Price)

No.	Description	Q'ty	Local Currency (Rp.) * 10 ⁶		Foreign Currency (US\$) * 10 ³		Equivalent Total (Million Rp.)
			Unit Price	Price	Unit Price	Price	
1	Hydrological Radio Telemetering System						
	Equipment for Master Station	1		62.9		150.0	311.2
	Water-level Gauging Station	6	24.8	149.0	35.00	210.0	496.6
	10KVA Uninterruptible Power Supply Equipment	1		9.9		120.0	208.5
	Sub-total			221.8		480.0	1,016.2
2	Radio Telecommunication System						
	Equipment for Master Station	2	0.8		12.00	24.0	41.4
	Equipment for Monitoring Station	1				14.0	24.0
	Sub-total					38.0	65.4
3	Training And Test	L.S		3.3		34.0	59.5
4	Spare Parts			24.8		60.0	124.1
5	Total	L.S		252.4		612.0	1,265.2

Table 8.5 BREAKDOWN OF LAND ACQUISITION/COMPENSATION COST OF URGENT PROJECT

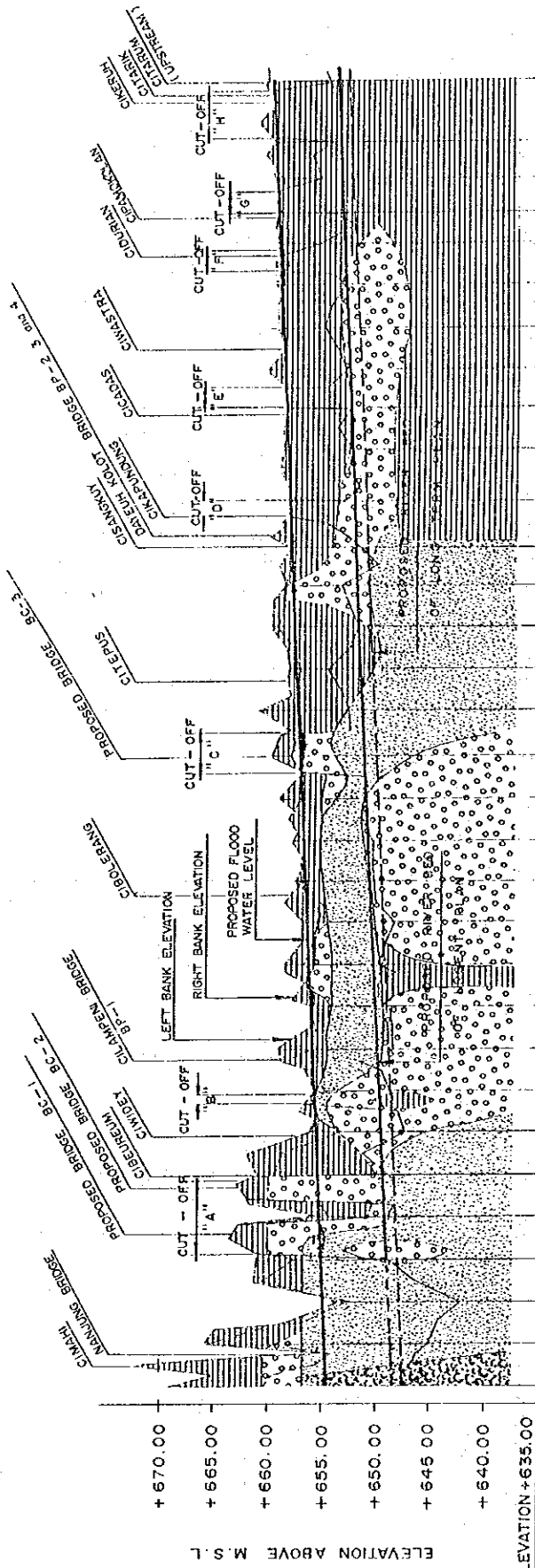
Item	Quantity		Local Currency (Rp.)		Foreign Currency (US\$)		(1987 Price) Equivalent Total (Rp. 10 ⁶)
	Unit	Amount	Amount (10 ⁶)		Amount (10 ³)		
			Unit Cost	Amount	Unit Cost	Amount	
I. Citarum River							
A Land Acquisition							
(a) Existing River	10 ³ m2	679	5,000	3,395.0			3,395.0
(b) Cut-off Channel	10 ³ m2	333	5,000	1,665.0			1,665.0
B House Resettlement							
(a) Existing River	house	114	5,000,000	570.0			570.0
(b) Cut-off Channel	house	80	5,000,000	400.0			400.0
C Total				6,030.0			6,030.0
II. Cisangkuy River							
A Existing River							
(a) Land Acquisition	10 ³ m2	71	5,000	355.0			355.0
(b) House Resettlement	house	29	5,000,000	145.0			145.0
B Cut-off Channel							
C Total				115.0			115.0
C Total				615.0			615.0
III. Grand Total				6,645.0			6,645.0

Table 8.6 ANNUAL DISBURSEMENT SCHEDULE

		Item	Currency	90/91	91/92	92/93	93/94	94/95	(1987 price)					
									Total Cost		Equivalent Total			
				(x10 ⁶ Rp)	(x10 ³ US\$)	(x10 ⁶ Rp)								
Civil Work	Citarum River	Existing River	L/C		869.2	579.4								
			F/C		2,947.9	1,965.3				1,448.6	4,913.2	9,579.9		
			E/T		5,747.9	3,832.0								
		Cut-off Channel	L/C		487.8	975.5	487.7							
			F/C		1,076.4	2,152.7	1,076.3			1,951.0	4,305.4	9,076.6		
			E/T		2,269.2	4,538.3	2,269.1							
		Existing River	L/C			1,467.9	1,284.5							
			F/C			5,802.7	5,077.4			2,752.4	10,880.1	20,758.9		
			E/T			11,071.4	9,687.5							
		Cut-off Channel	L/C			380.4	332.8							
			F/C			843.2	737.8			713.2	1,581.0	3,329.7		
			E/T			1,775.8	1,553.9							
	Existing River	L/C				664.5	797.4							
		F/C				1,674.6	2,009.5		1,461.9	3,684.1	7,559.2			
E/T					3,436.0	4,123.2								
Cut-off Channel	L/C				154.7	185.7								
	F/C				691.2	829.3		340.4	1,520.5	2,856.7				
	E/T				1,298.5	1,558.2								
Sub-total		L/T		1,357.0	3,403.2	2,924.2	983.1							
		F/C		4,024.3	10,763.9	9,257.3	2,838.8	8,667.5	26,884.3	53,161.0				
		E/T		8,017.1	21,217.5	18,245.0	5,681.4							
Cisangkuy River		L/C		292.5	168.9									
		F/C		785.9	502.0			461.4	1,287.9	2,593.0				
		E/T		1,593.3	999.7									
Sub-Total		L/C		1,649.5	3,572.1	2,924.2	983.1							
		F/C		4,810.2	11,265.9	9,257.3	2,838.8	9,128.9	28,172.2	55,754.0				
		E/T		9,610.4	22,217.2	18,245.0	5,681.4							
Warning System		L/C					252.4							
		F/C					612.0	252.4	612.0	1,265.2				
		E/T					1,265.2							
Sub-Total		L/C		1,649.5	3,572.1	2,924.2	1,235.5							
		F/C		4,810.2	11,265.9	9,257.3	3,450.8	9,381.3	28,784.2	57,019.2				
		E/T		9,610.4	22,217.2	18,245.0	6,946.6							
Land Acquisition & House Compensation		L/C	1,107.0	2,215.0	2,215.0	1,108.0	-	6,645.0	-	6,645.0				
		F/C	-	-	-	-	-	-	-	-				
		E/T	1,107.0	2,215.0	2,215.0	1,108.0	-	-	-	-				
Administration		L/C	707.4	707.4	707.4	707.4	353.6	3,183.2	-	3,183.2				
		F/C	-	-	-	-	-	-	-	-				
		E/T	707.4	707.4	707.4	707.4	353.6	-	-	-				
Engineering Services	Detailed Design	L/C	688.3	75.4										
		F/C	1,131.9	125.9					763.7	1,257.8	2,845.3			
		E/T	2,561.0	284.3										
	Construction Supervision	L/C		63.1	126.3	126.3	63.1							
		F/C		402.0	803.0	803.0	401.5	378.8	2,409.5	4,366.6				
		E/T		727.9	1,455.5	1,455.4	727.8							
Sub-Total		L/C	688.3	138.5	126.3	126.3	63.1							
		F/C	1,131.9	527.9	803.0	803.0	401.5	1,142.5	3,667.3	7,211.9				
		E/T	2,561.0	1,012.2	1,455.5	1,455.4	727.8							
Physical Contingency		L/C	250.3	471.0	662.1	486.6	165.2							
		F/C	113.2	533.8	1,206.9	1,006.0	385.3	2,035.2	3,245.2	7,405.9				
		E/T	437.5	1,354.5	2,659.5	2,151.6	802.8							
Total (1)		L/C	2,753.0	5,181.4	7,282.9	5,352.5	1,817.4							
		F/C	1,245.1	5,871.9	13,275.8	11,066.3	4,237.6	22,387.2	35,696.7	81,465.2				
		E/T	4,812.9	14,899.5	29,254.6	23,667.4	8,830.8							
Price Contingency		L/C	715.0	1,867.9	3,417.9	3,141.4	1,181.9							
		F/C	115.6	737.0	2,114.8	2,148.1	898.5	10,324.1	6,014.0	20,277.1				
		E/T	906.2	3,087.7	6,917.8	6,696.5	2,668.9							
Total (2)		L/C	3,468.0	7,049.3	10,700.8	8,493.9	2,999.3							
		F/C	1,360.7	6,608.9	15,390.6	13,214.4	5,136.1	32,711.3	41,710.7	101,742.3				
		E/T	5,719.1	17,987.2	36,172.4	30,363.9	11,499.7							

Note : 1. Unit of L/C and equivalent total is x10⁶ Rp
2. Unit of F/C is x10³ US\$

L/C : Local Currency
F/C : Foreign Currency
E/T : Equivalent Total



DATUM ELEVATION +635.00		I = 1:12,500	
PROPOSED	EXISTING	SAME AS EXISTING BANK ELEVATION	
RIVER BED SLOPE			
BANK ELEVATION (M)			
FLOOD WATER LEVEL (M)			
RIVER BED ELEVATION (M)			
LEFT BANK ELEVATION (M)			
RIGHT BANK ELEVATION (M)			
RIVER BED ELEVATION (M)			
CUMULATIVE DISTANCE (KM)			
SECTION DISTANCE (KM)			
SECTION NAME			

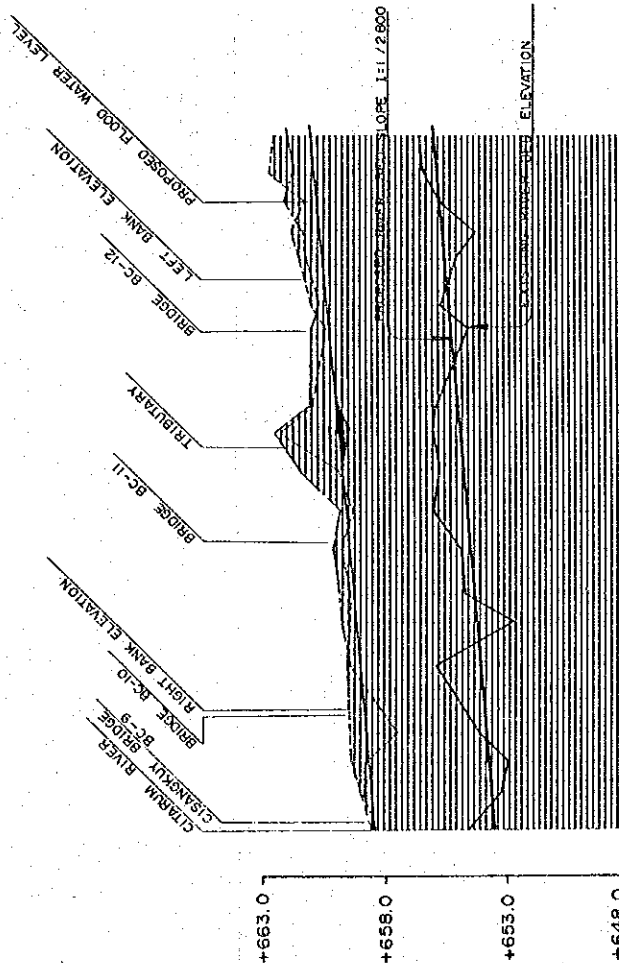
Note : Legend of soil Classification refer to next page, Fig.8.2

FIG. 8.1

GEOLOGICAL PROFILE OF CITARUM RIVER

STUDY ON THE FLOOD CONTROL PLAN OF THE UPPER CITARUM BASIN





SYMBOL	CLASSIFICATION OF STRATUM	NOTE
	COMMON SOIL	N<10
	STIFF SOIL	10<N<50
	SOFT ROCK	N>50
	HARD ROCK	INTRUSIVE ROCK

PROPOSED	BANK ELEVATION (M)		FLOOD WATER LEVEL (M)	RIVER BED ELEVATION (M)	LEFT BANK ELEVATION (M)	RIGHT BANK ELEVATION (M)	RIVER BED ELEVATION (M)	COMULATIVE DISTANCE (KM)	SECTION DISTANCE (KM)	SECTION NAME
	PROPOSED	EXISTING								
	658.47	658.47	658.47	658.47	658.47	658.47	658.47	0.00	0.00	BM 17
	659.90	659.90	659.90	659.90	659.90	659.90	659.90	0.35	0.35	
	658.68	658.68	658.68	658.68	658.68	658.68	658.68	0.55	0.55	
	658.70	658.70	658.70	658.70	658.70	658.70	658.70	0.70	0.70	
	658.87	658.87	658.87	658.87	658.87	658.87	658.87	1.00	1.00	
	658.98	658.98	658.98	658.98	658.98	658.98	658.98	1.35	1.35	
	659.02	659.02	659.02	659.02	659.02	659.02	659.02	1.70	1.70	
	659.11	659.11	659.11	659.11	659.11	659.11	659.11	2.15	2.15	
	659.27	659.27	659.27	659.27	659.27	659.27	659.27	2.45	2.45	
	659.38	659.38	659.38	659.38	659.38	659.38	659.38	2.90	2.90	
	659.54	659.54	659.54	659.54	659.54	659.54	659.54	3.30	3.30	
	659.68	659.68	659.68	659.68	659.68	659.68	659.68	3.78	3.78	
	659.84	659.84	659.84	659.84	659.84	659.84	659.84	4.15	4.15	
	659.98	659.98	659.98	659.98	659.98	659.98	659.98	4.60	4.60	
	660.07	660.07	660.07	660.07	660.07	660.07	660.07	5.10	5.10	
	660.18	660.18	660.18	660.18	660.18	660.18	660.18	5.45	5.45	
	660.24	660.24	660.24	660.24	660.24	660.24	660.24	5.85	5.85	
	660.30	660.30	660.30	660.30	660.30	660.30	660.30	6.25	6.25	
	660.44	660.44	660.44	660.44	660.44	660.44	660.44	6.65	6.65	
	660.84	660.84	660.84	660.84	660.84	660.84	660.84	7.25	7.25	
	660.90	660.90	660.90	660.90	660.90	660.90	660.90	7.40	7.40	
	661.14	661.14	661.14	661.14	661.14	661.14	661.14	7.90	7.90	

FIG. 8.2 GEOLOGICAL PROFILE OF CISANGKUY RIVER

STUDY ON THE FLOOD CONTROL PLAN OF THE UPPER CITARUM BASIN



CHAPTER 9

ORGANIZATION AND MANAGEMENT

Chapter 9. ORGANIZATION AND MANAGEMENT

In this chapter, the organizational and managerial aspects of implementing and operating the urgent project are studied and some recommendations are presented.

9.1 Present Organization and Management

The Citarum River and its tributaries have been maintained under the jurisdiction of the DPUP, West Java Province. Improvement works and maintenance of river structures of these rivers have been carried out by the Water Resources Division of DPUP.

Taking an opportunity of the 1986 serious flood, on May 1987, the Ministry of Public Works set up the project team for the Upper Citarum River Improvement under the direct control of the central government, DGWRD, Ministry of Public Works.

The project team is organized with 57 government officials including one (1) project manager and seven (7) assistant leadership members. At present, all works concerning the Citarum River flood control are managed by this project team.

The present organization of the Upper Citarum River flood control project is shown in Fig. 9.1.

9.2 Required Organization in Construction Stage

For the implementation of the Urgent Flood Control Project of the Citarum River, it is required to execute not only the preparatory works, detailed design, documentation of specification and tender, land acquisition, etc, but also the co-ordination works with agencies concerned including the West Java Province.

It is proposed that these activities should be managed and executed by the present project team under the direct control of DGWRD and a foreign consultant team should be retained as one of the supplemental

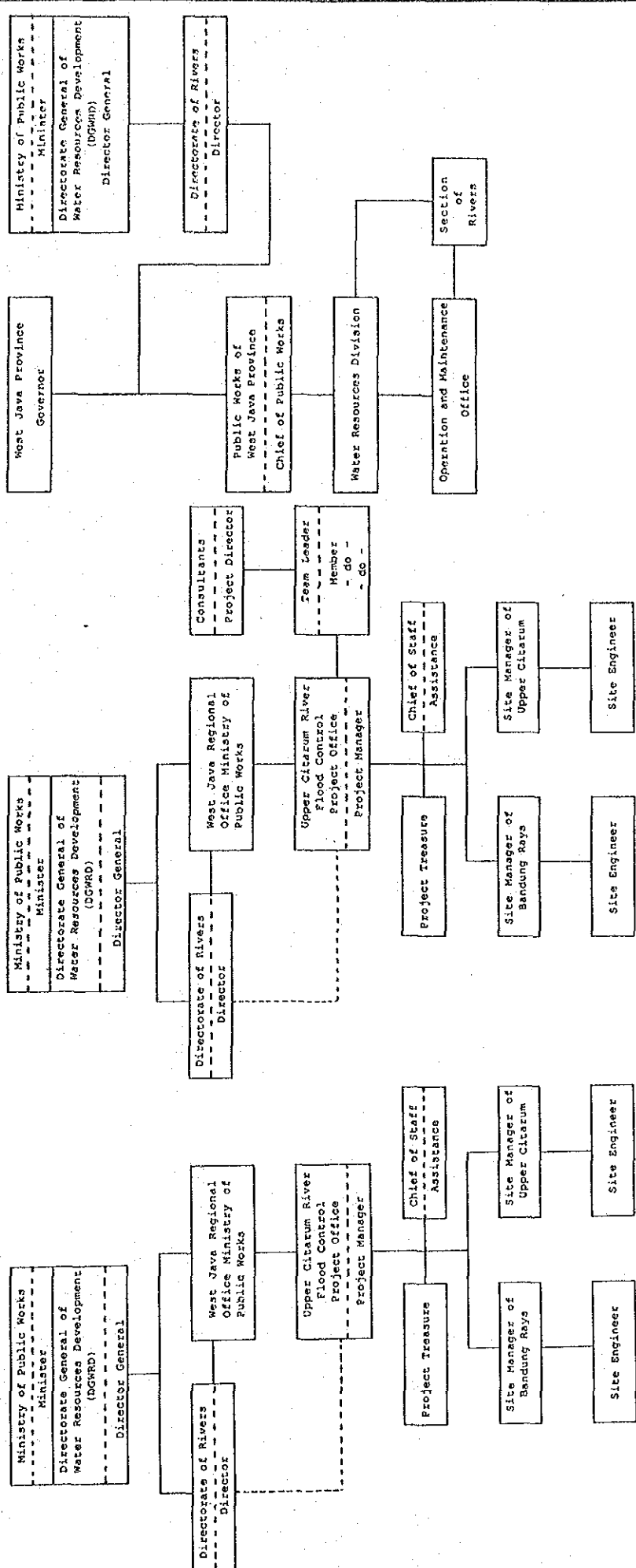
organizations, for the consultancy services of detailed design and construction supervision.

Fig. 9.1 shows the proposed organization during construction stage of the project.

9.3 Required Organization for Operation and Maintenance

Operation and maintenance works of the Citarum River and its related structures after completion of the Urgent Project are proposed to be transferred from the Ministry of Public Works to the West Java Province.

The proposed organization for operation and maintenance after the completion of the Urgent Project is shown in Fig. 9.1.



PROPOSED ORGANIZATION FOR
MAINTENANCE WORKS AFTER
COMPLETION OF UPPER CITATUN
RIVER FLOOD CONTROL PROJECT

PROPOSED ORGANIZATION DURING
CONSTRUCTION STAGE OF UPPER
CITATUN RIVER FLOOD CONTROL PROJECT

PRESENT ORGANIZATION OF
UPPER CITATUN RIVER
FLOOD CONTROL PROJECT

FIG. 9.1 ORGANIZATION CHART

STUDY ON THE FLOOD CONTROL PLAN OF THE UPPER CITATUN BASIN



CHAPTER 10

**PROJECT EVALUATION FOR
URGENT FLOOD CONTROL PLAN**

Chapter 10 PROJECT EVALUATION

10.1 Identification of Benefits

Benefits of this flood control project are defined as the difference in flood damage potential between the two cases "with-project" and "without-project". This is equivalent to the magnitude of reduction in flood damage.

The following items are identified as tangible benefits of this project :

- (1) Reduction of residential building damage
- (2) Reduction of industrial and commercial facility damage
- (3) Reduction of paddy production damage
- (4) Reduction of fishpond production damage
- (5) Reduction of infrastructure damage
- (6) Reduction of emergency activities

The estimated reduction of the flood damage potential of 1.5-year, 2-year, 5-year, 10-year, 20-year, 50-year and 100-year flood frequencies under present condition is given below at 1987 economic prices as shown in Table 10.1.

1.5-year frequency flood	Rp.11.6 billion
2-year frequency flood	Rp.13.5 billion
5-year frequency flood	Rp.18.4 billion
10-year frequency flood	Rp.22.8 billion
20-year frequency flood	Rp.26.1 billion
50-year frequency flood	Rp.27.8 billion
100-year frequency flood	Rp.28.4 billion

10.2 Estimate of Annual Benefits

Average annual flood damage reduction is calculated by the following equation:

$$D = \sum \{ (N_{m-1} - N_m) \times (L_{m-1} + L_m) / 2 \}$$

where, D : Average annual damage reduction

N : Probability of flood

L : Damage potential corresponding to probability of flood

m : Ordinal number

In estimating the average annual damage, a 100-year frequency flood is adopted as the maximum frequency up to which annual damage reduction is accumulated, because the proposed flood control scheme is effective whatever be the degree of inundation. Annual economic benefit is estimated at Rp.13.2 billion under the present socio-economic conditions.

10.3 Estimate of Economic Cost

For economic analysis, the nominal project cost is converted into economic cost which excludes the portions of transfer payments such as taxes and duties. The economic costs are calculated by using general conversion factors estimated for each work item.

The project cost excluding price escalation at 1987 prices is Rp.81.5 billion (Refer to section 8.3.2). The estimated economic cost at 1987 prices is Rp.79.2 billion. The required annual operation and maintenance cost is Rp.285 million (Refer to section 8.3.3).

10.4 Economic Evaluation

The economic evaluation of the project is made in terms of the Economic Internal Rate of Return (EIRR), Net Present Value (NPV) and Benefit-Cost ratio (B/C), based on the following assumption :

- (1) The project costs are disbursed over a period of five years (1990/1991 through 1994/1995), according to the implementation schedule proposed in Table 8.4.
- (2) The project benefits are reckoned over 50 years after completion of the project (1995 through 2049).

- (3) The opportunity cost of capital is assumed to be 10%.

The results are as follows, as shown in Table 10.2.

EIRR = 14.1%

NPV = Rp. 26.9 billion

B/C = 1.44

The above EIRR is examined by sensitivity test. The EIRR decrease to 12.8% when the economic benefit is reduced by 10%, and to 12.9% when the economic cost is increased by 10%. Still in both the cases, the EIRR indicates a high economic efficiency.

Taking into consideration of future conditions such as improvement of living standards and increase in crop yield in the flood area, EIRR would increase from 14.1% to 18.5%.

10.5 Social Impact

The major social impacts of the project are as follows:

- (1) Quality of life of the people in the flood risk area will be improved : reduction in flood menace, improvement of public health, improvement of security, and effective use of land. After the completion of the urgent project, land and number of houses relieved of flood damage against 5 and 20-year floods are estimated as follows:

Flood	Relieved Area (ha)	Number of Relieved House (house)	
		Completely	Free from Serious Inundation Depth(50cm)
5-year	4,090	19,300	24,100
20-year	2,550	12,300	20,300

- (2) Employment opportunity will be directly created by the project during implementation period of five years. In this regard, during this project implementation stage, approximately a 100,000 person-days of unskilled labor would be necessary for the construction works.
- (3) Local transportation will be improved so that most of road system would be free from inundation thereby not interfering with the economic activities related to transportation. Infact a 6.9 km of important provincial road would be releived of flood damage, and moreover a 53 km of Kabupaten and Desa roads also be releived of flooding.
- (4) Working opportunity which has been lost due to floods so far will be recovered after completion of the Urgent Project. This opportunity contributes to improvement of the socio-economic conditions in the flood area.
- (5) The unfavorable social impacts of this urgent project are, the requirement for resettlement of an estimated 230 houses and a land aquisition of 110 ha of land, before the project implementation. On the other hand, spoil-banking of existing river courses, that are created by cut-off channels, would result in reclaiming a land area of 87 ha for beneficial usage.

10.6 Environmental Assessment

No large construction work other than river dredging are proposed in this Project.

No valuable fauna, flora and cultural assets are identified in the proposed river improvement reaches.

Water pollution by river dredging is considered to be negligible. (This condition is also observed in the on-going project)

Table 10.1 ESTIMATED FLOOD DAMAGE WITH AND WITHOUT PROJECT AT ECONOMIC PRICE

ESTIMATED FLOOD DAMAGE AND AVERAGE ANNUAL DAMAGE POTENTIAL
UNDER WITHOUT-PROJECT CONDITION

(Unit : Million Rupiahs)

Asset Item	Recurrence Interval						
	1986 Flood	2-Years	5-Years	10-Years	20-Years	50-Years	100-Years
Houses	5,946.8	7,401.0	11,821.2	16,545.0	19,910.1	23,111.1	25,010.7
Industry	1,510.6	1,717.7	2,068.0	2,274.4	2,422.6	2,595.1	2,704.8
Paddy	4,258.6	4,408.5	4,633.0	4,695.9	4,717.0	4,741.8	4,751.7
Fishpond	18.2	18.2	18.2	18.2	18.2	18.2	18.2
Infrastructure	1,491.5	1,823.7	2,777.8	3,763.9	4,466.5	6,141.2	5,543.1
Indirect Damage	661.3	768.5	1,065.9	1,364.9	1,576.7	1,780.4	1,901.4
Total	13,887.0	16,137.6	22,384.2	28,662.2	33,111.2	37,387.8	39,929.9
Average Annual Damage							16,135.5

ESTIMATED FLOOD DAMAGE AFTER COMPLETION OF THE URGENT PLAN

(Unit : Million Rupiahs)

Asset Item	Recurrence Interval						
	1986 Flood	2-Years	5-Years	10-Years	20-Years	50-Years	100-Years
Houses	609.8	725.0	1,278.3	2,082.6	2,724.8	3,929.0	5,000.4
Industry	245.2	279.6	419.4	608.5	736.5	1,005.8	1,222.2
Paddy	1,181.0	1,292.6	1,758.4	2,319.4	2,532.9	3,198.0	3,544.3
Fishpond	0.0	0.0	0.0	0.0	0.9	9.5	15.5
Infrastructure	171.0	200.9	339.7	538.2	692.3	987.0	1,244.5
Indirect Damage	110.4	124.9	189.8	277.4	334.4	456.5	551.4
Total	2,317.4	2,623.0	3,986.7	5,826.2	7,021.7	9,585.7	11,578.5
Average Annual Damage							2,956.2

ESTIMATED FLOOD REDUCTION BENEFIT BY ASSET ITEM

(Unit : Million Rupiahs)

Asset Item	Recurrence Interval						
	1986 Flood	2-Years	5-Years	10-Years	20-Years	50-Years	100-Years
Houses	5,337.0	6,676.0	10,541.9	14,462.4	17,185.3	19,182.1	20,010.3
Industry	1,265.4	1,438.1	1,648.6	1,665.9	1,686.1	1,589.3	1,482.6
Paddy	3,077.6	3,115.9	2,874.6	2,376.5	2,184.1	1,543.8	1,207.2
Fishpond	18.2	18.2	18.2	18.2	17.3	8.7	2.7
Infrastructure	1,320.5	1,622.8	2,438.1	3,225.7	3,774.3	4,154.3	4,298.6
Indirect Damage	550.9	643.6	876.1	1,087.4	1,242.4	1,323.9	1,350.1
Total	11,569.6	13,514.6	18,397.5	22,836.1	26,089.4	27,802.1	28,351.4
Average Annual Damage							13,179.4

Table 10.2 ANNUAL FLOW OF ECONOMIC COST AND BENEFIT FOR URGENT PLAN

(Unit : Million Rupiahs) (1987 price)

No.	Year	Economic Cost			Economic Benefit	Difference
		Construction	O/M Cost	Total		
1	1990	4,538	0	4,538	0	-4,538
2	1991	14,381	0	14,381	0	-14,381
3	1992	28,526	0	28,526	0	-28,526
4	1993	23,132	113	23,245	1,777	-21,468
5	1994	8,649	256	8,905	8,367	-538
6	1995	0	285	285	13,179	12,894
7	1996	0	285	285	13,179	12,894
8	1997	0	285	285	13,179	12,894
9	1998	0	285	285	13,179	12,894
10	1999	0	285	285	13,179	12,894
11	2000	0	285	285	13,179	12,894
12	2001	0	285	285	13,179	12,894
13	2002	0	285	285	13,179	12,894
14	2003	0	285	285	13,179	12,894
15	2004	0	285	285	13,179	12,894
-	-	"	"	"	"	"
-	-	"	"	"	"	"
-	-	"	"	"	"	"
-	-	"	"	"	"	"
54	2043	0	285	285	13,179	12,894
55	2044	0	285	285	13,179	12,894

EIRR : 14.1%

B/C : 1.44

NPV : Rp 26.9 billion

CHAPTER 11

RECOMMENDATION

Chapter 11. RECOMMENDATION

- (1) The proposed Project is technically, economically and socially justified. Immediate implementation of the Project is recommended in consideration of the existing serious flood problems.
- (2) On going projects, watershed management and improvements of tributaries flowing through the Bandung Urban Area, are recommended to be progressed under the proposed plan by the government of Indonesia in view of necessity for the Overall Flood Control Plan of the Upper Citarum Basin.
- (3) Because of the high costs required for the implementation of the Urgent Project, foreign financial assistance may be necessary.
- (4) Flood plain management consisted of land-use regulation and flood forecasting, warning, and evacuation system shall be implemented for the proposed flood risk area of 5,640 ha. For its implementation, the existing topographic map (1/10,000 scale) of the flood prone area shall be updated.
- (5) Some low-lying Kampung are still flood prone even after completion of the Urgent Project. Main Drainage system in such Kampung shall be improved to drain the stagnant flood water soon after the flood in the river recedes.
- (6) Garbage disposal into rivers causes a river bed rising, resulting in decrease of the discharge capacity of the rivers. Garbage disposal shall be well controlled for maintenance of the proper river conditions.
- (7) Dredged materials of good quality shall be considered to be used profitably for beneficial purposes, for instance, reclaimed materials for land development, road raising, and partial bank construction, etc.

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