

Table 5.3 (6/6) ANNUAL COST AND BENEFIT FLOW OF BABON RIVER PROJECT
Unit: Million Rp.

Year	Economic Cost		Admin.	E/S	Phy. Conti.	OMR	Total	Benefit	Balance
	Const.	Comp.							
1994							0	0	0
-20 1995	2,577	1,658		208	208		4,651	0	-4,651
-19 1996	7,901	1,658		740	740		11,039	0	-11,039
-18 1997	8,517	829		802	802		10,950	0	-10,950
-17 1998	8,564			806	806		10,176	104	-10,072
-16 1999	1,719			121	121		1,961	259	-1,702
-15 2000						203	203	5,176	4,973
-14 2001						203	203	5,487	5,284
-13 2002						203	203	5,816	5,613
-12 2003						203	203	6,165	5,962
-11 2004						203	203	6,535	6,332
-10 2005						203	203	6,927	6,724
-9 2006						203	203	7,343	7,140
-8 2007						203	203	7,783	7,580
-7 2008						203	203	8,250	8,047
-6 2009				1,183	118	203	1,504	8,745	7,241
-5 2010				1,183	118	203	1,504	9,270	7,766
-4 2011		4,965	386	0	497	203	6,051	9,826	3,775
-3 2012	11,352	3,310	1,140	946	1,561	203	18,512	10,416	-8,096
-2 2013	11,352		883	946	1,230	203	14,614	11,041	-3,573
-1 2014	5,676		442	472	615	203	7,408	11,703	4,295
1 2015						423	423	17,453	17,030
2 2016						423	423	17,453	17,030
3 2017						423	423	17,453	17,030
4 2018						423	423	17,453	17,030
5 2019						423	423	17,453	17,030
6 2020						423	423	17,453	17,030
7 2021						423	423	17,453	17,030
8 2022						423	423	17,453	17,030
9 2023						423	423	17,453	17,030
10 2024						423	423	17,453	17,030
11 2025						423	423	17,453	17,030
12 2026						423	423	17,453	17,030
13 2027						423	423	17,453	17,030
14 2028						423	423	17,453	17,030
15 2029						423	423	17,453	17,030
16 2030						423	423	17,453	17,030
17 2031						423	423	17,453	17,030
18 2032						423	423	17,453	17,030
19 2033						423	423	17,453	17,030
20 2034						423	423	17,453	17,030
21 2035						423	423	17,453	17,030
22 2036						423	423	17,453	17,030
23 2037						423	423	17,453	17,030
24 2038						423	423	17,453	17,030
25 2039						423	423	17,453	17,030
26 2040						423	423	17,453	17,030
27 2041						423	423	17,453	17,030
28 2042						423	423	17,453	17,030
29 2043						423	423	17,453	17,030
30 2044						423	423	17,453	17,030
31 2045						423	423	17,453	17,030
32 2046						423	423	17,453	17,030
33 2047						423	423	17,453	17,030
34 2048						423	423	17,453	17,030
35 2049						423	423	17,453	17,030
36 2050						1,301	1,301	17,453	16,152
37 2051						423	423	17,453	17,030
38 2052						423	423	17,453	17,030
39 2053						423	423	17,453	17,030
40 2054						423	423	17,453	17,030
41 2055						423	423	17,453	17,030
42 2056						423	423	17,453	17,030
43 2057						423	423	17,453	17,030
44 2058						423	423	17,453	17,030
45 2059						423	423	17,453	17,030
46 2060						423	423	17,453	17,030
47 2061						423	423	17,453	17,030
48 2062						423	423	17,453	17,030
49 2063						423	423	17,453	17,030
50 2064						423	423	17,453	17,030
TOTAL	57,658	12,420	2,851	7,407	6,816	25,073		EIRR =	13.8%

(Discount Rate 10%)
B/C = 1.51
NPV = 18,547

Table 5.4 ANNUAL COST AND BENEFIT FLOW OF FLOOD CONTROL MASTER PLAN

Unit: Million Rp.

Year	Blorong R.		Bringln R.		Silandak R.		Garang R./West FH		East FH		Babon R.		Total Cost	Total Benefit	Balance
	Cost Main	OMR	Cost Main	OMR	Cost Main	OMR	Cost Main	OMR	Cost Main	OMR	Cost Main	OMR			
-21 1994													2,329	0	-2,329
-20 1995													4,661	0	-4,661
-19 1996													5,694	0	-5,694
-18 1997													27,325	0	-27,325
-17 1998	2,165								2,540				10,176	104	39,666
-16 1999	2,165								5,385				1,961	259	15,176
-15 2000	7,690												0	203	5,176
-14 2001	8,578									925			0	203	5,487
-13 2002	9,375									925			0	203	5,816
-12 2003	18,514									388			0	203	6,165
-11 2004	13,872									10,504			1,301	203	6,535
-10 2005	13,872									10,245			1,301	203	6,927
-9 2006	2,808									5,120			164	329	5,848
-8 2007	0	115	8,864										180	3,287	18,309
-7 2008	0	115	9,396										180	3,484	14,411
-6 2009	0	115	9,960										180	3,693	7,205
-5 2010	479		115	10,557									180	3,915	2,559
-4 2011	0	115	11,191	1,305									180	4,150	423
-3 2012	6,625		115	11,862	2,651								180	4,399	423
-2 2013			168	12,738	12,608								180	4,663	423
-1 2014			168	13,502	7,227								180	4,942	423
2015			168	14,312		177							180	5,239	423
2016			168	14,312		157	1,768						180	5,239	423
2017			168	14,312		157	1,768						180	5,239	423
2018			168	14,312		157	1,768						180	5,239	423
2019			168	14,312		157	1,768						180	5,239	423
2020			168	14,312		157	1,768						180	5,239	423
2021			168	14,312		157	1,768						180	5,239	423
2022			168	14,312		157	1,768						180	5,239	423
2023			168	14,312		157	1,768						180	5,239	423
2024			168	14,312		157	1,768						180	5,239	423
2025			168	14,312		157	1,768						180	5,239	423
2026			168	14,312		157	1,768						180	5,239	423
2027			168	14,312		157	1,768						180	5,239	423
2028			168	14,312		157	1,768						180	5,239	423
2029			168	14,312		157	1,768						180	5,239	423
2030			168	14,312		157	1,768						180	5,239	423
2031			168	14,312		157	1,768						180	5,239	423
2032			168	14,312		157	1,768						180	5,239	423
2033			168	14,312		157	1,768						180	5,239	423
2034			168	14,312		157	1,768						180	5,239	423
2035			168	14,312		157	1,768						180	5,239	423
2036			168	14,312		157	1,768						180	5,239	423
2037			168	14,312		157	1,768						180	5,239	423
2038			168	14,312		157	1,768						180	5,239	423
2039			168	14,312		157	1,768						180	5,239	423
2040			168	14,312		157	1,768						180	5,239	423
2041			168	14,312		157	1,768						180	5,239	423
2042			168	14,312		157	1,768						180	5,239	423
2043			168	14,312		157	1,768						180	5,239	423
2044			168	14,312		157	1,768						180	5,239	423
2045			168	14,312		157	1,768						180	5,239	423
2046			168	14,312		157	1,768						180	5,239	423
2047			168	14,312		157	1,768						180	5,239	423
2048			168	14,312		157	1,768						180	5,239	423
2049			168	14,312		157	1,768						180	5,239	423
2050			168	14,312		157	1,768						180	5,239	423
2051			168	14,312		157	1,768						180	5,239	423
2052			168	14,312		157	1,768						180	5,239	423
2053			168	14,312		157	1,768						180	5,239	423
2054			168	14,312		157	1,768						180	5,239	423
2055			168	14,312		157	1,768						180	5,239	423
2056			168	14,312		157	1,768						180	5,239	423
2057			1,462	14,312		157	1,768						785	5,239	423
2058			168	14,312		157	1,768						180	5,239	423
2059			168	14,312		157	1,768						180	5,239	423
2060			168	14,312		157	1,768						180	5,239	423
2061			168	14,312		157	1,768						180	5,239	423
2062			168	14,312		157	1,768						180	5,239	423
2063			325	14,312		157	1,768						180	5,239	423
2064			168	14,312		157	1,768						180	5,239	423

EIRR = 14.1%

(Discount Rate 10%)
B/C = 1.54
NPV = 78,016

Table 5.5 ANNUAL DISBURSEMENT SCHEDULE OF URBAN DRAINAGE PLAN FOR MASTER PLAN (INCLUDING SECONDARY CHANNEL)

Unit: Million Rp.

Description	Total	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
1. Eastern Semarang																							
Siringin	50,512	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,332	1,332	5,477	16,546	14,757	11,068	
Tenggung	123,302	0	0	0	0	0	0	0	0	0	0	0	0	3,145	3,282	6,527	20,520	20,520	18,344	16,168	14,275		
2. Central Semarang																							
Semarang	55,651	0	0	0	0	0	0	0	0	0	1,822	1,822	315	5,358	5,358	6,367	6,053	6,053	6,053	5,043	5,040		
Banger	30,710	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	833	833	2,987	16,828	9,229		
Bulu	3,431	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	157	1,096	2,178		
3. Western Semarang																							
Ronggojawe	8,032	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	450	1,351	6,231
Karangayu	7,741	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	465	838	6,438
Tawang	1,943	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131	0	1,812
Silandak	1,717	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	460	1,172
Total	283,039	0	0	0	0	0	0	0	0	0	1,822	1,822	315	8,504	8,640	12,894	28,219	28,738	32,883	45,218	56,541	57,443	

Notes : This economic cost will be used to identify the priority sequence of drainage area. The improvement costs of the surveyed and other primary, and secondary channels are considered.

Unit: Million Rp.

Description	Total	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
1. Eastern Semarang																							
Siringin	50,512	0	1,396	1,395	1,867	0	0	0	0	0	0	0	0	0	0	0	1,209	1,209	4,971	15,020	13,396	10,049	
Tenggung	123,302	1,823	1,823	1,823	1,823	0	0	0	0	0	0	0	0	2,960	3,089	6,141	19,306	19,306	17,259	15,213	13,430		
2. Central Semarang																							
Semarang	55,651	0	1,822	1,822	315	5,358	5,358	6,367	6,367	6,053	6,053	6,053	5,043	5,040	0	0	0	0	0	0	0	0	
Banger	30,710	1,909	1,908	1,908	1,908	0	0	626	626	826	2,245	12,645	6,935	0	0	0	0	0	0	0	0	0	
Bulu	3,431	422	421	562	0	0	0	0	0	0	94	647	1,285	0	0	0	0	0	0	0	0	0	
3. Western Semarang																							
Ronggojawe	8,032	0	275	0	0	0	0	0	0	0	0	0	435	1,304	6,018	0	0	0	0	0	0	0	
Karangayu	7,741	0	0	0	0	0	0	0	0	0	0	0	465	838	6,438	0	0	0	0	0	0	0	
Tawang	1,943	0	0	0	0	0	0	0	0	0	0	0	131	0	1,812	0	0	0	0	0	0	0	
Silandak	1,717	0	0	0	0	0	0	0	0	0	0	0	85	460	1,172	0	0	0	0	0	0	0	
Total	283,039	4,154	7,645	7,510	5,913	5,358	5,358	6,367	6,993	6,679	8,392	19,345	14,379	10,602	18,529	6,141	20,515	20,515	24,277	32,279	28,699	23,479	

Notes : This economic cost is made under the implementation schedule considering the priority sequence and the on-going projects. The improvement costs of the surveyed and other primary, and secondary channels are considered.

Table 5.6 (1/3) ANNUAL COST AND BENEFIT FLOW OF WESTERN SEMARANG CITY DRAINAGE AREA
Unit: Million Rp.

Year	Economic Cost							Benefit	Balance	
	Const.	Comp.	Admin.	E/S	Phy.	Contl.	OMR	Total		
1994								0	0	0
1995								0	0	0
1996								0	0	0
1997								0	0	0
1998								0	0	0
1999								0	0	0
2000								0	0	0
2001								0	0	0
2002								0	0	0
2003								0	0	0
2004								0	0	0
2005								0	0	0
2006								0	0	0
2007								0	0	0
2008								0	0	0
2009								0	0	0
2010								0	0	0
2011								0	0	0
-3 2012				1,028			103	1,131	0	-1,131
-2 2013		2,250	174	0			225	2,649	0	-2,649
-1 2014	12,330		960	1,027			1,336	15,653	0	-15,653
1 2015							78	78	2,255	2,177
2 2016							78	78	2,255	2,177
3 2017							78	78	2,255	2,177
4 2018							78	78	2,255	2,177
5 2019							78	78	2,255	2,177
6 2020							78	78	2,255	2,177
7 2021							78	78	2,255	2,177
8 2022							78	78	2,255	2,177
9 2023							78	78	2,255	2,177
10 2024							78	78	2,255	2,177
11 2025							78	78	2,255	2,177
12 2026							78	78	2,255	2,177
13 2027							78	78	2,255	2,177
14 2028							78	78	2,255	2,177
15 2029							78	78	2,255	2,177
16 2030							78	78	2,255	2,177
17 2031							78	78	2,255	2,177
18 2032							78	78	2,255	2,177
19 2033							78	78	2,255	2,177
20 2034							78	78	2,255	2,177
21 2035							78	78	2,255	2,177
22 2036							78	78	2,255	2,177
23 2037							78	78	2,255	2,177
24 2038							78	78	2,255	2,177
25 2039							78	78	2,255	2,177
26 2040							78	78	2,255	2,177
27 2041							78	78	2,255	2,177
28 2042							78	78	2,255	2,177
29 2043							78	78	2,255	2,177
30 2044							78	78	2,255	2,177
31 2045							78	78	2,255	2,177
32 2046							78	78	2,255	2,177
33 2047							78	78	2,255	2,177
34 2048							78	78	2,255	2,177
35 2049							78	78	2,255	2,177
36 2050							78	78	2,255	2,177
37 2051							78	78	2,255	2,177
38 2052							78	78	2,255	2,177
39 2053							78	78	2,255	2,177
40 2054							78	78	2,255	2,177
41 2055							78	78	2,255	2,177
42 2056							78	78	2,255	2,177
43 2057							78	78	2,255	2,177
44 2058							78	78	2,255	2,177
45 2059							78	78	2,255	2,177
46 2060							78	78	2,255	2,177
47 2061							78	78	2,255	2,177
48 2062							78	78	2,255	2,177
49 2063							78	78	2,255	2,177
50 2064							78	78	2,255	2,177
TOTAL	12,330	2,250	1,134	2,055	1,664	3,900			EIRR =	10.8%

(Discount Rate 10%)
B/C = 1.08
NPV = 223

Table 5.6 (2/3) ANNUAL COST AND BENEFIT FLOW OF CENTRAL SEMARANG CITY DRAINAGE AREA
Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Contl.	OMR			
1994							0	0	0
1995							0	0	0
1996							0	0	0
1997							0	0	0
1998							0	0	0
1999							0	0	0
2000							0	0	0
2001							0	0	0
2002							0	0	0
2003				1,656		166	1,822	0	(1,822)
2004				1,656		166	1,822	0	(1,822)
2005		267	21			27	315	0	(315)
2006	3,973	267	330	331		457	5,358	0	(5,358)
2007	3,973	267	330	331		457	5,358	867	(4,491)
2008	4,768	267	392	397		543	6,367	1,447	(4,920)
-6 2009	4,768	267	392	397		543	6,367	2,199	(4,168)
-6 2010	4,768		371	1,154		593	6,886	3,036	(3,850)
-4 2011	4,768		371	1,154		593	6,886	4,027	(2,859)
-3 2012	4,768	2,536	568	540		785	9,197	5,126	(4,071)
-2 2013	14,876	3,467	1,426	1,240		1,958	22,967	6,647	(16,320)
-1 2014	12,957		1,007	1,081		1,402	16,447	10,258	(6,189)
1 2015						486	486	16,640	16,154
2 2016						486	486	16,640	16,154
3 2017						486	486	16,640	16,154
4 2018						486	486	16,640	16,154
5 2019						486	486	16,640	16,154
6 2020						486	486	16,640	16,154
7 2021						486	486	16,640	16,154
8 2022						486	486	16,640	16,154
9 2023						486	486	16,640	16,154
10 2024						486	486	16,640	16,154
11 2025						486	486	16,640	16,154
12 2026						486	486	16,640	16,154
13 2027						486	486	16,640	16,154
14 2028						486	486	16,640	16,154
15 2029						486	486	16,640	16,154
16 2030						486	486	16,640	16,154
17 2031						486	486	16,640	16,154
18 2032						486	486	16,640	16,154
19 2033						486	486	16,640	16,154
20 2034						486	486	16,640	16,154
21 2035						486	486	16,640	16,154
22 2036						486	486	16,640	16,154
23 2037						486	486	16,640	16,154
24 2038						486	486	16,640	16,154
25 2039						486	486	16,640	16,154
26 2040						486	486	16,640	16,154
27 2041						486	486	16,640	16,154
28 2042						486	486	16,640	16,154
29 2043						486	486	16,640	16,154
30 2044						486	486	16,640	16,154
31 2045						486	486	16,640	16,154
32 2046						486	486	16,640	16,154
33 2047						486	486	16,640	16,154
34 2048						486	486	16,640	16,154
35 2049						486	486	16,640	16,154
36 2050						486	486	16,640	16,154
37 2051						486	486	16,640	16,154
38 2052						486	486	16,640	16,154
39 2053						486	486	16,640	16,154
40 2054						486	486	16,640	16,154
41 2055						486	486	16,640	16,154
42 2056						486	486	16,640	16,154
43 2057						486	486	16,640	16,154
44 2058						486	486	16,640	16,154
45 2059						486	486	16,640	16,154
46 2060						486	486	16,640	16,154
47 2061						486	486	16,640	16,154
48 2062						486	486	16,640	16,154
49 2063						486	486	16,640	16,154
50 2064						486	486	16,640	16,154
TOTAL	59,619	7,338	5,208	9,937	7,690	24,300		EIRR =	15.1%

(Discount Rate 10%)
B/C = 1.57
NPV = 10,179

Table 5.6 (3/3) ANNUAL COST AND BENEFIT FLOW OF EASTERN SEMARANG CITY DRAINAGE AREA
Unit: Million Rp.

Year	Economic Cost					Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.			
1994						0	0	0
1995						0	0	0
1996						0	0	0
1997						0	0	0
1998						0	0	0
1999						0	0	0
2000						0	0	0
2001						0	0	0
2002						0	0	0
2003						0	0	0
2004						0	0	0
2005						0	0	0
-9 2006				2,860	286	3,146	0	(3,146)
-8 2007				2,984	298	3,282	0	(3,282)
-7 2008		5,542	431	0	554	6,527	0	(6,527)
-6 2009	12,683	3,694	1,274	2,330	1,871	21,852	0	(21,852)
-5 2010	12,683	3,694	1,274	2,330	1,871	21,852	2,671	(19,181)
-4 2011	12,683	8,344	1,636	1,119	2,215	25,997	4,608	(21,389)
-3 2012	21,402	6,497	2,170	1,846	2,975	34,890	7,126	(27,764)
-2 2013	24,308	/	1,890	2,088	2,639	30,925	10,742	(20,183)
-1 2014	19,910		1,548	1,721	2,164	25,343	14,382	(10,961)
1 2015						546	17,847	17,301
2 2016						546	17,847	17,301
3 2017						546	17,847	17,301
4 2018						546	17,847	17,301
5 2019						546	17,847	17,301
6 2020						546	17,847	17,301
7 2021						546	17,847	17,301
8 2022						546	17,847	17,301
9 2023						546	17,847	17,301
10 2024						546	17,847	17,301
11 2025						546	17,847	17,301
12 2026						546	17,847	17,301
13 2027						546	17,847	17,301
14 2028						546	17,847	17,301
15 2029						546	17,847	17,301
16 2030						546	17,847	17,301
17 2031						546	17,847	17,301
18 2032						546	17,847	17,301
19 2033						546	17,847	17,301
20 2034						546	17,847	17,301
21 2035						546	17,847	17,301
22 2036						546	17,847	17,301
23 2037						546	17,847	17,301
24 2038						546	17,847	17,301
25 2039						546	17,847	17,301
26 2040						546	17,847	17,301
27 2041						546	17,847	17,301
28 2042						546	17,847	17,301
29 2043						546	17,847	17,301
30 2044						546	17,847	17,301
31 2045						546	17,847	17,301
32 2046						546	17,847	17,301
33 2047						546	17,847	17,301
34 2048						546	17,847	17,301
35 2049						546	17,847	17,301
36 2050						546	17,847	17,301
37 2051						546	17,847	17,301
38 2052						546	17,847	17,301
39 2053						546	17,847	17,301
40 2054						546	17,847	17,301
41 2055						546	17,847	17,301
42 2056						546	17,847	17,301
43 2057						546	17,847	17,301
44 2058						546	17,847	17,301
45 2059						546	17,847	17,301
46 2060						546	17,847	17,301
47 2061						546	17,847	17,301
48 2062						546	17,847	17,301
49 2063						546	17,847	17,301
50 2064						546	17,847	17,301
TOTAL	103,669	27,771	10,223	17,278	14,873	27,300	EIRR =	9.5%

(Discount Rate 10%)
B/C = 0.95
NPV = -4,797

Table 5.7 ANNUAL COST AND BENEFIT FLOW OF URBAN DRAINAGE MASTER PLAN

Unit: Million Rp.

Year	Western Semarang		Central Semarang		Eastern Semarang		Total Cost	Total Benefit	Balance		
	Cost	Benefit	Cost	Benefit	Cost	Benefit					
	Main	OMR	Main	OMR	Main	OMR					
(21) 1994			2,331		1,823		4,154	0	(4,154.00)		
(20) 1995	275		4,151		3,219		7,645	0	(7,645.00)		
(19) 1996		1	4,292	318	3,218	171	7,511	499	(7,011.73)		
(18) 1997		1	2,223	6	560	297	5,920	868	(5,052.09)		
(17) 1998		1	5,358	31	716	37	5,427	1,183	(4,243.92)		
(16) 1999		1	5,358	31	1,071	37	5,427	1,567	(3,860.24)		
(15) 2000		1	6,367	31	1,467	37	6,436	1,992	(4,443.78)		
(14) 2001		1	6,993	31	1,972	37	7,062	2,529	(4,532.75)		
(13) 2002		1	6,679	31	2,577	37	6,748	3,167	(3,580.93)		
(12) 2003		1	8,392	31	3,224	37	8,461	3,849	(4,611.81)		
(11) 2004		1	19,345	31	4,072	37	19,414	4,736	(14,678.46)		
(10) 2005	1,116	1	13,263	31	5,918	37	14,448	6,621	(7,826.87)		
(9) 2006	2,602	1	5,040	115	7,437	2,960	10,755	8,259	(2,496.11)		
(8) 2007	15,440	1		486	10,440	3,089	19,053	11,691	(7,361.62)		
(7) 2008		78	1,500	486	11,067	6,141	17,229	6,742	13,795	7,053.36	
(6) 2009		78	1,590	486	11,731	20,515	17,747	21,116	15,068	(6,048.41)	
(5) 2010		78	1,685	486	12,434	20,515	3,426	21,116	17,546	(3,570.29)	
(4) 2011		78	1,786	486	13,180	24,277	37	5,300	24,878	20,267	(4,611.04)
(3) 2012		78	1,893	486	13,971	32,279	37	7,711	32,880	23,576	(9,304.07)
(2) 2013		78	2,007	486	14,810	28,609	37	11,124	29,210	27,940	(1,269.74)
(1) 2014		78	2,127	486	15,698	23,479	37	14,562	24,080	32,388	8,307.93
1 2015		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
2 2016		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
3 2017		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
4 2018		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
5 2019		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
6 2020		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
7 2021		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
8 2022		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
9 2023		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
10 2024		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
11 2025		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
12 2026		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
13 2027		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
14 2028		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
15 2029		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
16 2030		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
17 2031		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
18 2032		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
19 2033		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
20 2034		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
21 2035		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
22 2036		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
23 2037		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
24 2038		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
25 2039		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
26 2040		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
27 2041		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
28 2042		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
29 2043		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
30 2044		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
31 2045		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
32 2046		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
33 2047		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
34 2048		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
35 2049		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
36 2050		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
37 2051		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
38 2052		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
39 2053		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
40 2054		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
41 2055		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
42 2056		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
43 2057		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
44 2058		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
45 2059		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
46 2060		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
47 2061		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
48 2062		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
49 2063		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00
50 2064		78	2,255	486	16,640		546	17,847	1,110	36,742	35,632.00

EIRR = 10.4%

(Discount Rate 10%)

B/C = 1.05

NPV = 4,370

Table 5.8 POPULATION PROJECTION IN THE STUDY AREA (1990-2015)

Kecamatan	1990	1995	2000	2005	2010	2015
I Semarang City						
1 Central Semarang	158,727	62,243	65,971	69,922	74,109	78,547
2 North Semarang	159,638	169,198	179,330	190,069	201,452	213,516
3 East Semarang	221,724	235,002	249,075	263,991	279,800	296,556
4 South Semarang	227,743	241,381	255,836	271,157	287,396	304,606
5 West Semarang	268,960	285,067	302,138	320,231	339,408	359,734
6 Genuk	160,362	169,965	180,143	190,932	202,365	214,484
7 Gunung Pati	46,362	49,138	52,081	55,200	58,506	62,009
8 Mijen	40,324	42,738	45,298	48,011	50,886	53,933
9 Tugu	65,390	69,305	73,456	77,855	82,518	87,459
Other	1,741	1,845	1,956	2,073	2,197	2,329
Subtotal	1,250,971	1,325,882	1,405,284	1,489,441	1,578,637	1,673,173
II Kabupaten Kendal						
10 Brangsong	38,092	40,373	42,791	45,353	48,069	50,948
11 Kaliwungu	83,736	88,751	94,065	99,698	105,669	111,997
12 Singorojo	42,181	44,707	47,384	50,222	53,229	56,417
13 Boja	51,329	54,403	57,661	61,114	64,774	68,653
14 Limbangan	26,182	27,750	29,412	31,173	33,040	35,018
15 Pegandon	61,577	65,265	69,173	73,315	77,705	82,359
Subtotal	303,097	321,249	340,486	360,875	382,486	405,392
III Kabupaten Semarang						
16 Ungaran	94,079	99,713	118,410	112,013	118,721	125,831
17 Klepu	75,423	79,940	84,727	89,801	95,178	100,878
Subtotal	169,502	179,653	203,137	201,814	213,899	226,709
Grand Total	1,723,570	1,826,784	1,948,907	2,052,130	2,175,022	2,305,274

Table 5.9

PROJECTION OF INDUSTRIAL AREA

Kotamadia /Kabupaten	Kecamatan	Industrial Area (ha)					
		Year	1990	1995	2000	2005	2010
Semarang	West/Tugu	90	270	450	720	900	1,080
	Central/North	116	231	385	385	385	385
	South	33	40	57	100	143	186
	East/Genuk	92	340	500	640	780	920
Demak	Sayung	90	270	720	1,217	1,800	1,800
Total		421	1,151	2,112	3,062	4,008	4,371

Table 5.10

FUTURE PUBLIC WATER DEMAND PROJECTION

WATER USE	unit	Year					
		1990	1995	2000	2005	2010	2015
Domestic Water							
Domestic Use	lcd	150	170	170	200	200	250
Population		1,250,971	1,325,882	1,405,284	1,489,441	1,578,637	1,673,173
Service Ratio	%	100	100	100	100	100	100
Water Demand	m ³ /d	187,646	225,400	238,898	297,888	315,727	418,293
	m ³ /s	2.172	2.609	2.765	3.448	3.654	4.841
Non-Domestic Water							
Industrial Use	l/s/ha	0.75	0.75	0.75	0.75	0.75	0.75
Industrial Area	ha	421	1,151	2,112	3,062	4,008	4,371
Water Demand	m ³ /s	0.316	0.863	1.584	2.297	3.006	3.278
Commercial Use of Domestic Water	%	8.5	15	20	20	20	20
Water Demand	m ³ /s	0.185	0.391	0.553	0.690	0.731	0.968
Unaccounted for Water	%	50	28	25	25	25	25
Total Water Demand	m ³ /s	5.34	5.37	6.54	8.58	9.85	12.12

Table 5.11 ANNUAL DISBURSEMENT SCHEDULE OF WATER RESOURCES DEVELOPMENT PLAN FOR MASTER PLAN

(Financial Cost)

Unit: Million Rp.

Description	Total	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
1. Babon Dam	320,530	0	0	0	0	0	0	0	0	0	8,869	8,869	18,147	26,630	34,742	81,543	64,357	64,357	13,016	0	0	0	0
2. Jatibarang Dam	44,070	0	4,439	11,527	12,299	12,299	3,506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Mundingan Dam	127,116	0	0	4,489	23,979	27,413	35,520	27,799	7,916	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. Interbasin Transfer	8,549	0	0	0	0	0	0	0	675	25	3,139	4,710	0	0	0	0	0	0	0	0	0	0	0
5. Kedungsuren Dam Kedungsuren Dam Conveyance Channel	192,918 9,739	0 0	0 0	0 0	0 0	4,839 0	4,839 0	18,972 0	21,102 0	23,026 0	45,365 585	33,952 273	33,952 3,551	6,871 5,330	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total	702,922	0	4,439	16,016	36,278	44,551	43,865	46,771	29,693	23,051	57,958	47,804	55,650	38,831	34,742	81,543	64,357	64,357	13,016	0	0	0	0

Note : Value added tax is included, but Price contingency is excluded.

(Economic Cost)

Unit: Million Rp.

Description	Total	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
1. Babon Dam	267,154	0	0	0	0	0	0	0	0	0	8,063	8,063	14,945	22,026	28,772	67,634	53,416	53,416	10,818	0	0	0	0
2. Jatibarang Dam	37,008	0	3,826	9,743	10,257	10,257	2,925	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Mundingan Dam	106,296	0	0	4,081	20,149	22,738	29,543	23,184	6,601	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. Interbasin Transfer	7,157	0	0	0	0	0	0	0	614	21	2,609	3,913	0	0	0	0	0	0	0	0	0	0	0
5. Kedungsuren Dam Kedungsuren Dam Conveyance Channel	160,611 8,120	0 0	0 0	0 0	0 0	4,399 0	4,399 0	15,627 0	17,430 0	19,051 0	37,622 532	28,188 225	28,188 2,944	5,707 4,419	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Total	588,346	0	3,826	13,824	30,406	37,394	36,867	38,811	24,645	19,072	48,826	40,389	46,078	32,152	28,772	67,634	53,416	53,416	10,818	0	0	0	0

Table 5.12 (1/3) ANNUAL COST AND BENEFIT FLOW OF KEDUNG SUREN RESERVOIR PROJECT

Unit: Million Rp.

Year	Economic Cost						Benefit			Balance	
	Const.	Comp.	Admin.	E/S	Phy.Contl.	OMR	Total	Public W.	Irrigation		Total
1994							0			0	0.00
1995							0			0	0.00
1996							0			0	0.00
1997							0			0	0.00
-9 1998				3,999		400	4,399			0	-4,399.00
-8 1999				3,999		400	4,399			0	-4,399.00
-7 2000		13,268	1,032	0	1,327		15,627			0	-15,627.00
-6 2001	4,381	9,951	1,115	500	1,483		17,430			0	-17,430.00
-5 2002	8,764	6,633	1,198	833	1,623		19,051			0	-19,051.00
-4 2003	26,293	3,316	2,303	2,983	3,259		38,154			0	-38,154.00
-3 2004	21,910	191	1,719	2,166	2,427		28,413			0	-28,413.00
-2 2005	24,230		1,884	2,359	2,659		31,132			0	-31,132.00
-1 2006	7,862		611	788	865		10,126			0	-10,126.00
1 2007						279	279	21,759.84	253.52	22,013.36	21,734.36
2 2008						279	279	21,759.84	253.52	22,013.36	21,734.36
3 2009						279	279	21,759.84	253.52	22,013.36	21,734.36
4 2010						279	279	21,759.84	253.52	22,013.36	21,734.36
5 2011						279	279	21,759.84	253.52	22,013.36	21,734.36
6 2012						279	279	21,759.84	253.52	22,013.36	21,734.36
7 2013						279	279	21,759.84	253.52	22,013.36	21,734.36
8 2014						279	279	21,759.84	253.52	22,013.36	21,734.36
9 2015						279	279	21,759.84	253.52	22,013.36	21,734.36
10 2016						279	279	21,759.84	253.52	22,013.36	21,734.36
11 2017						279	279	21,759.84	253.52	22,013.36	21,734.36
12 2018						279	279	21,759.84	253.52	22,013.36	21,734.36
13 2019						279	279	21,759.84	253.52	22,013.36	21,734.36
14 2020						279	279	21,759.84	253.52	22,013.36	21,734.36
15 2021						279	279	21,759.84	253.52	22,013.36	21,734.36
16 2022						279	279	21,759.84	253.52	22,013.36	21,734.36
17 2023						279	279	21,759.84	253.52	22,013.36	21,734.36
18 2024						279	279	21,759.84	253.52	22,013.36	21,734.36
19 2025						279	279	21,759.84	253.52	22,013.36	21,734.36
20 2026						279	279	21,759.84	253.52	22,013.36	21,734.36
21 2027						279	279	21,759.84	253.52	22,013.36	21,734.36
22 2028						279	279	21,759.84	253.52	22,013.36	21,734.36
23 2029						279	279	21,759.84	253.52	22,013.36	21,734.36
24 2030						279	279	21,759.84	253.52	22,013.36	21,734.36
25 2031						279	279	21,759.84	253.52	22,013.36	21,734.36
26 2032						279	279	21,759.84	253.52	22,013.36	21,734.36
27 2033						279	279	21,759.84	253.52	22,013.36	21,734.36
28 2034						279	279	21,759.84	253.52	22,013.36	21,734.36
29 2035						279	279	21,759.84	253.52	22,013.36	21,734.36
30 2036						279	279	21,759.84	253.52	22,013.36	21,734.36
31 2037						279	279	21,759.84	253.52	22,013.36	21,734.36
32 2038						279	279	21,759.84	253.52	22,013.36	21,734.36
33 2039						279	279	21,759.84	253.52	22,013.36	21,734.36
34 2040						279	279	21,759.84	253.52	22,013.36	21,734.36
35 2041						279	279	21,759.84	253.52	22,013.36	21,734.36
36 2042						279	279	21,759.84	253.52	22,013.36	21,734.36
37 2043						279	279	21,759.84	253.52	22,013.36	21,734.36
38 2044						279	279	21,759.84	253.52	22,013.36	21,734.36
39 2045						279	279	21,759.84	253.52	22,013.36	21,734.36
40 2046						279	279	21,759.84	253.52	22,013.36	21,734.36
41 2047						279	279	21,759.84	253.52	22,013.36	21,734.36
42 2048						279	279	21,759.84	253.52	22,013.36	21,734.36
43 2049						279	279	21,759.84	253.52	22,013.36	21,734.36
44 2050						279	279	21,759.84	253.52	22,013.36	21,734.36
45 2051						279	279	21,759.84	253.52	22,013.36	21,734.36
46 2052						279	279	21,759.84	253.52	22,013.36	21,734.36
47 2053						279	279	21,759.84	253.52	22,013.36	21,734.36
48 2054						279	279	21,759.84	253.52	22,013.36	21,734.36
49 2055						279	279	21,759.84	253.52	22,013.36	21,734.36
50 2056						279	279	21,759.84	253.52	22,013.36	21,734.36
2057							0			0.00	0.00
2058							0			0.00	0.00
2059							0			0.00	0.00
2060							0			0.00	0.00
2061							0			0.00	0.00
2062							0			0.00	0.00
2063							0			0.00	0.00
2064							0			0.00	0.00
TOTAL	93,440	33,359	9,862	17,627	14,443	13,950				EIRR =	9.5%

(Discount Rate 10%)
B/C = 0.93
NPV = -4,545

Table 5.12 (2/3) ANNUAL COST AND BENEFIT FLOW OF JATIBARANG RES./MUNDINGAN RES./INTERBASIN TRANS. PROJECT
Unit: Million Rp.

Year	Economic Cost					Benefit				Total	Balance	
	Const.	Comp.	Admin.	E/S	Phy.Contl.	OMR	Total	Jatibarang	Mundingan			Inter.
1994							0				0.00	0.00
-7 1995		1,716	133	1,641		336	3,826				0.00	-3,826.00
-6 1996	4,321	1,716	469	6,104	1,214		13,824				0.00	-13,824.00
-5 1997	7,560	13,498	1,638	5,095	2,615		30,406				0.00	-30,406.00
-4 1998	17,323	8,099	1,977	2,776	2,820		32,995				0.00	-32,995.00
-3 1999	19,246	5,399	1,918	3,127	2,778		32,468				0.00	-32,468.00
-2 2000	17,086	0	1,329	2,782	1,987	77	23,261	13,434.34			13,434.34	-9,826.66
-1 2001	4,882	0	380	1,331	622	77	7,292	13,434.34			13,434.34	6,142.34
1 2002	0	18	1	0	2	233	254	13,434.34	15,137.28		28,571.62	28,317.62
2 2003	2,007		156	223	223	233	2,842	13,434.34	15,137.28		28,571.62	25,729.62
3 2004	3,010		235	334	334	233	4,146	13,434.34	15,137.28		28,571.62	24,425.62
4 2005						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
5 2006						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
6 2007						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
7 2008						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
8 2009						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
9 2010						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
10 2011						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
11 2012						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
12 2013						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
13 2014						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
14 2015						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
15 2016						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
16 2017						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
17 2018						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
18 2019						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
19 2020						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
20 2021						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
21 2022						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
22 2023						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
23 2024						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
24 2025						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
25 2026						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
26 2027						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
27 2028						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
28 2029						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
29 2030						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
30 2031						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
31 2032						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
32 2033						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
33 2034						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
34 2035						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
35 2036						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
36 2037						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
37 2038						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
38 2039						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
39 2040						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
40 2041						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
41 2042						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
42 2043						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
43 2044						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
44 2045						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
45 2046						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
46 2047						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
47 2048						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
48 2049						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
49 2050						908	908	13,434.34	15,137.28	5,676.48	34,248.10	33,340.07
50 2051						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
2052							0				0.00	0.00
2053							0				0.00	0.00
2054							0				0.00	0.00
2055							0				0.00	0.00
2056							0				0.00	0.00
2057							0				0.00	0.00
2058							0				0.00	0.00
2059							0				0.00	0.00
2060							0				0.00	0.00
2061							0				0.00	0.00
2062							0				0.00	0.00
2063							0				0.00	0.00
2064							0				0.00	0.00
TOTAL	75,435	30,446	8,236	23,413	12,931	13,721					EIRR =	16.1%

(Discount Rate 10%)
B/C = 1.79
NPV = 72,955

Table 5.12 (3/3) ANNUAL COST AND BENEFIT FLOW OF BABON RESERVOIR PROJECT

Unit: Million Rp.

Year	Economic Cost						Benefit			Balance	
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR	Total	Public W.	Irrigation Total		
1994							0	0	0	0.00	0.00
1995							0	0	0	0.00	0.00
1996							0	0	0	0.00	0.00
1997							0	0	0	0.00	0.00
1998							0	0	0	0.00	0.00
1999							0	0	0	0.00	0.00
2000							0	0	0	0.00	0.00
2001							0	0	0	0.00	0.00
2002							0	0	0	0.00	0.00
-9 2003				7,330		733	8,063	0	0	0.00	-8,063
-8 2004				7,330		733	8,063	0	0	0.00	-8,063
-7 2005		12,690	987	0		1,269	14,946	0	0	0.00	-14,946
-6 2006	8,329	9,517	1,388	916		1,876	22,026	0	0	0.00	-22,026
-5 2007	16,658	6,345	1,789	1,527		2,453	28,772	0	0	0.00	-28,772
-4 2008	49,974	3,172	4,134	4,581		5,773	67,634	0	0	0.00	-67,634
-3 2009	41,645		3,239	3,970		4,562	53,416	0	0	0.00	-53,416
-2 2010	41,645		3,239	3,970		4,562	53,416	0	0	0.00	-53,416
-1 2011	8,329		648	916		925	10,818	0	0	0.00	-10,818
1 2012						446	446	17,029.44	0.13	17,029.57	16,583.57
2 2013						446	446	17,029.44	0.13	17,029.57	16,583.57
3 2014						446	446	17,029.44	0.13	17,029.57	16,583.57
4 2015						446	446	17,029.44	0.13	17,029.57	16,583.57
5 2016						446	446	17,029.44	0.13	17,029.57	16,583.57
6 2017						446	446	17,029.44	0.13	17,029.57	16,583.57
7 2018						446	446	17,029.44	0.13	17,029.57	16,583.57
8 2019						446	446	17,029.44	0.13	17,029.57	16,583.57
9 2020						446	446	17,029.44	0.13	17,029.57	16,583.57
10 2021						446	446	17,029.44	0.13	17,029.57	16,583.57
11 2022						446	446	17,029.44	0.13	17,029.57	16,583.57
12 2023						446	446	17,029.44	0.13	17,029.57	16,583.57
13 2024						446	446	17,029.44	0.13	17,029.57	16,583.57
14 2025						446	446	17,029.44	0.13	17,029.57	16,583.57
15 2026						446	446	17,029.44	0.13	17,029.57	16,583.57
16 2027						446	446	17,029.44	0.13	17,029.57	16,583.57
17 2028						446	446	17,029.44	0.13	17,029.57	16,583.57
18 2029						446	446	17,029.44	0.13	17,029.57	16,583.57
19 2030						446	446	17,029.44	0.13	17,029.57	16,583.57
20 2031						446	446	17,029.44	0.13	17,029.57	16,583.57
21 2032						446	446	17,029.44	0.13	17,029.57	16,583.57
22 2033						446	446	17,029.44	0.13	17,029.57	16,583.57
23 2034						446	446	17,029.44	0.13	17,029.57	16,583.57
24 2035						446	446	17,029.44	0.13	17,029.57	16,583.57
25 2036						446	446	17,029.44	0.13	17,029.57	16,583.57
26 2037						446	446	17,029.44	0.13	17,029.57	16,583.57
27 2038						446	446	17,029.44	0.13	17,029.57	16,583.57
28 2039						446	446	17,029.44	0.13	17,029.57	16,583.57
29 2040						446	446	17,029.44	0.13	17,029.57	16,583.57
30 2041						446	446	17,029.44	0.13	17,029.57	16,583.57
31 2042						446	446	17,029.44	0.13	17,029.57	16,583.57
32 2043						446	446	17,029.44	0.13	17,029.57	16,583.57
33 2044						446	446	17,029.44	0.13	17,029.57	16,583.57
34 2045						446	446	17,029.44	0.13	17,029.57	16,583.57
35 2046						446	446	17,029.44	0.13	17,029.57	16,583.57
36 2047						446	446	17,029.44	0.13	17,029.57	16,583.57
37 2048						446	446	17,029.44	0.13	17,029.57	16,583.57
38 2049						446	446	17,029.44	0.13	17,029.57	16,583.57
39 2050						446	446	17,029.44	0.13	17,029.57	16,583.57
40 2051						446	446	17,029.44	0.13	17,029.57	16,583.57
41 2052						446	446	17,029.44	0.13	17,029.57	16,583.57
42 2053						446	446	17,029.44	0.13	17,029.57	16,583.57
43 2054						446	446	17,029.44	0.13	17,029.57	16,583.57
44 2055						446	446	17,029.44	0.13	17,029.57	16,583.57
45 2056						446	446	17,029.44	0.13	17,029.57	16,583.57
46 2057						446	446	17,029.44	0.13	17,029.57	16,583.57
47 2058						446	446	17,029.44	0.13	17,029.57	16,583.57
48 2059						446	446	17,029.44	0.13	17,029.57	16,583.57
49 2060						446	446	17,029.44	0.13	17,029.57	16,583.57
50 2061						446	446	17,029.44	0.13	17,029.57	16,583.57
2062							0			0.00	0.00
2063							0			0.00	0.00
2064							0			0.00	0.00
TOTAL	166,580	31,724	15,424	30,540		22,886	22,300			EIRR =	4.9%

(Discount Rate 10%)
 B/C = 0.46
 NPV = -35,410

Table 5.13 ANNUAL COST AND BENEFIT FLOW OF WATER RESOURCES DEVELOPMENT MASTER PLAN

Unit: Million Rp.

Year	Kudun Suren Res.		Benefit	J- M- I		Benefit	Babon Res.		Total Cost	Total Benefit	Balance
	Cost Main	OMR		Cost Main	OMR		Cost Main	OMR			
-21 1994									0	0	0
-20 1995				3,826					3,826	0	-3,826
-19 1996				13,824					13,824	0	-13,824
-18 1997				30,406					30,406	0	-30,406
-17 1998	4,399			32,995					37,394	0	-37,394
-16 1999	4,399			32,468					36,867	0	-36,867
-15 2000	15,627			23,184	77	13,434			38,888	13,434	-25,454
-14 2001	17,430			7,215	77	13,434			24,722	13,434	-11,288
-13 2002	19,051			21	233	28,572			19,305	28,572	9,267
-12 2003	38,154			2,609	233	28,572	8,063		49,059	28,572	-20,487
-11 2004	28,413			3,913	233	28,572	8,063		40,622	28,572	-12,050
-10 2005	31,132				260	34,248	14,946		46,338	34,248	-12,090
-9 2006	10,126				260	34,248	22,026		32,412	34,248	1,836
-8 2007		279	22,013		260	34,248	28,772		29,311	56,261	26,950
-7 2008		279	22,013		260	34,248	67,634		68,173	56,261	-11,912
-6 2009		279	22,013		260	34,248	53,416		53,955	56,261	2,306
-5 2010		279	22,013		260	34,248	53,416		53,955	56,261	2,306
-4 2011		279	22,013		260	34,248	10,818		11,357	56,261	44,904
-3 2012		279	22,013		260	34,248		446	17,030	985	73,291
-2 2013		279	22,013		260	34,248		446	17,030	985	73,291
-1 2014		279	22,013		260	34,248		446	17,030	985	73,291
1 2015		279	22,013		260	34,248		446	17,030	985	73,291
2 2016		279	22,013		260	34,248		446	17,030	985	73,291
3 2017		279	22,013		260	34,248		446	17,030	985	73,291
4 2018		279	22,013		260	34,248		446	17,030	985	73,291
5 2019		279	22,013		260	34,248		446	17,030	985	73,291
6 2020		279	22,013		260	34,248		446	17,030	985	73,291
7 2021		279	22,013		260	34,248		446	17,030	985	73,291
8 2022		279	22,013		260	34,248		446	17,030	985	73,291
9 2023		279	22,013		260	34,248		446	17,030	985	73,291
10 2024		279	22,013		260	34,248		446	17,030	985	73,291
11 2025		279	22,013		260	34,248		446	17,030	985	73,291
12 2026		279	22,013		260	34,248		446	17,030	985	73,291
13 2027		279	22,013		260	34,248		446	17,030	985	73,291
14 2028		279	22,013		260	34,248		446	17,030	985	73,291
15 2029		279	22,013		260	34,248		446	17,030	985	73,291
16 2030		279	22,013		260	34,248		446	17,030	985	73,291
17 2031		279	22,013		260	34,248		446	17,030	985	73,291
18 2032		279	22,013		260	34,248		446	17,030	985	73,291
19 2033		279	22,013		260	34,248		446	17,030	985	73,291
20 2034		279	22,013		260	34,248		446	17,030	985	73,291
21 2035		279	22,013		260	34,248		446	17,030	985	73,291
22 2036		279	22,013		260	34,248		446	17,030	985	73,291
23 2037		279	22,013		260	34,248		446	17,030	985	73,291
24 2038		279	22,013		260	34,248		446	17,030	985	73,291
25 2039		279	22,013		260	34,248		446	17,030	985	73,291
26 2040		279	22,013		260	34,248		446	17,030	985	73,291
27 2041		279	22,013		260	34,248		446	17,030	985	73,291
28 2042		279	22,013		260	34,248		446	17,030	985	73,291
29 2043		279	22,013		260	34,248		446	17,030	985	73,291
30 2044		279	22,013		260	34,248		446	17,030	985	73,291
31 2045		279	22,013		260	34,248		446	17,030	985	73,291
32 2046		279	22,013		260	34,248		446	17,030	985	73,291
33 2047		279	22,013		260	34,248		446	17,030	985	73,291
34 2048		279	22,013		260	34,248		446	17,030	985	73,291
35 2049		279	22,013		260	34,248		446	17,030	985	73,291
36 2050		279	22,013		908	34,248		446	17,030	1,633	73,291
37 2051		279	22,013		260	34,248		446	17,030	985	73,291
38 2052		279	22,013		1,725	34,248		446	17,030	2,450	73,291
39 2053		279	22,013		260	34,248		446	17,030	985	73,291
40 2054		279	22,013		260	34,248		446	17,030	985	73,291
41 2055		279	22,013		411	34,248		446	17,030	1,136	73,291
42 2056		279	22,013		260	34,248		446	17,030	985	73,291
43 2057		3,082	22,013		260	34,248		446	17,030	3,788	73,291
44 2058		279	22,013		260	34,248		446	17,030	985	73,291
45 2059		279	22,013		260	34,248		446	17,030	985	73,291
46 2060		279	22,013		260	34,248		446	17,030	985	73,291
47 2061		279	22,013		260	34,248		446	17,030	985	73,291
48 2062		279	22,013		260	34,248		5,443	17,030	5,982	73,291
49 2063		279	22,013		260	34,248		446	17,030	985	73,291
50 2064		279	22,013		260	34,248		446	17,030	985	73,291
TOTAL	168,731	18,985	1,276,775	150,461	18,716	2,167,469	267,154	28,635	902,567	EIRR =	11.4%

(Discount Rate 10%)
B/C = 1.15
NPV = 34,289

Table 5.14 HYDROPOWER GENERATION POTENTIAL

Reservoir	Jatibarang			Mundingan			Babon		
	Stage I	Stage II	Stage III	Stage II	Stage III	Suren	Stage I	Stage II	Stage III
Normal Water Level	EL.153.0m	EL.153.0m	EL.153.0m	EL.224.6m	EL.224.6m	EL. 69.7m	EL. 69.4m		
Low Water Level	EL.138.2m	EL.128.1m	EL.128.1m	EL.207.9m	EL.207.9m	EL. 60.3m	EL. 55.7m		
Tail Water Level	EL. 90.0m	EL. 90.0m	EL. 90.0m	EL.185.0m	EL.185.0m	EL. 40.0m	EL. 35.0m		
Firm Discharge	0.6m ³ /s	0.6m ³ /s	1.8m ³ /s	0.6m ³ /s	1.8m ³ /s	2.4m ³ /s	0.4m ³ /s		
Maximum Discharge for Hydropower	2.1m ³ /s	2.1m ³ /s	5.0m ³ /s	2.1m ³ /s	5.0m ³ /s	8.0m ³ /s	1.3m ³ /s		
Head Loss	2.0m	2.0m	2.0m	2.0m	2.0m	1.7m	5.6m		
Effective Maximum Head	61.0m	61.0m	61.0m	37.6m	37.6m	28.0m	28.8m		
Installed Capacity	1,050 kW	1,050 kW	2,510 kW	650 kW	1,540 kW	1,840 kW	310 kW		
Annual Energy Production	5,800 MWh	6,100 MWh	11,400 MWh	3,700 MWh	7,100 MWh	10,800 MWh	2,400 MWh		

Note : Stage I ; Operation with Jatibarang reservoir only

Stage II ; Operation as a series reservoirs with Jatibarang and Mundingan reservoirs

Stage III ; Operation as a series reservoirs and receiving water through interbasin transfer from Blorong River

Table 6.1 ALTERNATIVE FLOOD CONTROL CAPACITY AND DESIGN FLOOD DISCHARGE
(DESIGN FLOOD WATER LEVEL = EL. 162 m FIXED)

Surchage Water Level (SWL) (El. m)	Normal Water Level (NWL) (El. m)	Flood Control Outlet Width (m)	Flood Control Capacity (MCM)	Auxiliary Spillway Crest Level (El. m)	Design Flood Water Level (DFWL) (El. m)	Design Flood Discharge at	
						Dam Site (m ³ /s)	River Improvement Section (m ³ /s)
158.57	153.57	2.30	5.93	159.96	162.00	39	739
158.80	155.30	10.00	4.33	160.13	162.00	99	770
159.17	156.47	21.60	3.34	160.39	162.00	145	796
159.77	157.97	57.40	2.23	160.74	162.00	211	849
160.15	158.75	94.20	1.76	160.97	162.00	242	890

Note : (1) Width of Auxiliary Spillway = 150 m

(2) Width of Main Spillway = 60 m

Table 6.2 COST OF ALTERNATIVE FLOOD CONTROL PLANS FOR WEST FLOODWAY/GARANG RIVER

Item	Alt. 1 (1)	Alt. 1 (2)	Alt. 1 (3)	Alt. 1 (4)	Alt. 2
1. Garang River Improvement					
Design Discharge (m ³ /s)	740	770	850	900	980
Improved River Length (m)	4,250	4,250	4,250	4,250	4,250
River Width (m)	77 to 102	80 to 107	89 to 116	95 to 132	103 to 156
Construction Cost (Mill.Rp.)	43,849	47,622	53,066	60,542	72,870
OMR Cost (Mill.Rp.)	174	189	209	222	243
Land Acquisition (ha)	0.0	0.0	0.3	5.6	15.1
House Evacuation (pc)	0	0	5	85	229
2. West Floodway Improvement					
Design Discharge (m ³ /s)	740	770	850	900	980
Improved Floodway Length (m)	5,290	5,290	5,290	5,290	5,290
River Width (m)	88 to 324	90 to 337	96 to 372	104 to 393	117 to 428
Construction Cost (Mill.Rp.)	13,845	14,895	36,399	43,992	56,177
OMR Cost (Mill.Rp.)	63	68	128	138	152
Land Acquisition (ha)	0.0	0.0	8.5	15.5	26.8
House Evacuation (pc)	0	0	128	236	406
3. Jatibarang Dam					
Dam Height (m)	81.000	81.000	81.000	81.000	-
Total Capacity (MCM)	27.640	27.830	29.120	29.610	-
Sediment Capacity (MCM)	6.800	6.800	6.800	6.800	-
Flood Control Capacity (MCM)	5.880	4.330	2.220	1.760	-
Water Supply Capacity (MCM)	14.960	16.700	20.100	21.050	-
Construction Cost (Mill.Rp.)	31,343	28,349	22,079	20,394	-
OMR Cost (Mill.Rp.)	57	51	40	37	-
Land Acquisition (ha)	15.1	10.6	2.4	0.1	-
House Evacuation (pc)	0	0	0	0	-
4. Total					
Construction Cost (Mill.Rp.)	89,037	90,867	111,544	124,928	129,047
OMR Cost (Mill.Rp.)	294	308	377	397	395
Net Present Value (Mill.Rp.)	69,305	70,778	86,877	97,146	100,257
Land Acquisition (ha)	15.1	10.6	11.2	21.2	41.9
House Evacuation (pc)	0	0	133	321	635

Notes *1 : The difference in the compensation value between the multipurpose dam and the water supply dam.

*2 : Total of Construction Cost & OMR Cost (Condition: Construction Period=5years, Project Life=50years, Discount Rate=10%)

Table 6.3(1/2)

SUMMARY OF RIVER IMPROVEMENT PROJECT COST
FOR FEASIBILITY STUDY (FINANCIAL)

Description	Amount			Total (1,000 US\$)	Total (Mill.Yen)
	F.C. (Mill.Rp.)	L.C. (Mill.Rp.)	Total (Mill.Rp.)		
I. Construction Base Cost	34,700	24,646	59,346	29,191	3,663
1. Preparatory Works	2,659	1,436	4,095	2,014	253
2. West Floodway Improvement Works	3,904	1,687	5,591	2,750	345
3. Garang River Improvement Works	3,940	2,474	6,414	3,155	396
4. Reconstruction of Simongan Weir	11,330	6,681	18,011	8,859	1,112
5. Intake Structure	1,465	869	2,334	1,148	144
6. Others	3,536	1,344	4,880	2,400	301
7. Miscellaneous Works	2,418	1,306	3,724	1,832	230
Sub-total	29,252	15,797	45,049	22,159	2,781
8. Price Contingency ; F.C.3% & L.C.8%	5,448	8,849	14,297	7,032	883
II. Compensation Cost	0	0	0	0	0
III. Administration Cost	0	4,924	4,924	2,422	304
1. Administration	0	3,154	3,154	1,551	195
2. Price Contingency ; F.C.3% & L.C.8%	0	1,770	1,770	871	109
IV. Engineering Service	6,948	3,950	10,898	5,361	673
1. Detailed Design	2,958	1,385	4,343	2,136	268
2. Construction Supervision	3,172	1,454	4,626	2,275	286
3. Price Contingency ; F.C.3% & L.C.8%	818	1,111	1,929	949	119
V. Physical Contingency; 10% of I+II+IV	4,165	2,860	7,025	3,455	434
VI. Total (I+II+III+IV+V)	45,813	36,380	82,193	40,429	5,074
VII .Value Added Tax ; 10% of VI	0	8,219	8,219	4,043	507
VIII.Grand Total	45,813	44,599	90,412	44,472	5,581
Grand Total (1,000 US\$)	22,535	21,938	44,473		
Grand Total (Mill.Yen)	2,828	2,753	5,581		

Notes : *1 Price Level in July, 1992

*2 Conversion Rate US\$ 1.00 = Rp.2,033, 1 Yen = Rp.16.20

Table 6.3(2/2)

SUMMARY OF JATIBARANG DAM PROJECT COST
FOR FEASIBILITY STUDY (FINANCIAL)

Description	Amount			Total (1,000 US\$)	Total (Mill.Yen)
	F.C. (Mill.Rp.)	L.C. (Mill.Rp.)	Total (Mill.Rp.)		
I. Construction Base Cost	40,258	39,972	80,230	39,464	4,952
1. Preparatory Works	2,388	2,152	4,540	2,233	280
2. Main dam	17,649	16,729	34,378	16,910	2,122
3. Left Side Ridge Treatment	847	498	1,345	662	83
4. Auxiliary Spillway	675	476	1,151	566	71
5. Diversion Tunnel	1,680	1,120	2,800	1,377	173
6. Relocation Road	350	525	875	430	54
7. Relocation of Electrical Tower	504	216	720	354	44
8. Miscellaneous Works	2,171	1,956	4,127	2,030	255
9. Hydropower	7,741	2,116	9,857	4,848	608
Sub-total	34,005	25,788	59,793	29,411	3,691
10. Price Contingency ; F.C.3% & L.C.8%	6,253	14,184	20,437	10,053	1,262
II. Compensation Cost	0	7,898	7,898	3,885	488
1. Compensation	0	5,582	5,582	2,746	345
2. Price Contingency ; F.C.3% & L.C.8%	0	2,316	2,316	1,139	143
III. Administration Cost	0	7,051	7,051	3,468	435
1. Administration	0	4,576	4,576	2,251	282
2. Price Contingency ; F.C.3% & L.C.8%	0	2,475	2,475	1,217	153
IV. Engineering Service	14,268	7,482	21,750	10,698	1,343
1. Detailed Design	5,197	2,488	7,685	3,780	474
2. Construction Supervision	7,182	2,712	9,894	4,867	611
3. Price Contingency ; F.C.3% & L.C.8%	1,889	2,282	4,171	2,052	257
V. Physical Contingency; 10% of I+II+IV	5,453	5,536	10,989	5,405	678
VI. Total (I+II+III+IV+V)	59,979	67,939	127,918	62,921	7,896
VII. Value Added Tax ; 10% of VI	0	12,793	12,793	6,293	790
VIII. Grand Total	59,979	80,732	140,711	69,213	8,686
Grand Total (1,000 US\$)	29,503	39,711	69,214		
Grand Total (Mill.Yen)	3,702	4,983	8,685		

Notes : *1 Price Level in July, 1992

*2 Conversion Rate US\$ 1.00 = Rp.2,033, 1 Yen = Rp.16.20

Table 6.4 (1/2) ANNUAL DISBURSEMENT SCHEDULE OF RIVER IMPROVEMENT WORKS FOR FEASIBILITY STUDY (FINANCIAL)

Unit: Million Rp.

Description	Amount		1994/1995		1995/1996		1996/1997		1997/1998		1998/1999		1999/2000		2000/2001		2001/2002		2002/2003		2003/2004		2004/2005		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
I. Construction Base Cost	34,700	24,646	59,346																						
1. Preparatory Works	2,659	1,436	4,095																						
2. West Floodway Improvement Works	3,904	1,687	5,591																						
3. Karang River Improvement Works	3,940	2,474	6,414																						
4. Reconstruction of Simongan Weir	11,330	6,681	18,011																						
5. Intake Structure	1,465	869	2,334																						
6. Others	3,536	1,344	4,880																						
7. Miscellaneous Works	2,418	1,306	3,724																						
Sub-total	29,252	15,797	45,049																						
8. Price Contingency	5,448	8,849	14,297																						
II. Compensation Cost	0	0	0																						
III. Administration Cost	0	4,924	4,924																						
1. Administration	0	3,154	3,154																						
2. Price Contingency	0	1,770	1,770																						
IV. Engineering Service	6,948	3,950	10,898	1,569	807	1,616	873	0	0	1,512	879	1,557	949	694	442	0	0	0	0	0	0	0	0	0	0
1. Detailed Design	2,958	1,385	4,343	1,479	692	1,479	693	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Construction Supervision	3,172	1,454	4,626	0	0	0	0	0	0	1,304	598	1,304	598	564	258	0	0	0	0	0	0	0	0	0	0
3. Price Contingency	818	1,111	1,929	90	115	137	180	0	0	208	281	253	351	130	184	0	0	0	0	0	0	0	0	0	0
V. Physical Contingency	4,165	2,860	7,025	157	81	162	87	0	0	1,552	1,034	1,563	1,163	731	495	0	0	0	0	0	0	0	0	0	0
VI. Total (I+II+III+IV+V)	45,813	36,360	82,193	1,726	888	1,778	960	0	0	17,075	13,276	17,195	14,849	8,039	6,407	0	0	0	0	0	0	0	0	0	0
VII. Value Added Tax	0	8,219	8,219	0	261	0	274	0	0	3,035	0	3,204	0	1,445											
VIII. Grand Total	45,813	44,599	90,412	1,726	1,149	1,778	1,234	0	0	17,075	16,311	17,195	18,053	8,039	7,852	0	0	0	0	0	0	0	0	0	0

Notes : *1 Price Level in July,1992
 *2 Conversion Rate US\$ 1.00 = Rp.2,033, 1 Yen = Rp.16.20

Table 6.4 (2/2) ANNUAL DISBURSEMENT SCHEDULE OF JATIBARANG DAM CONSTRUCTION WORKS FOR FEASIBILITY STUDY (FINANCIAL)

Unit: Million Rp.

Description	Amount		1994/1995		1995/1996		1996/1997		1997/1998		1998/1999		1999/2000		2000/2001		2001/2002		2002/2003		2003/2004		2004/2005		
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	
I. Construction Base Cost	40,258	39,972	80,230																						
1. Preparatory Works	2,388	2,152	4,540																						
2. Main dam	17,649	16,729	34,378																						
3. Left Side Ridge Treatment	847	498	1,345																						
4. Auxiliary Spillway	675	476	1,151																						
5. Diversion Tunnel	1,660	1,120	2,800																						
6. Relocation Road	350	525	875																						
7. Relocation of Electrical Tower	504	216	720																						
8. Miscellaneous Works	2,171	1,955	4,127																						
9. Hydropower	7,741	2,116	9,857																						
Sub-total	34,005	25,788	59,793																						
10. Price Contingency	6,253	14,184	20,437																						
II. Compensation Cost	0	7,898	7,898																						
1. Compensation	0	5,582	5,582																						
2. Price Contingency	0	2,316	2,316																						
III. Administration Cost	0	7,051	7,051																						
1. Administration	0	4,576	4,576																						
2. Price Contingency	0	2,475	2,475																						
IV. Engineering Service	14,268	7,482	21,750																						
1. Detailed Design	5,197	2,438	7,635																						
2. Construction Supervision	7,182	2,712	9,894																						
3. Price Contingency	1,889	2,282	4,171																						
V. Physical Contingency	5,453	5,536	10,989																						
VI. Total (I+II+III+IV+V)	59,979	67,939	127,918																						
VII. Value Added Tax	0	12,793	12,793																						
VIII. Grand Total	59,979	80,732	140,711																						

Notes : *1 Price Level in July,1992
*2 Conversion Rate US\$ 1.00 = Rp.2.033, 1 Yen = Rp.16.20

Table 6.5 ANNUAL COST AND BENEFIT FLOW OF WEST FLOODWAY/GARANG RIVER PROJECT

Unit: Million Rp.

Year		Economic Cost							Benefit Balance		
		Const.	Comp.	Admin.	E/S	Phy.	Conti.	OMR	Total		
-6	1994	0			2,171		217	0	2,388	0	-2,388
-5	1995	0			3,354		335	0	3,689	0	-3,689
-4	1996	2,496	870	259	1,605		497	0	5,727	0	-5,727
-3	1997	21,268	870	1,708	2,814		2,496	0	29,156	0	-29,156
-2	1998	22,203		1,714	2,977		2,518	0	29,412	2,849	-26,563
-1	1999	10,442		806	1,568		1,202	0	14,018	5,496	-8,522
1	2000							286	286	11,376	11,090
2	2001							286	286	12,059	11,773
3	2002							286	286	12,702	12,496
4	2003							286	286	13,549	13,263
5	2004							286	286	14,362	14,076
6	2005							286	286	15,224	14,938
7	2006							286	286	16,138	15,852
8	2007							286	286	17,106	16,820
9	2008							286	286	18,132	17,846
10	2009							286	286	19,220	18,934
11	2010							286	286	20,373	20,087
12	2011							286	286	21,596	21,310
13	2012							286	286	22,891	22,605
14	2013							286	286	24,265	23,979
15	2014							286	286	25,721	25,435
16	2015							286	286	27,264	26,978
17	2016							286	286	27,264	26,978
18	2017							286	286	27,264	26,978
19	2018							286	286	27,264	26,978
20	2019							286	286	27,264	26,978
21	2020							286	286	27,264	26,978
22	2021							286	286	27,264	26,978
23	2022							286	286	27,264	26,978
24	2023							286	286	27,264	26,978
25	2024							286	286	27,264	26,978
26	2025							286	286	27,264	26,978
27	2026							286	286	27,264	26,978
28	2027							286	286	27,264	26,978
29	2028							286	286	27,264	26,978
30	2029							286	286	27,264	26,978
31	2030							286	286	27,264	26,978
32	2031							286	286	27,264	26,978
33	2032							286	286	27,264	26,978
34	2033							286	286	27,264	26,978
35	2034							286	286	27,264	26,978
36	2035							286	286	27,264	26,978
37	2036							286	286	27,264	26,978
38	2037							286	286	27,264	26,978
39	2038							286	286	27,264	26,978
40	2039							286	286	27,264	26,978
41	2040							286	286	27,264	26,978
42	2041							286	286	27,264	26,978
43	2042							286	286	27,264	26,978
44	2043							286	286	27,264	26,978
45	2044							286	286	27,264	26,978
46	2045							286	286	27,264	26,978
47	2046							286	286	27,264	26,978
48	2047							286	286	27,264	26,978
49	2048							286	286	27,264	26,978
50	2049							286	286	27,264	26,978
TOTAL		56,409	1,740	4,487	14,489		7,265	14,300		EIRR =	16.2%

(Discount Rate 10%)
B/C = 1.90
NPV = 51,626

Table 6.6 SUMMARY OF URBAN DRAINAGE PROJECT COST
FOR FEASIBILITY STUDY (FINANCIAL)

Description	Amount			Total (1,000 US\$)	Total (Mill.Yen)
	F.C. (Mill.Rp.)	L.C. (Mill.Rp.)	Total (Mill.Rp.)		
I. Construction Base Cost	25,880	15,701	41,581	20,453	2,567
1. Preparatory Works	1,802	730	2,532	1,245	156
2. Bandarharjo West	2,735	839	3,574	1,758	221
3. Asin River Basin	7,544	2,288	9,832	4,836	607
4. Bandarharjo East	3,964	1,349	5,313	2,613	328
5. Semarang River	1,252	1,173	2,425	1,193	150
6. Baru River	884	983	1,867	918	115
7. Secondary Channel Improvement	0	0	0	0	0
8. Miscellaneous Works	1,638	663	2,301	1,132	142
Sub-total	19,819	8,025	27,844	13,696	1,719
9. Price Contingency ; F.C.3% & L.C.8%	6,061	7,676	13,737	6,757	848
II. Compensation Cost	0	2,184	2,184	1,074	135
1. Compensation	0	1,429	1,429	703	88
2. Price Contingency ; F.C.3% & L.C.8%	0	755	755	371	47
III. Administration Cost	0	4,050	4,050	1,992	250
1. Administration	0	2,050	2,050	1,008	127
2. Price Contingency ; F.C.3% & L.C.8%	0	2,000	2,000	984	123
IV. Engineering Service	3,221	2,322	5,543	2,727	342
1. Detailed Design	1,629	877	2,506	1,233	155
2. Construction Supervision	1,087	587	1,674	823	103
3. Price Contingency ; F.C.3% & L.C.8%	505	858	1,363	670	84
V. Physical Contingency; 10% of I+II+IV	2,910	2,021	4,931	2,425	304
VI. Total (I+II+III+IV+V)	32,011	26,278	58,289	28,671	3,598
VII .Value Added Tax ; 10% of VI	0	5,829	5,829	2,867	360
VIII.Grand Total	32,011	32,107	64,118	31,540	3,958
Grand Total (1,000 US\$)	15,746	15,793	31,539		
Grand Total (Mill.Yen)	1,976	1,982	3,958		

Notes : *1 Price Level in July,1992

*2 Conversion Rate US\$ 1.00 = Rp.2,033, 1 Yen = Rp.16.20

Table 6.7 ANNUAL DISBURSEMENT SCHEDULE OF URBAN DRAINAGE WORKS FOR FEASIBILITY STUDY (FINANCIAL)

Unit: Million Rp.

Description	Amount		1994/1995		1995/1996		1996/1997		1997/1998		1998/1999		1999/2000		2000/2001		2001/2002		2002/2003		2003/2004		2004/2005	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
I. Construction Base Cost	25,880	15,701	41,581																					
1. Preparatory Works	1,802	730	2,532																					
2. Banderharjo West	2,735	839	3,574																					
3. Asin River Basin	7,544	2,288	9,832																					
4. Banderharjo East	3,964	1,349	5,313																					
5. Semarang River	1,252	1,173	2,425																					
6. Baru River	884	983	1,867																					
7. Secondary Channel Improvement	0	0	0																					
8. Miscellaneous Works	1,638	563	2,201																					
Sub-total	19,819	8,025	27,844																					
9. Price Contingency	6,061	7,676	13,737																					
II. Compensation Cost	0	2,184	2,184																					
1. Compensation	0	1,429	1,429																					
2. Price Contingency	0	755	755																					
III. Administration Cost	0	4,050	4,050																					
1. Administration	0	2,050	2,050																					
2. Price Contingency	0	2,000	2,000																					
IV. Engineering Service	3,221	2,322	5,543																					
1. Detailed Design	1,629	877	2,506																					
2. Construction Supervision	1,087	587	1,674																					
3. Price Contingency	505	858	1,363																					
V. Physical Contingency	2,910	2,021	4,931																					
VI. Total (I+II+III+IV+V)	32,011	26,278	58,289																					
VII. Value Added Tax	0	5,829	5,829																					
VIII. Grand Total	32,011	32,107	64,118																					

Notes : *1 Price Level in July, 1992
*2 Conversion Rate US\$ 1.00 = Rp.2,033, 1 Yen = Rp.16.20

Table 6.8

ANNUAL COST AND BENEFIT FLOW OF CENTRAL SEMARANG AREA DRAINAGE PROJECT

Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Contl.	OMR			
1994							0	0	0
1995				1,254	127		1,381	0	(1,381)
1996				1,252	125		1,377	0	(1,377)
-8 1997		649	50		65		764	0	(764)
-7 1998	2,486	650	307	220	336		3,999	0	(3,999)
-6 1999	3,083		289	248	333		3,953	613	(3,340)
-5 2000	4,312		335	291	460		5,398	991	(4,407)
-4 2001	4,026		313	268	429		5,036	1,544	(3,492)
-3 2002	3,914		305	261	417		4,897	2,126	(2,771)
-2 2003	3,071		240	206	328		3,845	2,757	(1,088)
-1 2004	2,697		211	180	287		3,375	3,341	(34)
1 2005						314	314	5,617	5,303
2 2006						314	314	5,954	5,640
3 2007						314	314	6,311	5,997
4 2008						314	314	6,690	6,376
5 2009						314	314	7,091	6,777
6 2010						314	314	7,516	7,202
7 2011						314	314	7,967	7,653
8 2012						314	314	8,446	8,132
9 2013						314	314	8,952	8,638
10 2014						314	314	9,489	9,175
11 2015						314	314	10,059	9,745
12 2016						314	314	10,059	9,745
13 2017						314	314	10,059	9,745
14 2018						314	314	10,059	9,745
15 2019						314	314	10,059	9,745
16 2020						314	314	10,059	9,745
17 2021						314	314	10,059	9,745
18 2022						314	314	10,059	9,745
19 2023						314	314	10,059	9,745
20 2024						314	314	10,059	9,745
21 2025						314	314	10,059	9,745
22 2026						314	314	10,059	9,745
23 2027						314	314	10,059	9,745
24 2028						314	314	10,059	9,745
25 2029						314	314	10,059	9,745
26 2030						314	314	10,059	9,745
27 2031						314	314	10,059	9,745
28 2032						314	314	10,059	9,745
29 2033						314	314	10,059	9,745
30 2034						314	314	10,059	9,745
31 2035						314	314	10,059	9,745
32 2036						314	314	10,059	9,745
33 2037						314	314	10,059	9,745
34 2038						314	314	10,059	9,745
35 2039						314	314	10,059	9,745
36 2040						314	314	10,059	9,745
37 2041						314	314	10,059	9,745
38 2042						314	314	10,059	9,745
39 2043						314	314	10,059	9,745
40 2044						314	314	10,059	9,745
41 2045						314	314	10,059	9,745
42 2046						314	314	10,059	9,745
43 2047						314	314	10,059	9,745
44 2048						314	314	10,059	9,745
45 2049						314	314	10,059	9,745
46 2050						314	314	10,059	9,745
47 2051						314	314	10,059	9,745
48 2052						314	314	10,059	9,745
49 2053						314	314	10,059	9,745
50 2054						314	314	10,059	9,745
TOTAL	23,589	1,299	2,050	4,180	2,907	15,700	EIRR =	15.7%	
								(Discount Rate 10%)	
								B/C =	1.81
								NPV =	14,872

Table 6.9 ANNUAL COST AND BENEFIT FLOW OF WATER REOURCES DEVELOPMENT PLAN

Unit: Million Rp.

Year	Economic Cost							Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy.	Conti.	OMR		
1994								0	0
-5 1995				2,259		226		2,485	0
-4 1996	4,769	1,662	495	3,067		950		10,943	0
-3 1997	8,525	1,662	785	1,743		1,193		13,908	0
-2 1998	10,365		799	2,054		1,242		14,460	0
-1 1999	6,075		468	1,427		751		8,721	0
1 2000							98	98	23,274
2 2001							98	98	23,274
3 2002							98	98	23,274
4 2003							98	98	23,274
5 2004							98	98	23,274
6 2005							98	98	23,274
7 2006							98	98	23,274
8 2007							98	98	23,274
9 2008							98	98	23,274
10 2009							98	98	23,274
11 2010							98	98	23,274
12 2011							98	98	23,274
13 2012							98	98	23,274
14 2013							98	98	23,274
15 2014							98	98	23,274
16 2015							98	98	23,274
17 2016							98	98	23,274
18 2017							98	98	23,274
19 2018							98	98	23,274
20 2019							98	98	23,274
21 2020							98	98	23,274
22 2021							98	98	23,274
23 2022							98	98	23,274
24 2023							98	98	23,274
25 2024							98	98	23,274
26 2025							98	98	23,274
27 2026							98	98	23,274
28 2027							98	98	23,274
29 2028							98	98	23,274
30 2029							98	98	23,274
31 2030							98	98	23,274
32 2031							98	98	23,274
33 2032							98	98	23,274
34 2033							98	98	23,274
35 2034							98	98	23,274
36 2035							98	98	23,274
37 2036							98	98	23,274
38 2037							98	98	23,274
39 2038							98	98	23,274
40 2039							98	98	23,274
41 2040							98	98	23,274
42 2041							98	98	23,274
43 2042							98	98	23,274
44 2043							98	98	23,274
45 2044							98	98	23,274
46 2045							98	98	23,274
47 2046							98	98	23,274
48 2047							98	98	23,274
49 2048							98	98	23,274
50 2049							98	98	23,274
TOTAL	29,734	3,324	2,547	10,550		4,362	4,900		EIRR = 28.8%

(Discount Rate 10%)
 B/C = 3.81
 NPV = 96,030

Table 6.10 ANNUAL COST AND BENEFIT FLOW OF JATIBARANG DAM PROJECT
(FLOOD CONTROL, WATER RESOURCES AND HYDROPOWER PLANS)

Unit: Million Rp.

Year	Economic Cost					Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR		
1994							0	0
-5 1995				3,842	384		4,226	0
-4 1996	7,279	2,537	755	5,075	1,490		17,136	0
-3 1997	15,700	2,537	1,405	2,867	2,111		24,620	0
-2 1998	18,509		1,426	3,342	2,185		25,462	2
-1 1999	12,857		990	2,453	1,532		17,832	44
1 2000						429	429	28,376
2 2001						429	429	28,616
3 2002						429	429	28,870
4 2003						429	429	29,139
5 2004						429	429	29,425
6 2005						429	429	29,728
7 2006						429	429	30,049
8 2007						429	429	30,389
9 2008						429	429	30,750
10 2009						429	429	31,132
11 2010						429	429	31,537
12 2011						429	429	31,966
13 2012						429	429	32,422
14 2013						429	429	32,904
15 2014						429	429	33,416
16 2015						429	429	34,959
17 2016						429	429	34,959
18 2017						429	429	34,959
19 2018						429	429	34,959
20 2019						429	429	34,959
21 2020						429	429	34,959
22 2021						429	429	34,959
23 2022						429	429	34,959
24 2023						429	429	34,959
25 2024						429	429	34,959
26 2025						429	429	34,959
27 2026						429	429	34,959
28 2027						429	429	34,959
29 2028						429	429	34,959
30 2029						429	429	34,959
31 2030						429	429	34,959
32 2031						429	429	34,959
33 2032						429	429	34,959
34 2033						429	429	34,959
35 2034						429	429	34,959
36 2035						429	429	34,959
37 2036						429	429	34,959
38 2037						429	429	34,959
39 2038						429	429	34,959
40 2039						429	429	34,959
41 2040						429	429	34,959
42 2041						429	429	34,959
43 2042						429	429	34,959
44 2043						429	429	34,959
45 2044						429	429	34,959
46 2045						429	429	34,959
47 2046						429	429	34,959
48 2047						429	429	34,959
49 2048						429	429	34,959
50 2049						429	429	34,959
TOTAL	54,345	5,074	4,576	17,579	7,702	21,450	EIRR =	23.2%

(Discount Rate 10%)
B/C = 2.84
NPV = 115,352

Table 6.11 ANNUAL COST AND BENEFIT FLOW OF HYDROPOWER GENERATION PLAN

Unit: Million Rp.

Year	Economic Cost						Total	Benefit Balance	
	Const.	Comp.	Admin.	E/S	Phy.	Contl.		OMR	
1994							0	0	0
-5 1995				400		40	440	0	-440
-4 1996	14		5	1	403		42	0	-465
-3 1997	2,713		5	209	212		293	0	-3,432
-2 1998	2,719			209	213		294	0	-3,435
-1 1999	3,602			277	280		389	0	-4,548
1 2000							280	1,105	825
2 2001							280	1,105	825
3 2002							280	1,105	825
4 2003							280	1,105	825
5 2004							280	1,105	825
6 2005							280	1,105	825
7 2006							280	1,105	825
8 2007							280	1,105	825
9 2008							280	1,105	825
10 2009							280	1,105	825
11 2010							280	1,105	825
12 2011							280	1,105	825
13 2012							280	1,105	825
14 2013							280	1,105	825
15 2014							280	1,105	825
16 2015							280	1,105	825
17 2016							280	1,105	825
18 2017							280	1,105	825
19 2018							280	1,105	825
20 2019							280	1,105	825
21 2020							280	1,105	825
22 2021							280	1,105	825
23 2022							280	1,105	825
24 2023							280	1,105	825
25 2024							280	1,105	825
26 2025							280	1,105	825
27 2026							280	1,105	825
28 2027							280	1,105	825
29 2028							280	1,105	825
30 2029							280	1,105	825
31 2030							280	1,105	825
32 2031							280	1,105	825
33 2032							280	1,105	825
34 2033							280	1,105	825
35 2034							280	1,105	825
36 2035							280	1,105	825
37 2036							280	1,105	825
38 2037							280	1,105	825
39 2038							280	1,105	825
40 2039							280	1,105	825
41 2040							280	1,105	825
42 2041							280	1,105	825
43 2042							280	1,105	825
44 2043							280	1,105	825
45 2044							280	1,105	825
46 2045							280	1,105	825
47 2046							280	1,105	825
48 2047							280	1,105	825
49 2048							280	1,105	825
50 2049							280	1,105	825
TOTAL	9,048	10	696	1,508		1,058	14,000	EIRR =	5.9%

(Discount Rate 10%)
 B/C = 0.66
 NPV = -3,140

Table 6.12 ANNUAL COST AND BENEFIT FLOW OF ALL PROJECTS

Unit: Million Rp.

Year	Economic Cost		Admin.	E/S	Phy.	Contl.	OMR	Total	Benefit	Balance
	Const.	Comp.								
1994				2,171		217		2,388	0	-2,388
-10 1995				6,013		601		6,614	0	-6,614
-9 1996	7,279	2,537	755	5,075		1,492		17,138	0	-17,138
-8 1997	32,506	2,537	2,702	6,023		4,108		47,876	0	-47,876
-7 1998	35,287		2,722	6,496		4,179		48,684	57	-48,627
-6 1999	20,119	649	1,601	3,275		2,407		28,051	114	-27,937
-5 2000	3,500	650	436	333		448	664	6,031	35,755	29,724
-4 2001	6,181		482	413		660	664	8,400	36,437	28,037
-3 2002	5,684		443	380		605	664	7,776	37,161	29,385
-2 2003	4,848		377	323		517	664	6,729	38,209	31,480
-1 2004	3,376		262	225		360	664	4,887	39,302	34,415
1 2005							664	664	45,219	44,555
2 2006							664	664	46,470	45,806
3 2007							664	664	47,795	47,131
4 2008							664	664	49,200	48,536
5 2009							664	664	50,689	50,025
6 2010							664	664	52,268	51,604
7 2011							664	664	53,941	53,277
8 2012							664	664	55,715	55,051
9 2013							664	664	57,595	56,931
10 2014							664	664	59,588	58,924
11 2015							664	664	61,701	61,037
12 2016							664	664	61,701	61,037
13 2017							664	664	61,701	61,037
14 2018							664	664	61,701	61,037
15 2019							664	664	61,701	61,037
16 2020							664	664	61,701	61,037
17 2021							664	664	61,701	61,037
18 2022							664	664	61,701	61,037
19 2023							664	664	61,701	61,037
20 2024							664	664	61,701	61,037
21 2025							664	664	61,701	61,037
22 2026							664	664	61,701	61,037
23 2027							664	664	61,701	61,037
24 2028							664	664	61,701	61,037
25 2029							664	664	61,701	61,037
26 2030							664	664	61,701	61,037
27 2031							664	664	61,701	61,037
28 2032							664	664	61,701	61,037
29 2033							664	664	61,701	61,037
30 2034							664	664	61,701	61,037
31 2035							664	664	61,701	61,037
32 2036							664	664	61,701	61,037
33 2037							664	664	61,701	61,037
34 2038							664	664	61,701	61,037
35 2039							664	664	61,701	61,037
36 2040							664	664	61,701	61,037
37 2041							664	664	61,701	61,037
38 2042							664	664	61,701	61,037
39 2043							664	664	61,701	61,037
40 2044							664	664	61,701	61,037
41 2045							664	664	61,701	61,037
42 2046							664	664	61,701	61,037
43 2047							664	664	61,701	61,037
44 2048							664	664	61,701	61,037
45 2049							664	664	61,701	61,037
46 2050							664	664	10,059	9,395
47 2051							664	664	10,059	9,395
48 2052							664	664	10,059	9,395
49 2053							664	664	10,059	9,395
50 2054							664	664	10,059	9,395
TOTAL	118,780	6,373	9,780	30,727		15,594	36,520		EIRR =	19.2%

(Discount Rate 10%)
 B/C = 2.32
 NPV = 153,133

Table 7.1 COMPARATIVE STUDY ON GATE TYPE OF SIMONGAN WEIR

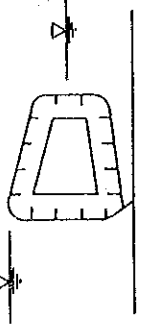
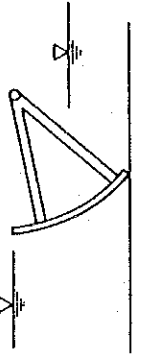
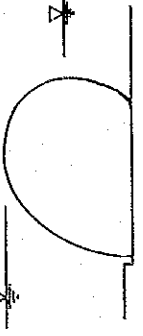
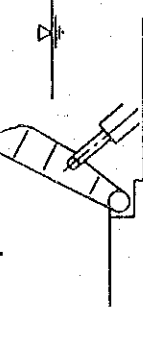
Item	Roller Gate	Radial Gate	Rubber Gate	Tilting Gate
General View				
Mechanical & Structural Character	Gate body is lifted vertically by Hoisting Device. Structure and mechanical system is so simple that reliability is high.	Gate body is lifted by Hoisting Device and turn round Trunnion Axis. Mechanical system is complicated.	Gate body is inflated by air or water. Gate body is made of synthetic rubber which is fragile against sharp edged matters. Mechanical system is simple.	Gate body is lifted by Hydraulic Hoist. Deck Slab must have a drop for the storing space.
Flood Control Ability	As gate body can be lifted upto the safety position during flood, control ability is better than other types.	Owing to the limitation of span length, the possibility of the flow blocking by driftwoods is high.	There is possibility of incomplete open by sediment or boulder stone.	(The same as left)
Control Ability of Upstream Water Level	Possible	Possible	Difficult	Possible
Maintenance	Inspection of gate and parts exchange is easier than Rubber and Tilting Gate. Painting should be done in every seven (7) years. Working Life: 50 years	(The same as left)	Inspection of gate and parts exchange is difficult. Painting is unnecessary. Working Life: 25 years	Inspection of gate and parts exchange is difficult. Painting should be done in every seven (7) years. Working Life: 50 years
Manufacture	Domestic manufacture in Indonesia is possible.	Though domestic manufacture in Indonesia is possible, high grade manufacturing technique is required.	Gate body should be imported from abroad.	Though domestic manufacture in Indonesia is possible, high grade manufacturing technique is required.
Civil Structure	Because of the tall pier for gate operation, foundation is large scale.	As the whole loads concentrate to Trunnion Axis, designing and construction is complicated.	As the gate weight is small, civil structure can be simple.	As the weight of the structure is smaller than other steel gate, foundation can be small scale.
Construction Cost	Aprox.18,000 Milli.Rp.	Aprox.19,100 Milli.Rp.	Aprox.18,300 Milli.Rp.	Aprox.17,900 Milli.Rp.
Evaluation	Adequate	Inadequate	Inadequate	Moderate

Table 7.2 SUMMARY OF URGENT PROJECT COST (FINANCIAL)

Description	Amount			Total (1,000 US\$)	Total (Mill.Yen)
	F.C. (Mill.Rp.)	L.C. (Mill.Rp.)	Total (Mill.Rp.)		
I. Construction Base Cost	34,700	24,646	59,346	29,191	3,663
1. Preparatory Works	2,659	1,436	4,095	2,014	253
2. West Floodway Improvement Works	3,904	1,687	5,591	2,750	345
3. Garang River Improvement Works	3,940	2,474	6,414	3,155	396
4. Reconstruction of Simongan Weir	11,330	6,681	18,011	8,859	1,112
5. Intake Structure	1,465	869	2,334	1,148	144
6. Others	3,536	1,344	4,880	2,400	301
7. Miscellaneous Works	2,418	1,306	3,724	1,832	230
Sub-total	29,252	15,797	45,049	22,159	2,781
8. Price Contingency ; F.C.3% & L.C.8%	5,448	8,849	14,297	7,032	883
II. Compensation Cost	0	0	0	0	0
III. Administration Cost	0	4,924	4,924	2,422	304
1. Administration	0	3,154	3,154	1,551	195
2. Price Contingency ; F.C.3% & L.C.8%	0	1,770	1,770	871	109
IV. Engineering Service	6,948	3,950	10,898	5,361	673
1. Detailed Design	2,958	1,385	4,343	2,136	268
2. Construction Supervision	3,172	1,454	4,626	2,275	286
3. Price Contingency ; F.C.3% & L.C.8%	818	1,111	1,929	949	119
V. Physical Contingency; 10% of I+II+IV	4,165	2,860	7,025	3,455	434
VI. Total (I+II+III+IV+V)	45,813	36,380	82,193	40,429	5,074
VII. Value Added Tax ; 10% of VI	0	8,219	8,219	4,043	507
VIII. Grand Total	45,813	44,599	90,412	44,472	5,581
Grand Total (1,000 US\$)	22,535	21,937	44,472		
Grand Total (Mill.Yen)	2,828	2,753	5,581		

Notes : *1 Price Level in July,1992

*2 Conversion Rate US\$ 1.00 = Rp.2,033, 1 Yen = Rp.16.20

Table 7.3 ANNUAL DISBURSEMENT SCHEDULE FOR URGENT PROJECT (FINANCIAL)

Unit: Million Rp.

Description	Amount		1994/1995		1995/1996		1996/1997		1997/1998		1998/1999		1999/2000		2000/2001	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
I. Construction Base Cost	34,700	24,646	59,346	0	0	0	0	0	14,011	9,457	14,075	10,680	6,614	4,509	0	0
1. Preparatory Works	2,659	1,436	4,095	0	0	0	0	0	1,330	718	1,329	718	0	0	0	0
2. West Floodway Improvement Works	3,904	1,687	5,591	0	0	0	0	0	2,787	1,180	1,117	507	0	0	0	0
3. Garang River Improvement Works	3,940	2,474	6,414	0	0	0	0	0	797	359	2,689	1,784	454	331	0	0
4. Reconstruction of Simongan Weir	11,330	6,681	18,011	0	0	0	0	0	4,898	2,849	5,500	3,147	932	685	0	0
5. Intake Structure	1,465	869	2,334	0	0	0	0	0	0	0	41	39	1,424	830	0	0
6. Others	3,536	1,344	4,880	0	0	0	0	0	1,549	938	387	143	1,600	263	0	0
7. Miscellaneous Works	2,418	1,306	3,724	0	0	0	0	0	725	392	725	392	968	522	0	0
Sub-total	29,252	15,797	45,049	0	0	0	0	0	12,086	6,436	11,788	6,730	5,378	2,631	0	0
8. Price Contingency : F.C.3% & L.C.8%	5,448	8,849	14,297	0	0	0	0	0	1,925	3,021	2,287	3,950	1,236	1,878	0	0
II. Compensation Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
III. Administration Cost	0	4,924	4,924	0	0	0	0	0	0	1,906	0	2,057	0	961	0	0
1. Administration	0	3,154	3,154	0	0	0	0	0	0	1,297	0	1,296	0	561	0	0
2. Price Contingency : F.C.3% & L.C.8%	0	1,770	1,770	0	0	0	0	0	0	609	0	761	0	400	0	0
IV. Engineering Service	6,948	3,950	10,898	1,569	807	1,616	873	0	1,512	879	1,557	949	694	442	0	0
1. Detailed Design	2,958	1,385	4,343	1,479	692	1,479	693	0	0	0	0	0	0	0	0	0
2. Construction Supervision	3,172	1,454	4,626	0	0	0	0	0	1,304	598	1,304	598	564	258	0	0
3. Price Contingency : F.C.3% & L.C.8%	818	1,111	1,929	90	115	137	180	0	208	281	253	351	130	184	0	0
V. Physical Contingency : 10% of I+II+IV	4,165	2,860	7,025	157	81	162	87	0	1,582	1,034	1,583	1,163	731	495	0	0
VI. Total (I+II+III+IV+V)	45,813	36,380	82,193	1,726	888	1,778	960	0	17,075	13,276	17,195	14,849	8,039	6,407	0	0
VII. Value Added Tax : 10% of VI	0	8,219	8,219	0	261	0	274	0	0	3,035	0	3,204	0	1,445	0	0
VIII. Grand Total	45,813	44,599	90,412	1,726	1,149	1,778	1,234	0	17,075	16,311	17,195	18,053	8,039	7,852	0	0

Notes : *1 Price Level in July, 1992

*2 Conversion Rate : US\$ 1.00 = Rp. 2.033, 1 Yen = Rp. 16.20

Table 7.4

ANNUAL COST AND BENEFIT FLOW OF URGENT PROJECT
FOR WEST FLOODWAY/GARANG RIVER

(Unit : Million Rp.)

Year	Economic Cost			Benefit	Balance
	Const.	OMR	Total		
1994	2,388	0	2,388	0	(2,388)
1995	2,388	0	2,388	0	(2,388)
1996	0	0	0	0	0
1997	21,877	0	21,877	0	(21,877)
1998	21,845	0	21,845	2,753	(19,092)
1999	9,453	0	9,453	5,808	(3,645)
2000	0	220	220	7,473	7,253
2001	0	220	220	7,884	7,664
2002	0	220	220	8,317	8,097
2003	0	220	220	8,775	8,555
2004	0	220	220	9,258	9,038
2005	0	220	220	9,767	9,547
2006	0	220	220	10,304	10,084
2007	0	220	220	10,871	10,651
2008	0	220	220	11,469	11,249
2009	0	220	220	12,099	11,879
2010	0	220	220	12,765	12,545
2011	0	220	220	13,467	13,247
2012	0	220	220	14,207	13,987
2013	0	220	220	14,989	14,769
2014	0	220	220	15,813	15,593
2015	0	220	220	16,683	16,463
2016	0	220	220	16,683	16,463
2017	0	220	220	16,683	16,463
2018	0	220	220	16,683	16,463
2019	0	220	220	16,683	16,463
2020	0	220	220	16,683	16,463
2021	0	220	220	16,683	16,463
2022	0	220	220	16,683	16,463
2023	0	220	220	16,683	16,463
2024	0	220	220	16,683	16,463
2025	0	220	220	16,683	16,463
2026	0	220	220	16,683	16,463
2027	0	220	220	16,683	16,463
2028	0	220	220	16,683	16,463
2029	0	220	220	16,683	16,463
2030	0	220	220	16,683	16,463
2031	0	220	220	16,683	16,463
2032	0	220	220	16,683	16,463
2033	0	220	220	16,683	16,463
2034	0	220	220	16,683	16,463
2035	0	220	220	16,683	16,463
2036	0	220	220	16,683	16,463
2037	0	220	220	16,683	16,463
2038	0	220	220	16,683	16,463
2039	0	220	220	16,683	16,463
2040	0	220	220	16,683	16,463
2041	0	220	220	16,683	16,463
2042	0	220	220	16,683	16,463
2043	0	220	220	16,683	16,463
2044	0	220	220	16,683	16,463
2045	0	220	220	16,683	16,463
2046	0	220	220	16,683	16,463
2047	0	220	220	16,683	16,463
2048	0	220	220	16,683	16,463
2049	0	220	220	16,683	16,463
Total	57,951	11,000	68,951	753,860	690,972
				EIRR=	15.9%

(Discount Rate 10 %)

B/C - 1.79
NPV - 31,153

Table 8.1 BUDGET FOR DIRECTORATE GENERAL OF WATER RESOURCES
DEVELOPMENT PROJECTED IN SIXTH FIVE-YEAR DEVELOP-
MENT PLAN

I t e m	Budget (Million Rp.)	Percentage (%)
1. Flood Control	1,805,000	8.1
1.1 Existing Urban Area	925,000	4.2
1.2 Existing Rural Area	800,000	3.6
1.3 Newly Developed Area	80,000	0.4
2. Water Resources Development	3,404,400	15.3
2.1 Planning	102,000	0.5
2.2 Large Dam Construction	3,120,000	14.1
2.3 Small Dam Construction	78,400	0.4
2.4 Estuary Barrage Construction	54,000	0.2
2.5 Conservation Works	50,000	0.2
3. Soil & Water Quality Conservation	232,500	
4. Raw Water Supply (Excluding Distribution Works)	403,750	1.8
5. Operation/Maintenance Works	537,350	2.4
6. Irrigation Development	9,325,810	42.0
7. Swamp Development	3,970,000	17.9
8. Coastal Development	200,000	0.9
9. Soil & Water Conservation	2,037,500	9.2
10. Restoration for Natural Disaster	190,000	0.9
11. Training	85,100	0.4
Grand Total	22,191,410	100.0

Table 8.2 OPTIMUM DISBURSEMENT SCHEDULE FOR FLOOD CONTROL AND WATER RESOURCES DEVELOPMENT PLAN

Unit: Million Rp.

Description	Total	(1994)	First 5-year (1995 to 1999)	Second 5-year (2000 to 2004)	Third 5-year (2005 to 2009)	Fourth 5-year (2010 to 2014)
I. Priority Project -----	231,123	2,875	228,248	0	0	0
1. Urgent Project (West Floodway/Garang R. Improvement)	90,412	2,875	87,537	0	0	0
2. Jatibarang Dam	140,711	0	140,711	0	0	0
II. Master Plan Project -----	945,822	0	156,467	291,970	371,081	126,304
1. Babon Floodway	50,624	0	50,624	0	0	0
2. Babon River Improvement	58,139	0	0	1,431	56,708	0
3. East Floodway Improvement	33,706	0	0	15,177	18,529	0
4. Silandak River Improvement	12,462	0	0	0	634	11,828
5. Bringin River Improvement	28,587	0	0	0	0	28,587
6. Blorong River Improvement	8,516	0	0	0	0	8,516
7. Babon Dam	320,530	0	0	17,738	225,419	77,373
8. Mundingan Dam	127,116	0	91,401	35,715	0	0
9. Interbasin Transfer	8,549	0	0	8,549	0	0
10. Kedungsuren Dam	287,854	0	14,442	212,502	60,910	0
11. Conveyance Channel	9,739	0	0	858	8,881	0
Total	1,176,945	2,875	384,715	291,970	371,081	126,304

Table 8.3 ALTERNATIVE DISBURSEMENT SCHEDULE FOR FLOOD CONTROL AND WATER RESOURCES DEVELOPMENT PLAN

Unit: Million Rp.

Description	Total	(1994)	First 5-year (1995 to 1999)	Second 5-year (2000 to 2004)	Third 5-year (2005 to 2009)	Fourth 5-year (2010 to 2014)	Fifth 5-year (2015 to 2019)
I. Priority Project -----	231,123	2,875	228,248	0	0	0	0
1. Urgent Project							
(West Floodway/Garang R. Improvement)	90,412	2,875	87,537	0	0	0	0
2. Jatibarang Dam	140,711	0	140,711	0	0	0	0
II. Master Plan Project -----	945,822	0	0	229,182	255,565	237,802	223,273
1. Babon Floodway	50,624	0	0	50,624	0	0	0
2. Babon River Improvement	58,139	0	0	1,431	56,708	0	0
3. East Floodway Improvement	33,706	0	0	15,177	18,529	0	0
4. Silandak River Improvement	12,462	0	0	0	634	11,828	0
5. Bringin River Improvement	28,587	0	0	0	0	28,587	0
6. Blorong River Improvement	8,516	0	0	0	0	8,516	0
7. Babon Dam	320,530	0	0	0	0	97,257	223,273
8. Mundingan Dam	127,116	0	0	119,200	7,916	0	0
9. Interbasin Transfer	8,549	0	0	0	8,549	0	0
10. Kedungsuren Dam	287,854	0	0	42,750	162,644	82,460	0
11. Conveyance Channel	9,739	0	0	0	585	9,154	0
Total	1,176,945	2,875	228,248	229,182	255,565	237,802	223,273

Table 8.4 BUDGET FOR URBAN DRAINAGE PROJECT ALLOCATED TO JAVA PROVINCE IN FIFTH FIVE-YEAR NATIONAL DEVELOPMENT PLAN

Municipality	Improvement Cost (Million Rp.)	Percentage (%)
(1) Semarang	22,516	25.5
(2) Tengal	14,719	16.7
(3) Cilacap	2,025	2.3
(4) Purwokerto	7,449	8.4
(5) Surakarta	20,451	23.1
(6) Kudus	9,488	10.7
(7) Kendal	232	0.3
(8) Demak	388	0.4
(9) Ungaran	371	0.4
(10) Sukoharjo	436	0.5
(11) Karangayar	571	0.6
(12) Sragen	764	0.9
(13) Pemaslang	1,179	1.3
(14) Batang	828	0.9
(15) Pekalongan	1,216	1.4
(16) Brebes	783	0.9
(17) Purbalingga	171	0.2
(18) Banjarnegara	377	0.4
(19) Kebumen	778	0.9
(20) Jepara	424	0.5
(21) Pati	698	0.8
(22) Rembang	336	0.4
(23) Salatiga	1,062	1.2
(24) Boyolali	454	0.5
(25) Slawi	635	0.7
Total	88,351	100.0

Table 8.5 OPTIMUM DISBURSEMENT SCHEDULE FOR URBAN DRAINAGE PLAN

Unit: Million Rp.

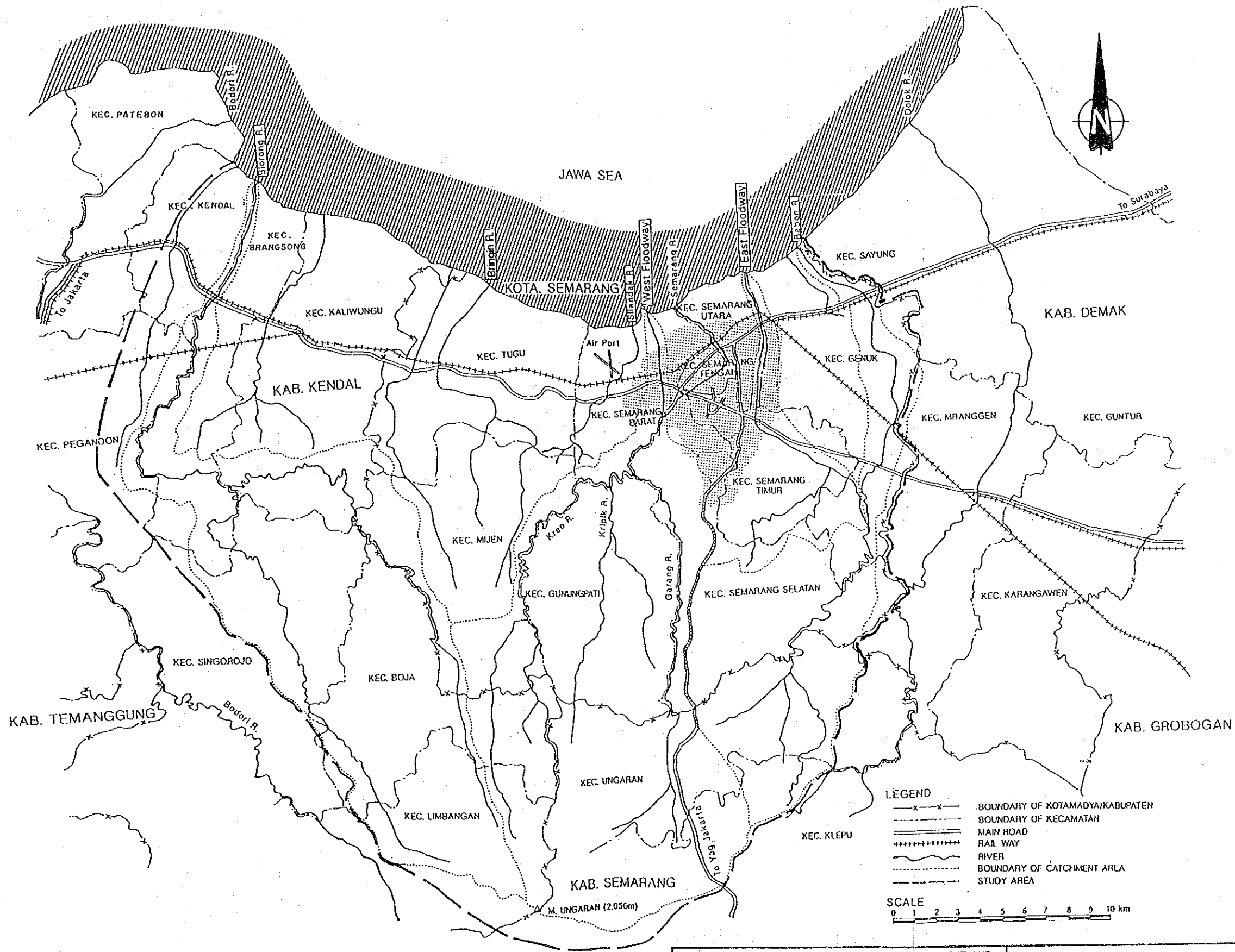
Description	Total	(1994)	First 5-year (1995 to 1999)	Second 5-year (2000 to 2004)	Third 5-year (2005 to 2009)	Fourth 5-year (2010 to 2014)
I. On-Going Project (SSUDP Project) -----	25,553	4,989	20,564	0	0	0
1. Eastern Semarang						
1) Siringin	5,601	0	5,601	0	0	0
2) Tenggang	8,757	2,189	6,568	0	0	0
2. Central Semarang						
1) Banger	9,172	2,292	6,880	0	0	0
2) Bulu	1,693	508	1,185	0	0	0
3. Western Semarang						
1) Ronggolawe	330	0	330	0	0	0
II. Priority Project -----	64,118	0	21,108	43,010	0	0
1. Semarang River	64,118	0	21,108	43,010	0	0
III. Master Plan Project -----	110,139	0	0	10,790	59,603	39,746
1. Eastern Semarang						
1) Siringin	14,827	0	0	0	287	14,540
2) Tenggang	35,275	0	0	0	10,069	25,206
2. Central Semarang						
1) Semarang	20,476	0	0	0	20,476	0
2) Banger	14,422	0	0	9,961	4,461	0
3) Bulu	2,135	0	0	829	1,306	0
3. Western Semarang						
1) Ronggolawe	9,318	0	0	0	9,318	0
2) Karangayu	9,294	0	0	0	9,294	0
3) Tawang	2,328	0	0	0	2,328	0
4) Silandak	2,064	0	0	0	2,064	0
Total	199,810	4,989	41,672	53,800	59,603	39,746

Table 8.6 ALTERNATIVE DISBURSEMENT SCHEDULE FOR URBAN DRAINAGE PLAN

Unit: Million Rp.

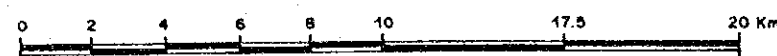
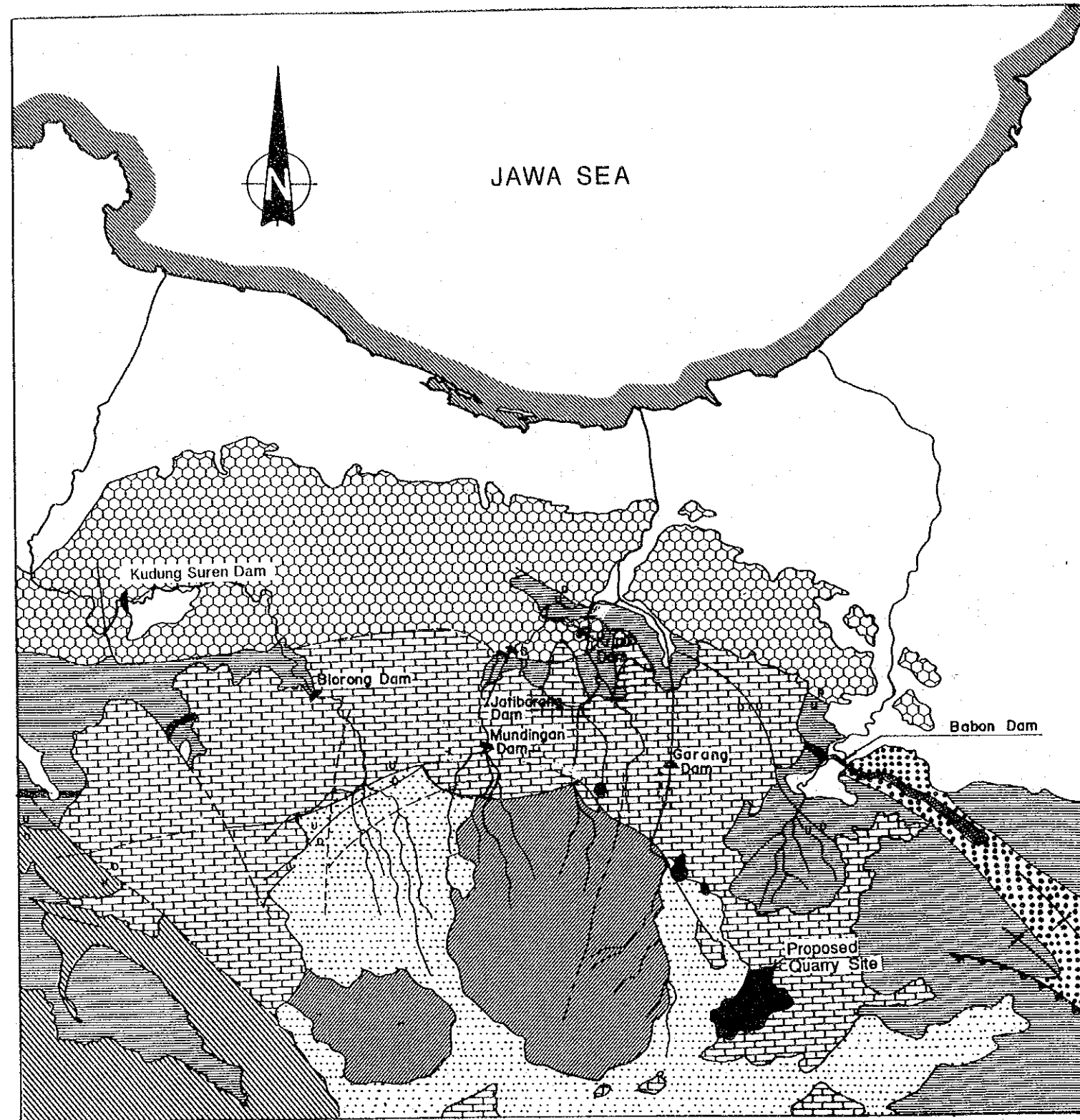
Description	Total	(1994)	(1995 to 1999)	Second 5-year (2000 to 2004)	Third 5-year (2005 to 2009)	Fourth 5-year (2010 to 2014)	Fifth 5-year (2015 to 2019)	Sixth 5-year (2020 to 2024)	Seventh 5-year (2025 to 2029)	Eighth 5-year (2030 to 2034)	Ninth 5-year (2035 to 2039)
I. On-Going Project (SSUDP Project) -----	25,553	4,989	20,564	0	0	0	0	0	0	0	0
1. Eastern Semarang	5,601	0	5,601	0	0	0	0	0	0	0	0
1) Siringin	5,601	0	5,601	0	0	0	0	0	0	0	0
2) Tenggang	8,757	2,189	6,568	0	0	0	0	0	0	0	0
2. Central Semarang	9,172	2,292	6,880	0	0	0	0	0	0	0	0
1) Banger	1,693	508	1,185	0	0	0	0	0	0	0	0
2) Bulu	330	0	330	0	0	0	0	0	0	0	0
1) Ronggolawe	64,118	0	0	21,108	23,378	19,632	0	0	0	0	0
II. Priority Project -----	64,118	0	0	21,108	23,378	19,632	0	0	0	0	0
1. Semarang River	64,118	0	0	21,108	23,378	19,632	0	0	0	0	0
III. Master Plan Project -----	110,139	0	0	0	0	4,119	21,904	22,112	22,258	20,165	19,581
1. Eastern Semarang	14,827	0	0	0	0	0	0	0	287	3,058	11,482
1) Siringin	35,275	0	0	0	0	0	0	0	10,069	17,107	8,099
2) Tenggang	20,476	0	0	0	0	4,119	16,357	0	0	0	0
2. Central Semarang	14,422	0	0	0	0	0	5,461	8,961	0	0	0
1) Semarang	2,135	0	0	0	0	0	86	2,049	0	0	0
2) Banger	9,318	0	0	0	0	0	0	5,690	3,628	0	0
3) Bulu	9,294	0	0	0	0	0	0	5,412	3,882	0	0
3. Western Semarang	2,328	0	0	0	0	0	0	0	2,328	0	0
1) Ronggolawe	2,064	0	0	0	0	0	0	0	2,064	0	0
2) Karangayu	199,810	4,989	20,564	21,108	23,378	23,751	21,904	22,112	22,258	20,165	19,581
3) Tawang											
4) Sitandak											
Total	199,810	4,989	20,564	21,108	23,378	23,751	21,904	22,112	22,258	20,165	19,581

FIGURES



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 2.1
 STUDY AREA



SCALE 1: 200,000

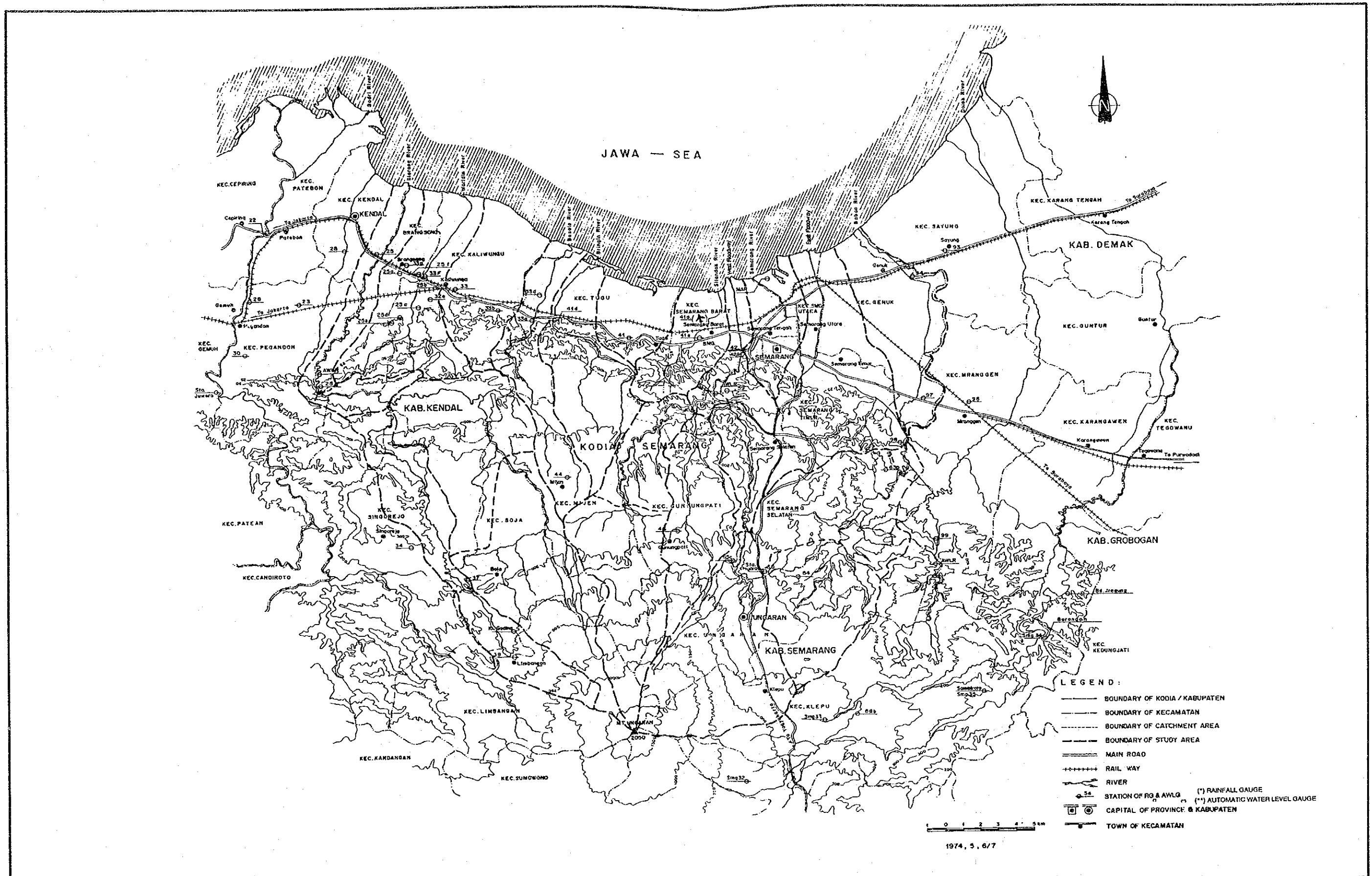
LEGEND :

- ALLUVIUM : Coastal plain; clay and sand, stream deposits; sand, silt, gravel and boulder
- MIDDLE G. UNGARAN LAHAR AND VOLCANIC ROCK : Augite - olivine basalt flows
- LAVA FLOW OF G. UNGARAN : Augite - hornblende andesite
- NOTOPURO FORMATION : Volcanic breccia, lava flows, tuff, tuffaceous sandstone and claystone
- DAMAR FORMATION : Tuffaceous sandstone, conglomerate, volcanic breccia and tuff
- KALIBIUK FORMATION : Claystone, marl, sandstone, conglomerate, volcanic breccia and tuff
- BANYAK MEMBER : Alternation of tuffaceous sandstone, calcareous siltstone, sandstone and pebbly sand stone
- PENYATAN FORMATION : Sandstone, breccia, tuff, claystone and lava flow.
- LIMESTONE
- INTRUSIVE ROCKS : Augite - hornblende andesite and augite - olivine andesite
- NORMAL FAULT : U = up
D = down
- REVERSE FAULT
- FOLD AXIS
- INFERRED FAULT

SURFICIAL DEPOSITS	VOLCANIC ROCKS	SEDIMENTARY ROCKS	GEOLOGICAL AGE	
			Holocene	Quaternary
			Pleistocene	Tertiary
			Pliocene	
			Miocene	

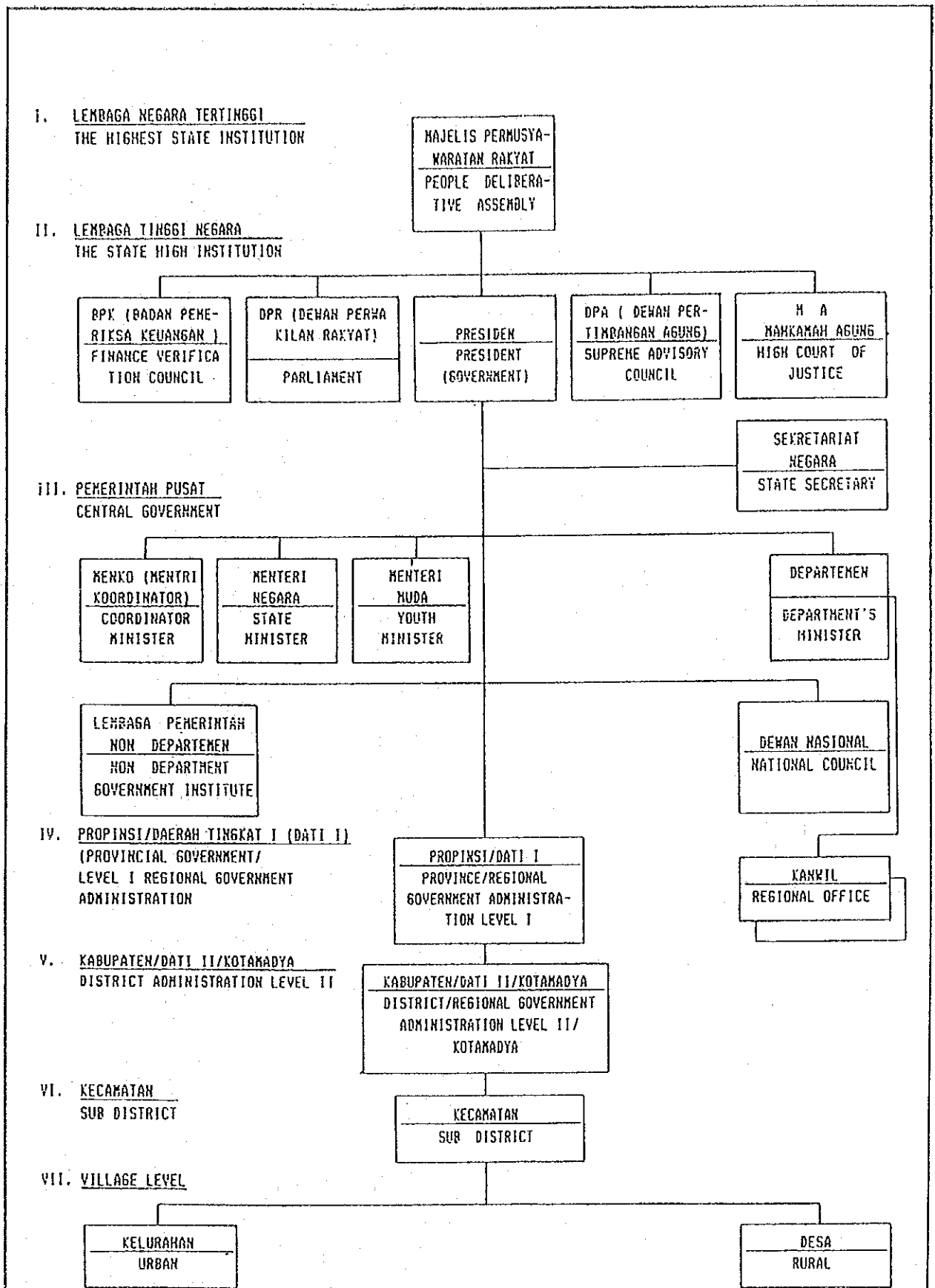
MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
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Fig. 2.2 REGIONAL GEOLOGICAL MAP
AROUND THE STUDY AREA



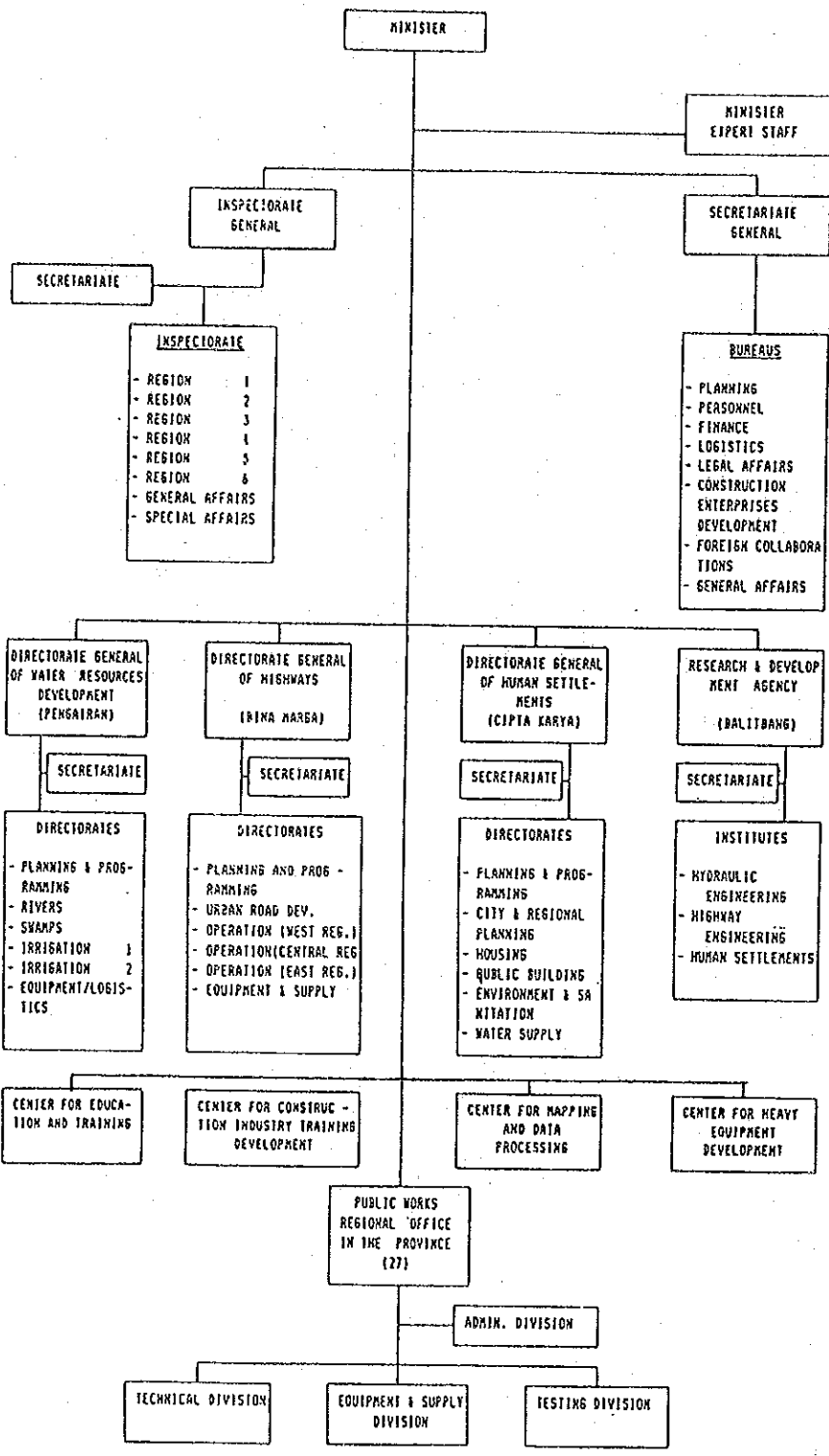
MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
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Fig. 2.3
 LOCATION MAP OF METEOROLOGICAL AND WATER
 LEVEL GAUGING STATION



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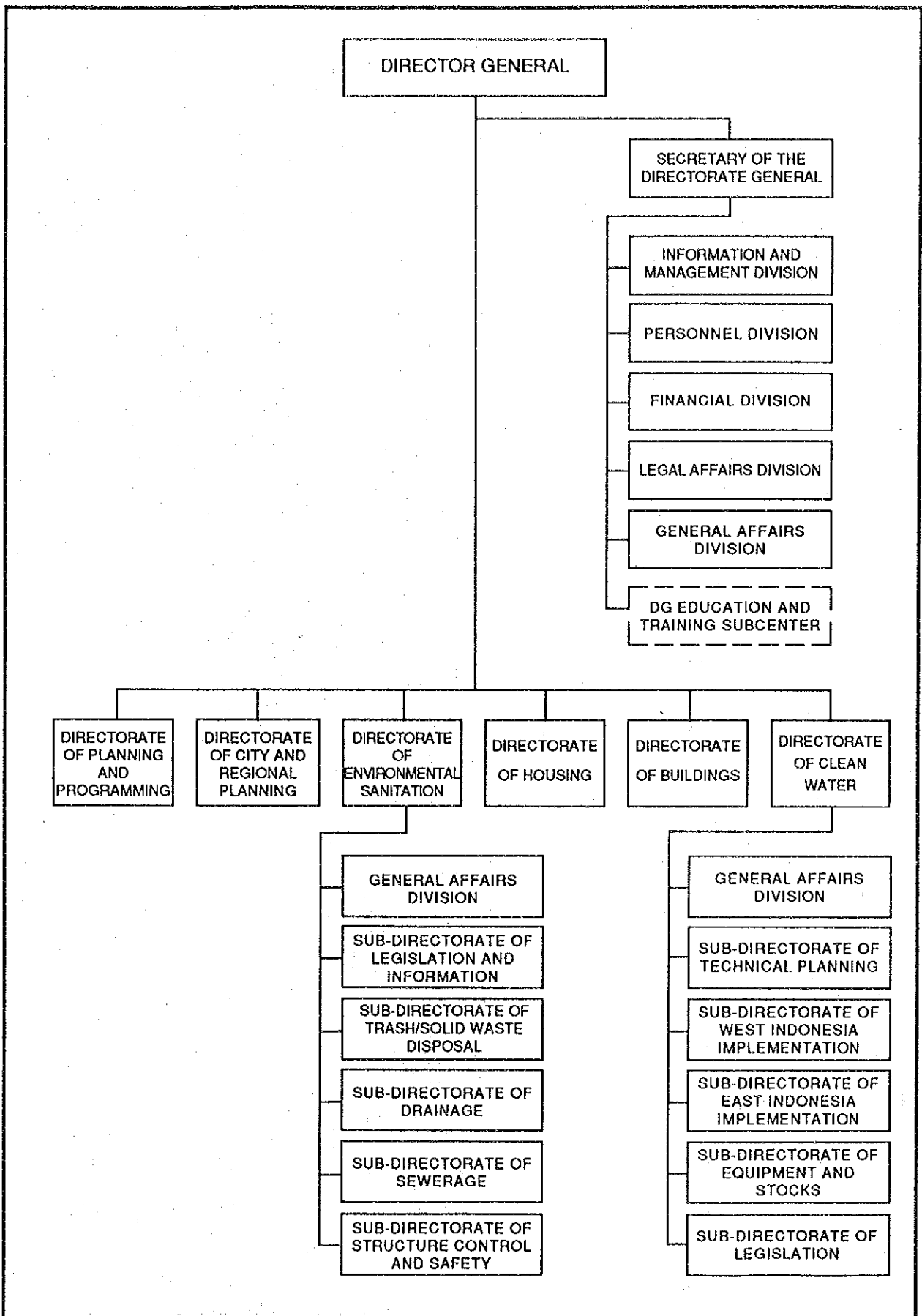
Fig. 2.4
STATE ORGANIZATION BASED ON THE 1945 CONSTITUTION



Source: Decree of the Minister of Public Works No 211/EPIS/1981
 (Organization Structure and Work Systems of NPW)

MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

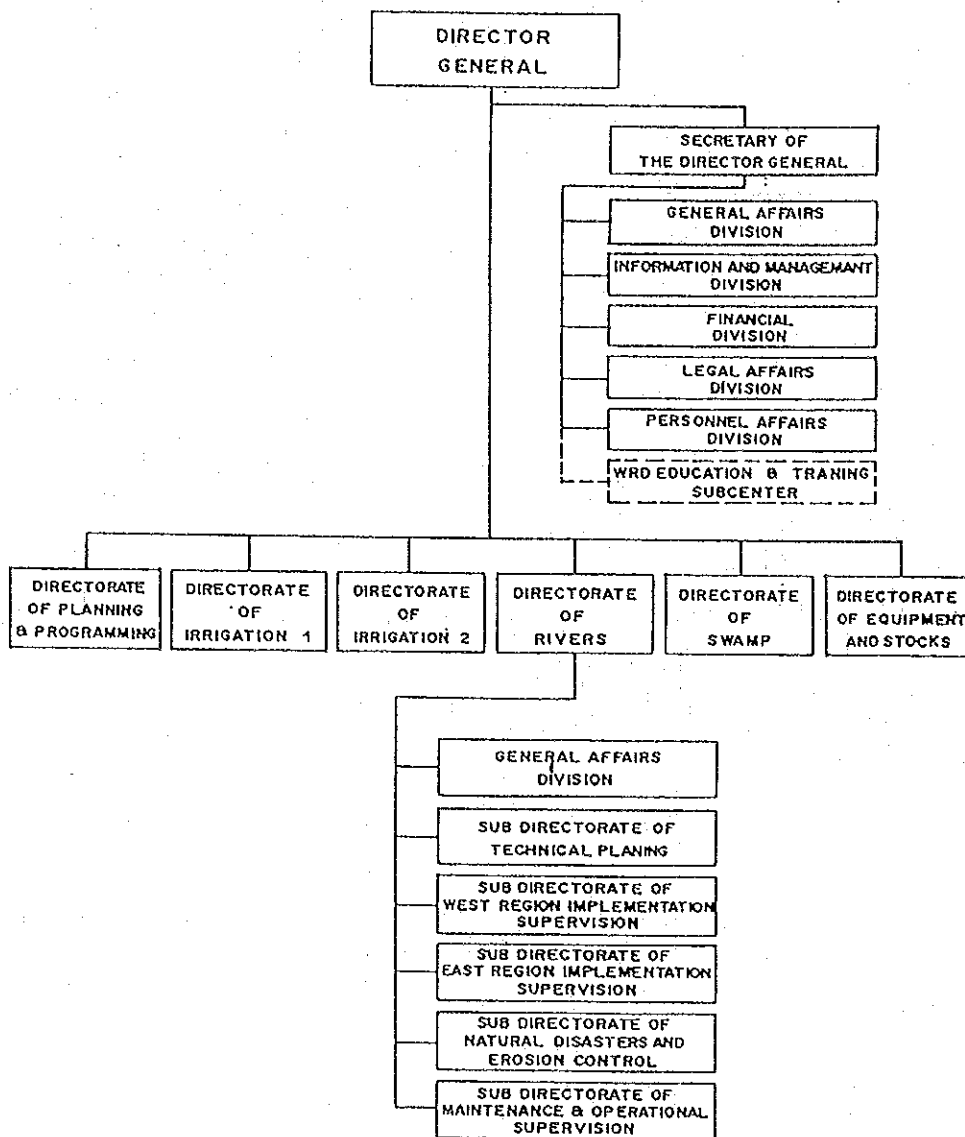
Fig. 2.5
 ORGANIZATION CHART OF THE MINISTRY OF PUBLIC WORKS



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 2.6

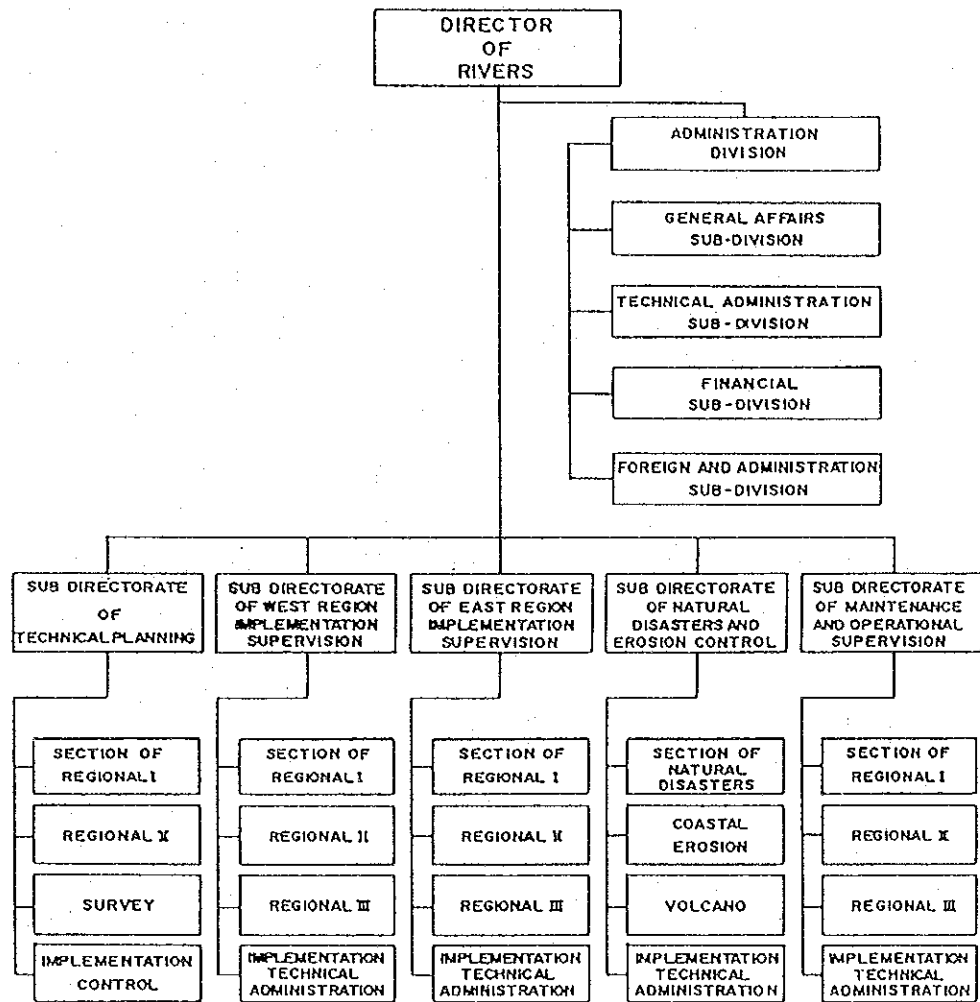
ORGANIZATION CHART OF CIPTA KARYA



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 2.7

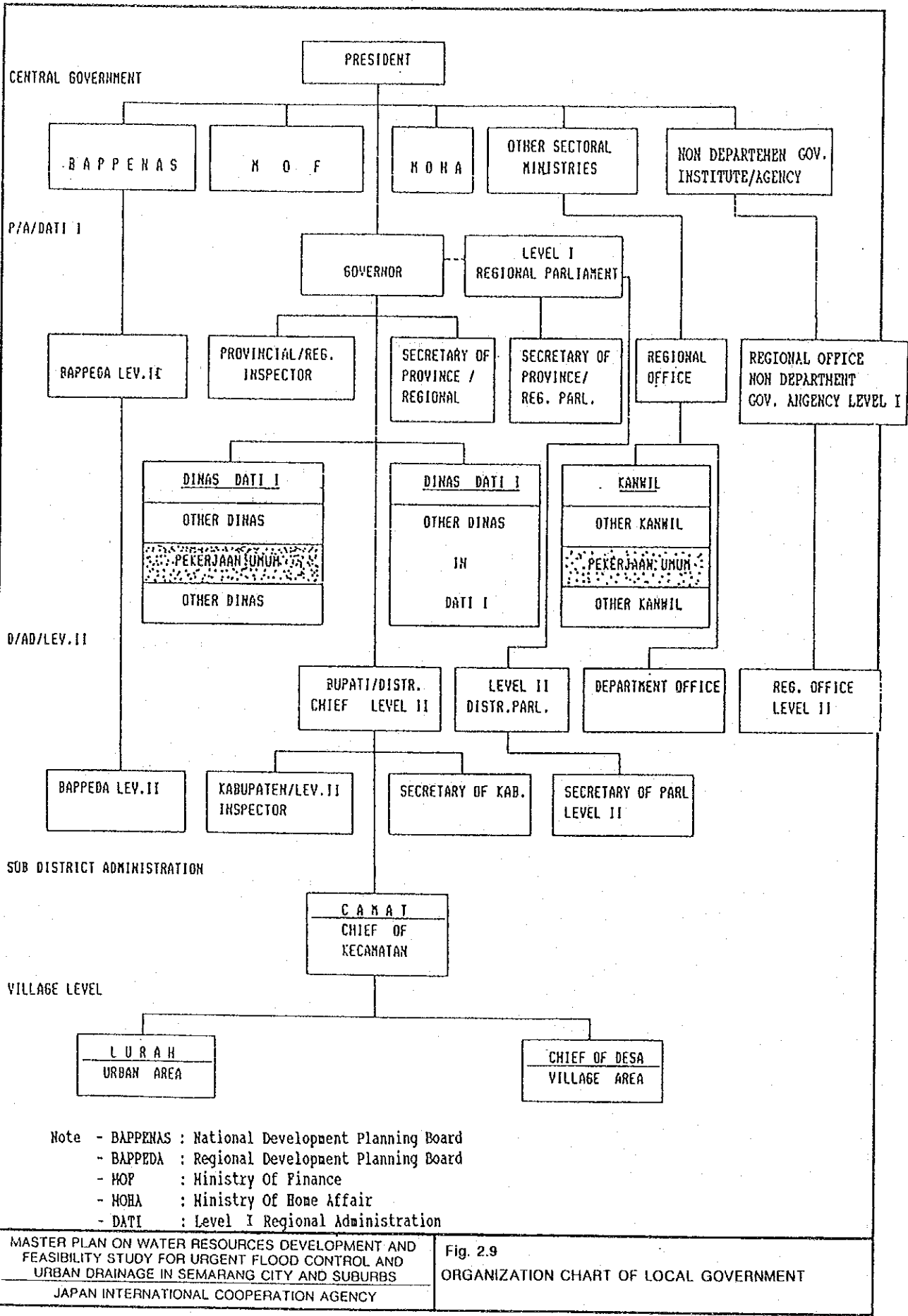
ORGANIZATION CHART OF DIRECTORATE GENERAL OF
 WATER RESOURCES DEVELOPMENT

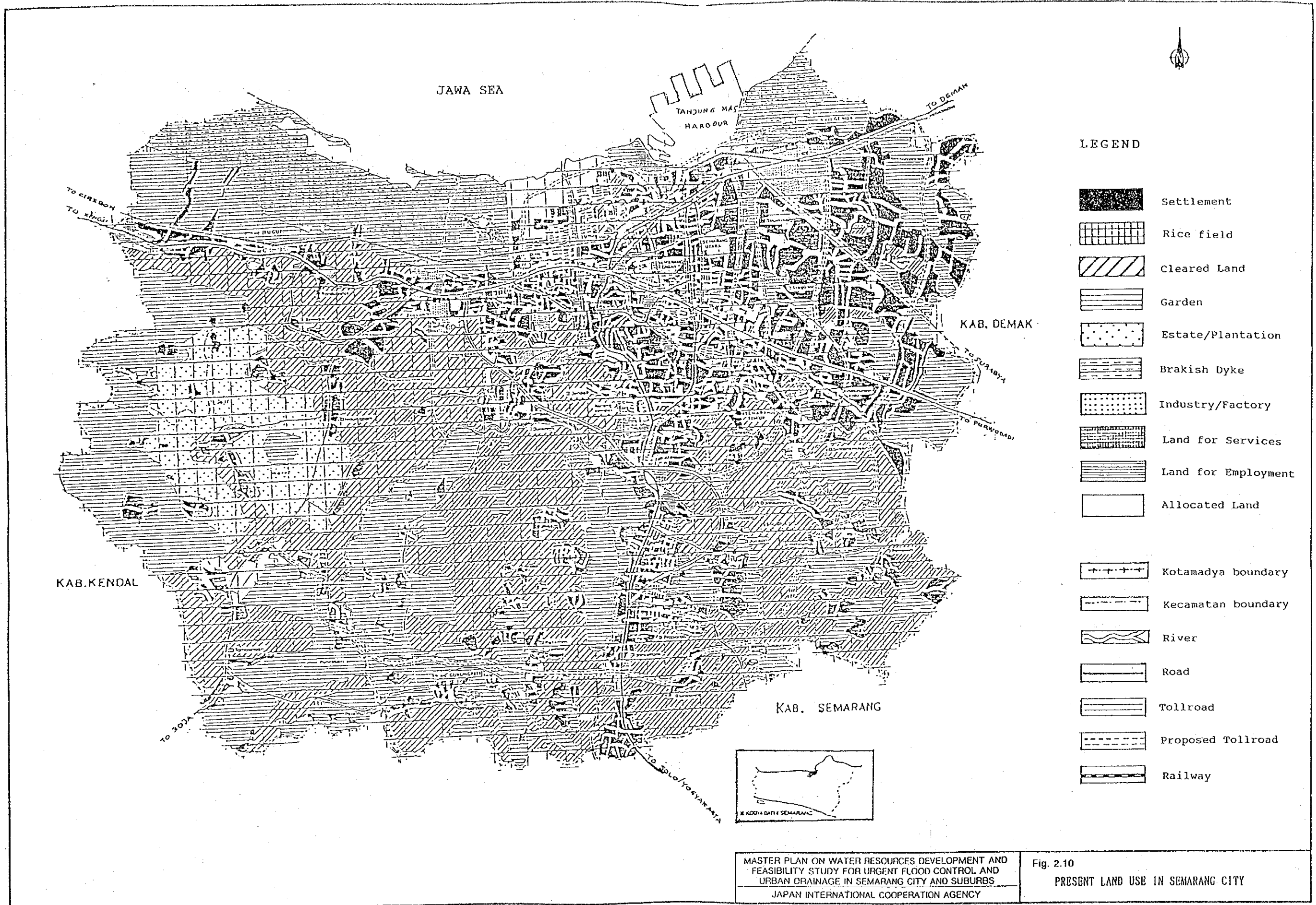


MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
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Fig. 2.8

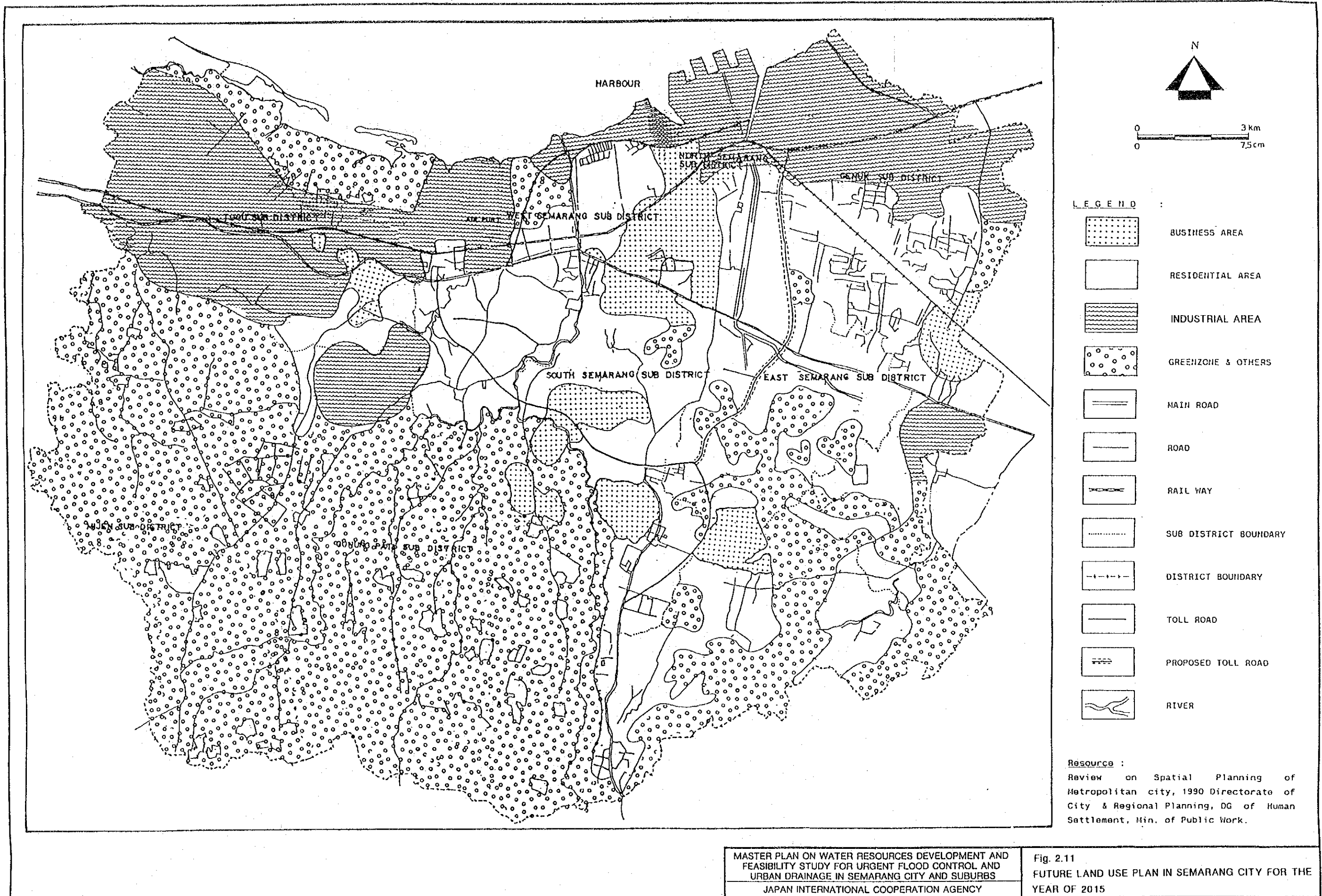
ORGANIZATION CHART OF DIRECTORATE OF RIVERS





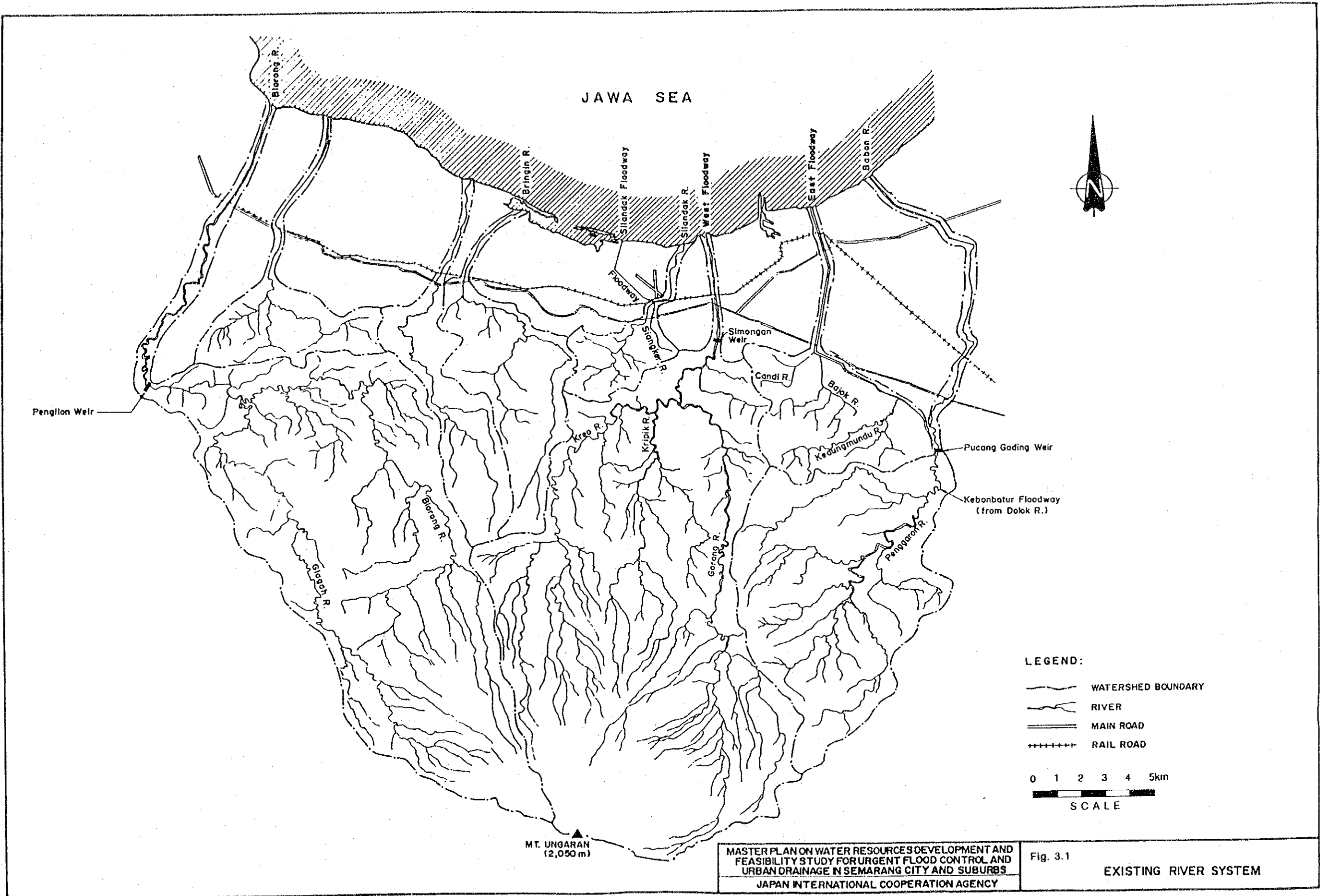
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 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
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Fig. 2.10
 PRESENT LAND USE IN SEMARANG CITY



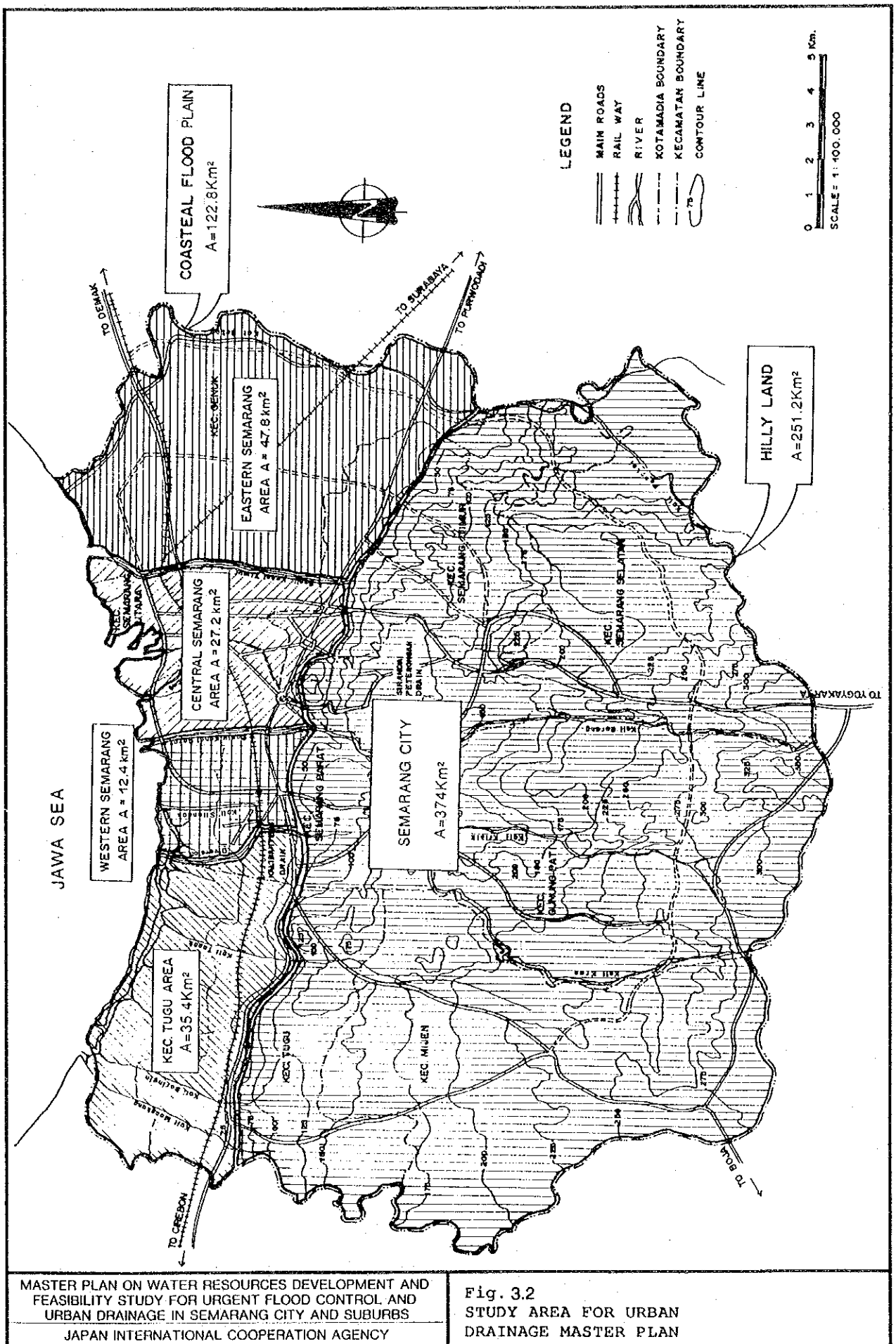
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Fig. 2.11
 FUTURE LAND USE PLAN IN SEMARANG CITY FOR THE
 YEAR OF 2015



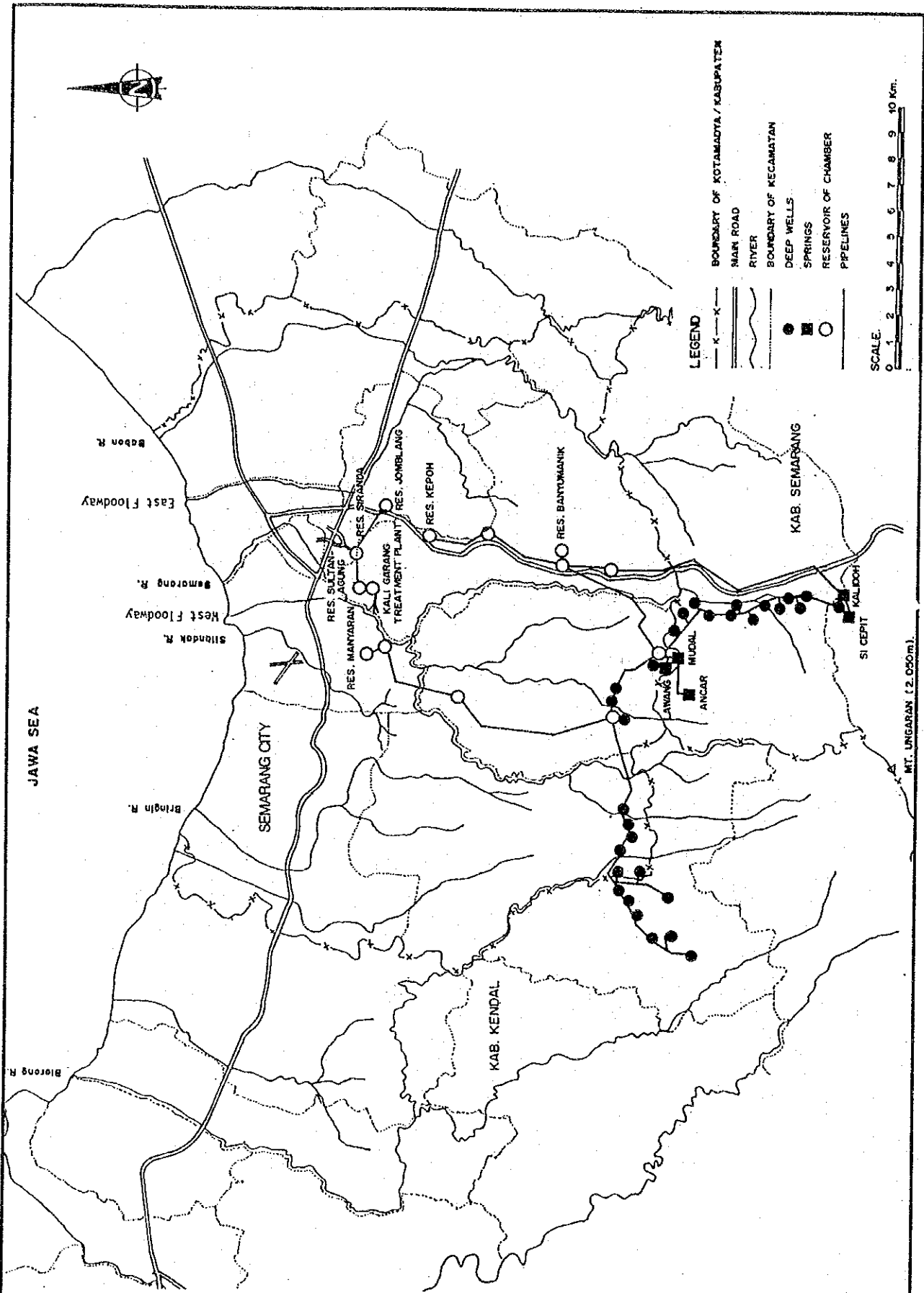
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Fig. 3.1
 EXISTING RIVER SYSTEM



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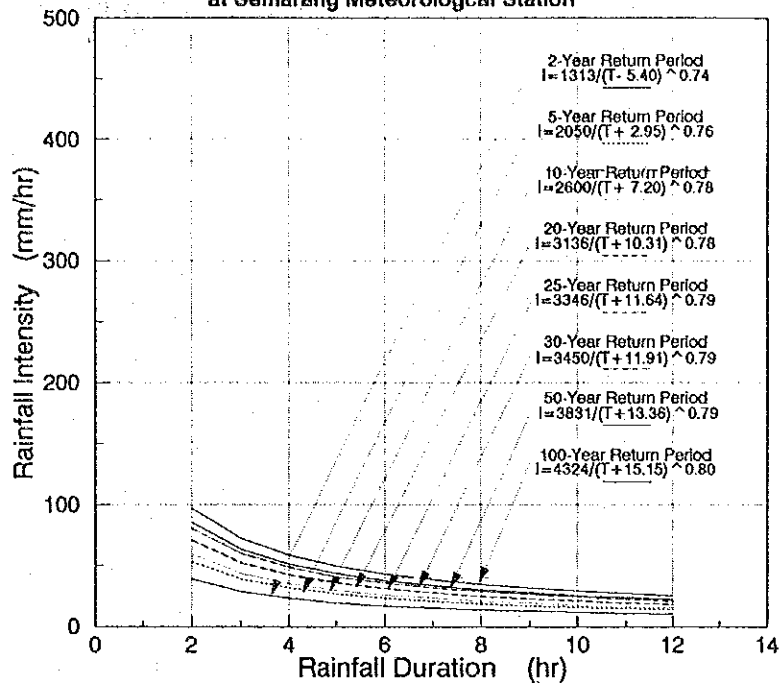
Fig. 3.2
 STUDY AREA FOR URBAN
 DRAINAGE MASTER PLAN



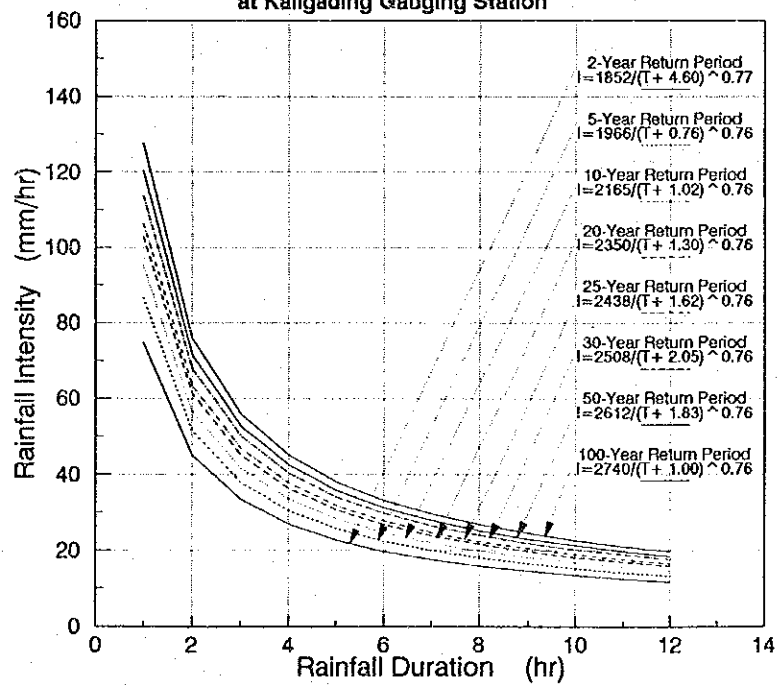
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Fig. 33
 WATER SOURCES AND TRANSPORTATION SYSTEM
 OF PDAM SEMARANG CITY

**RAINFALL INTENSITY-DURATION CURVE
LONG DURATION CURVES
at Semarang Meteorological Station**

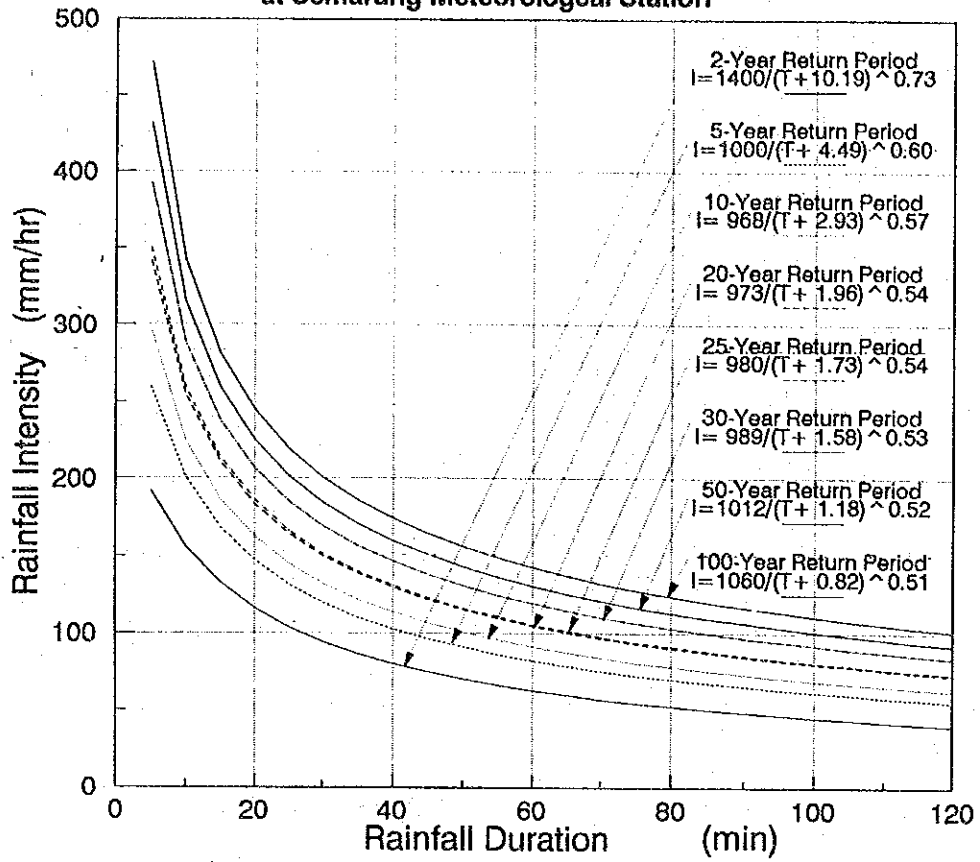


**RAINFALL INTENSITY-DURATION CURVE
LONG DURATION CURVES
at Kaligading Gauging Station**

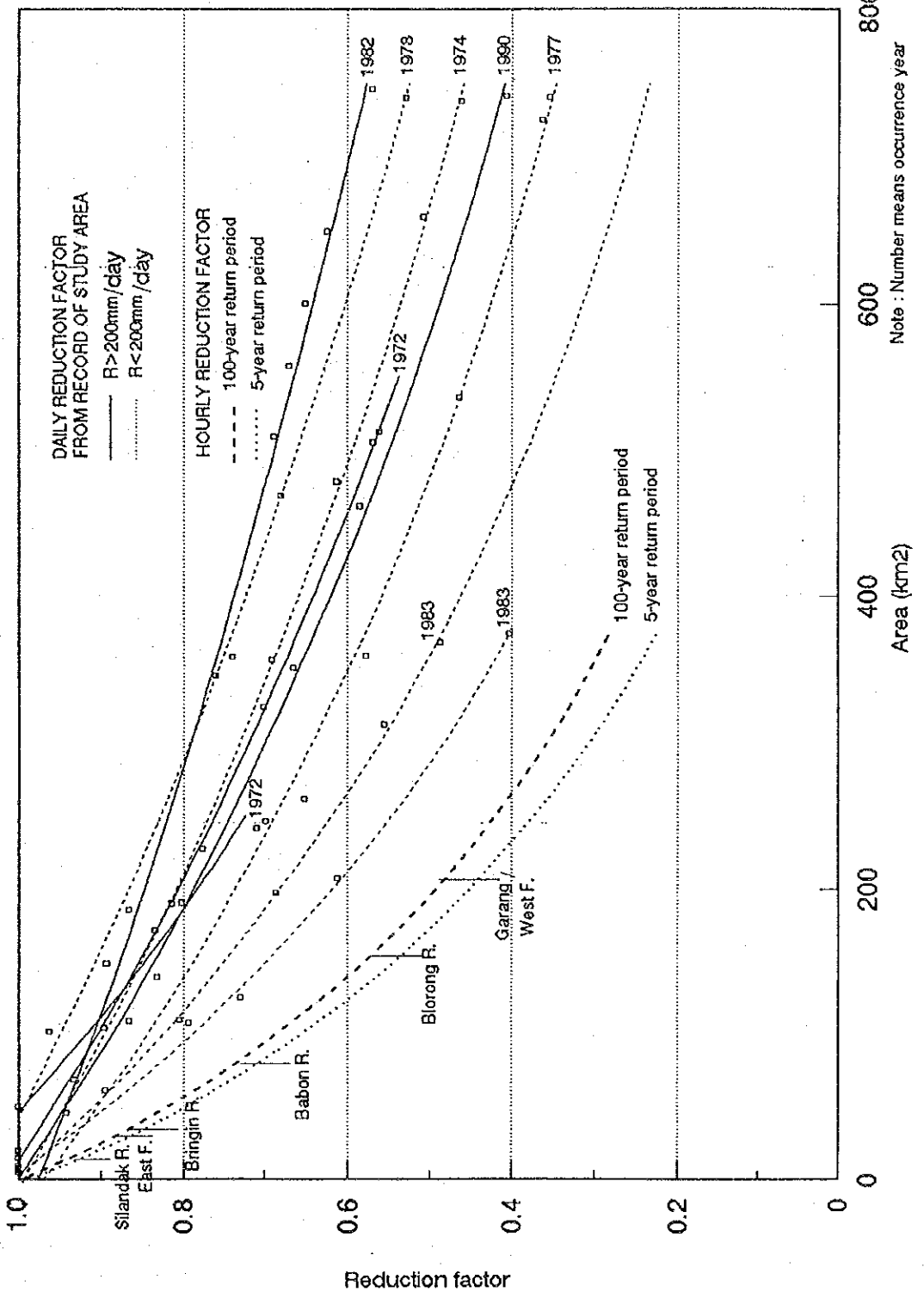


Note : Horner Type Equation

**RAINFALL INTENSITY-DURATION CURVE
SHORT DURATION CURVES
at Semarang Meteorological Station**



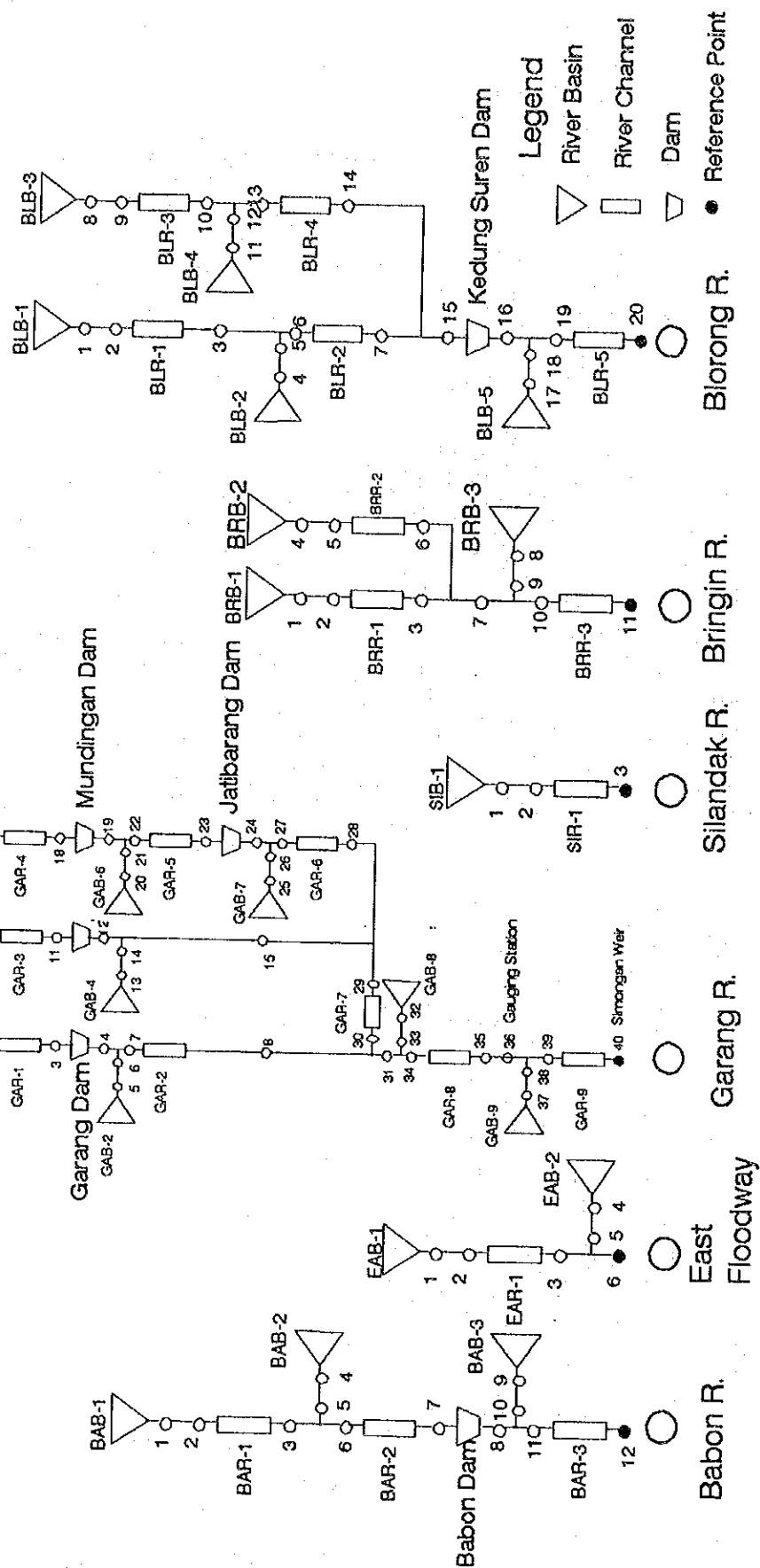
AREA REDUCTION FACTOR



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 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
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Fig. 4.2
 AREA REDUCTION FACTOR

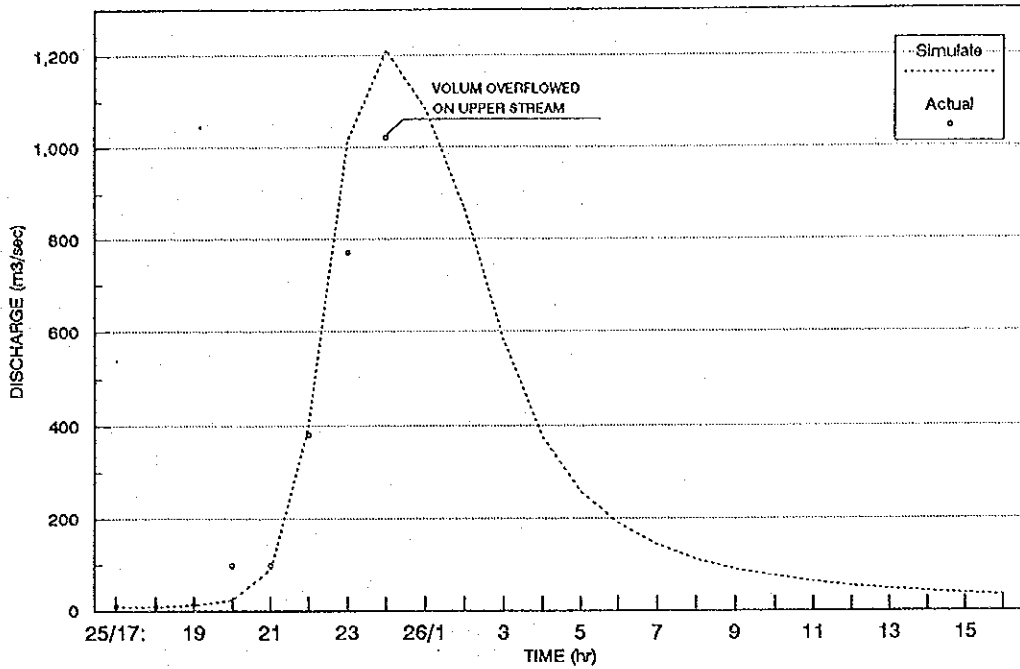
DIAGRAM FOR FLOOD SIMULATION MODEL



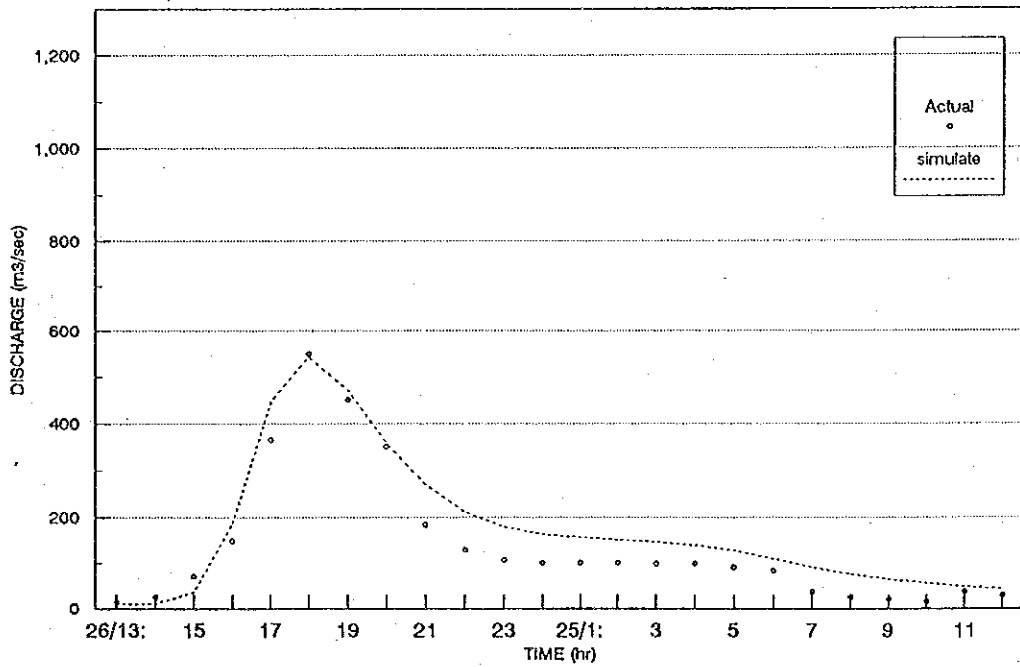
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Fig. 4.3
 MODEL DIAGRAM FOR STORAGE FUNCTION MODEL
 SIMULATION

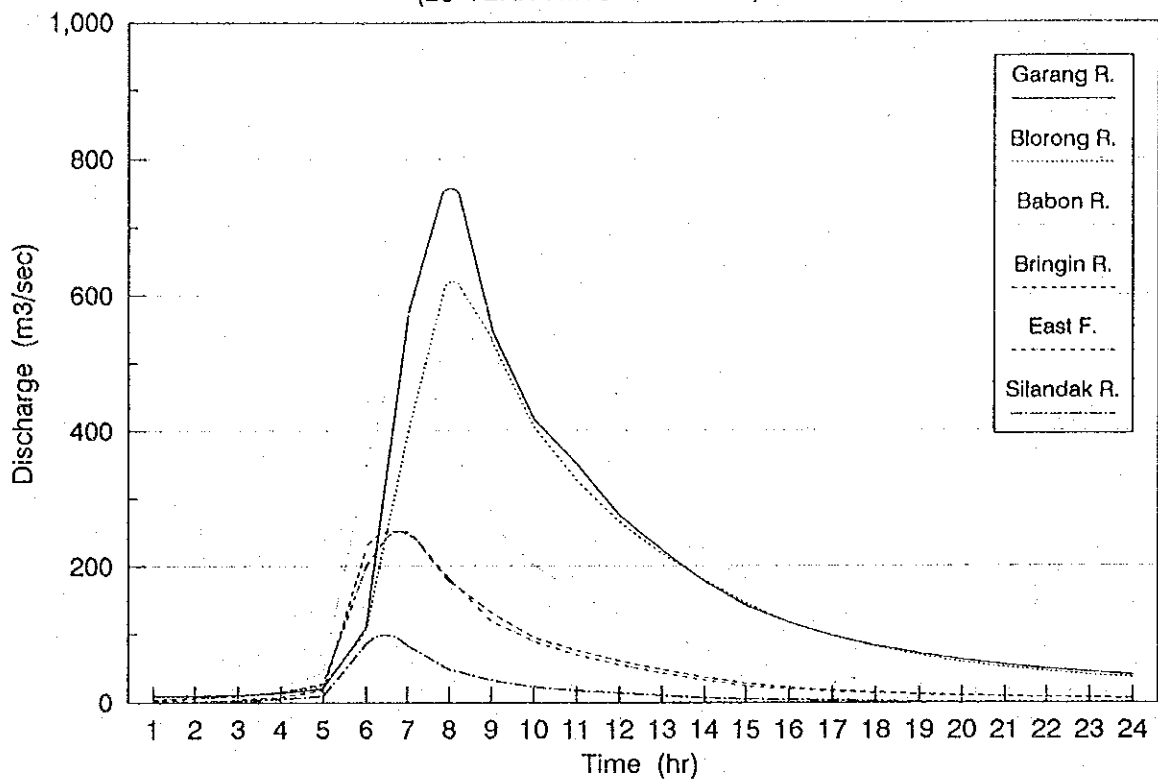
SIMULATED FLOOD OF THE GARANG RIVER GAUGING
STATION ON JAN.25 1990



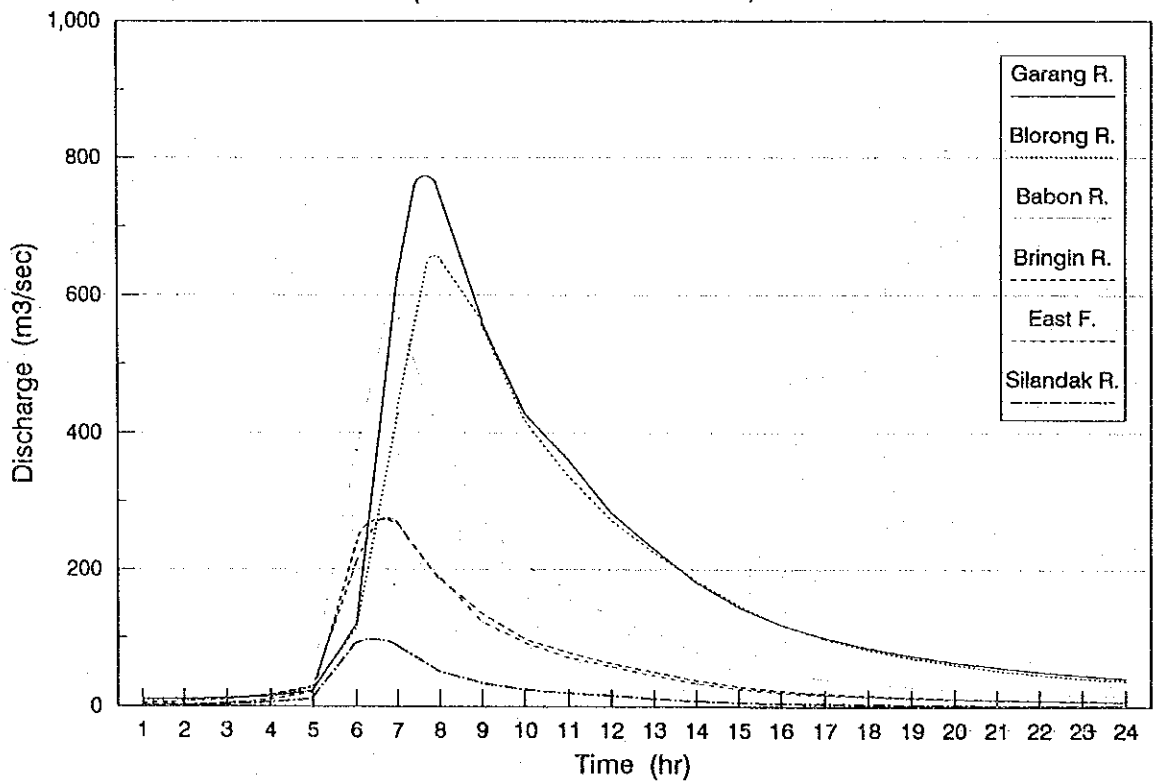
SIMULATED FLOOD OF THE GARANG RIVER GAUGING
STATION ON JAN.26 1987



**PROBABLE FLOOD RUNOFF HYDROGRAPH
(20-YEAR RETURN PERIOD)**

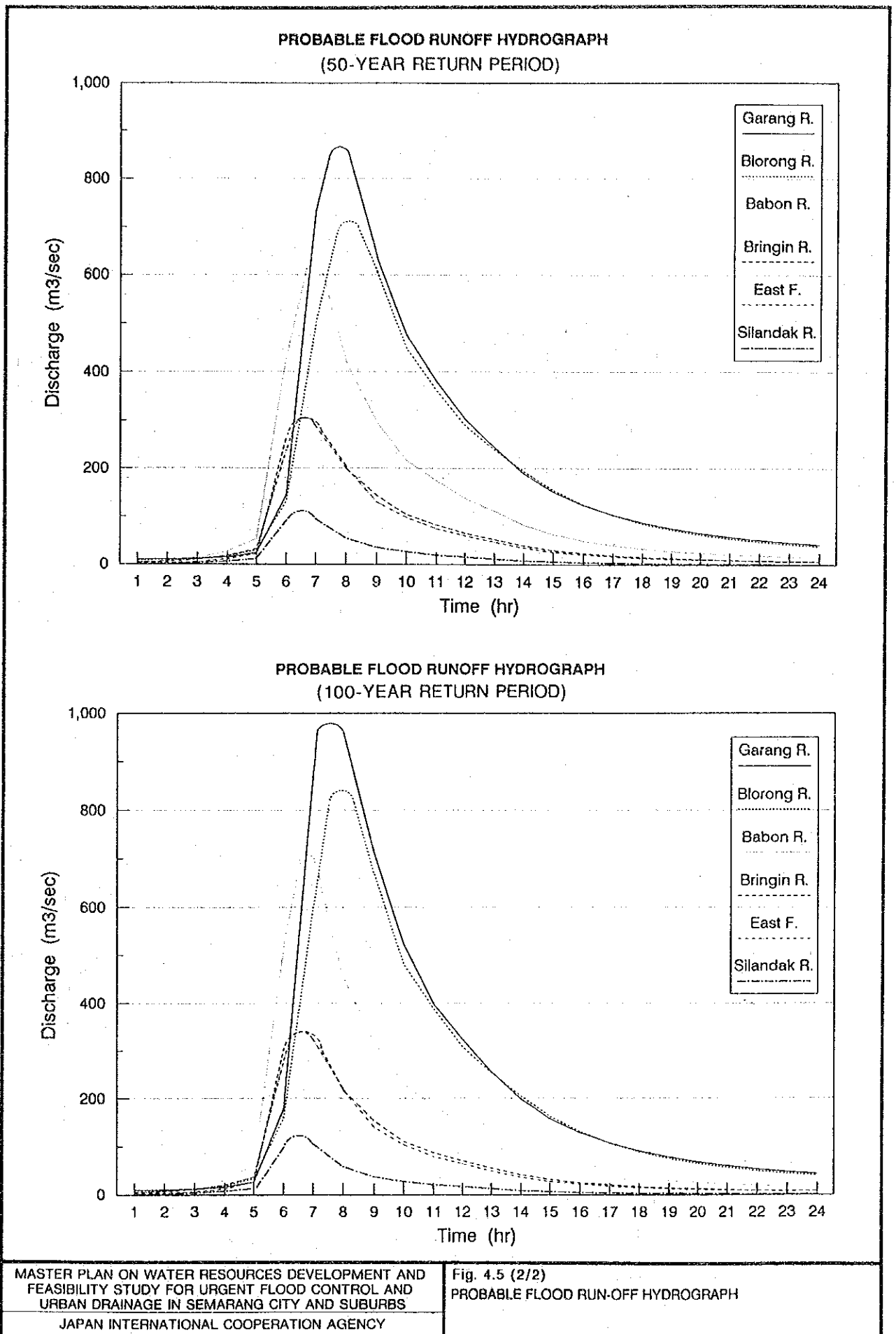


**PROBABLE FLOOD RUNOFF HYDROGRAPH
(25-YEAR RETURN PERIOD)**



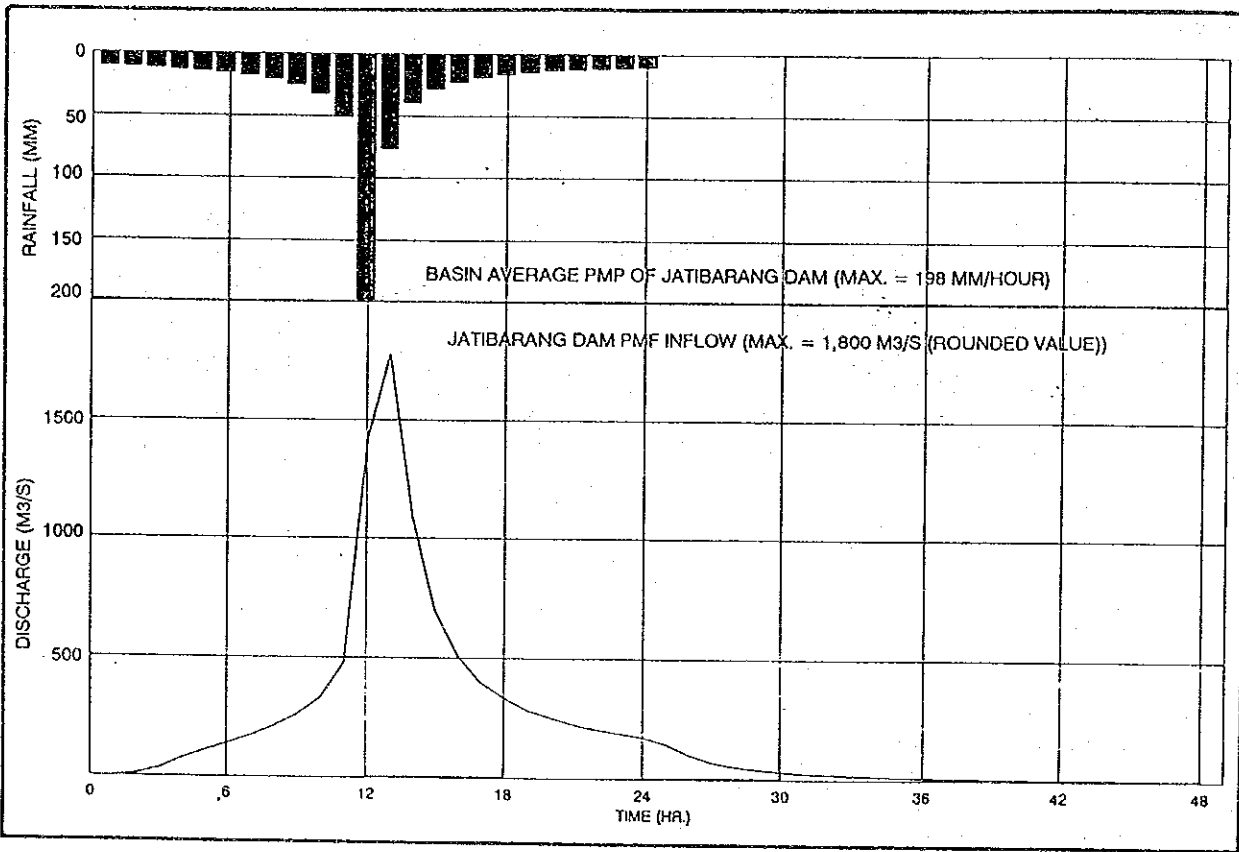
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Fig. 4.5 (1/2)
PROBABLE FLOOD RUN-OFF HYDROGRAPH



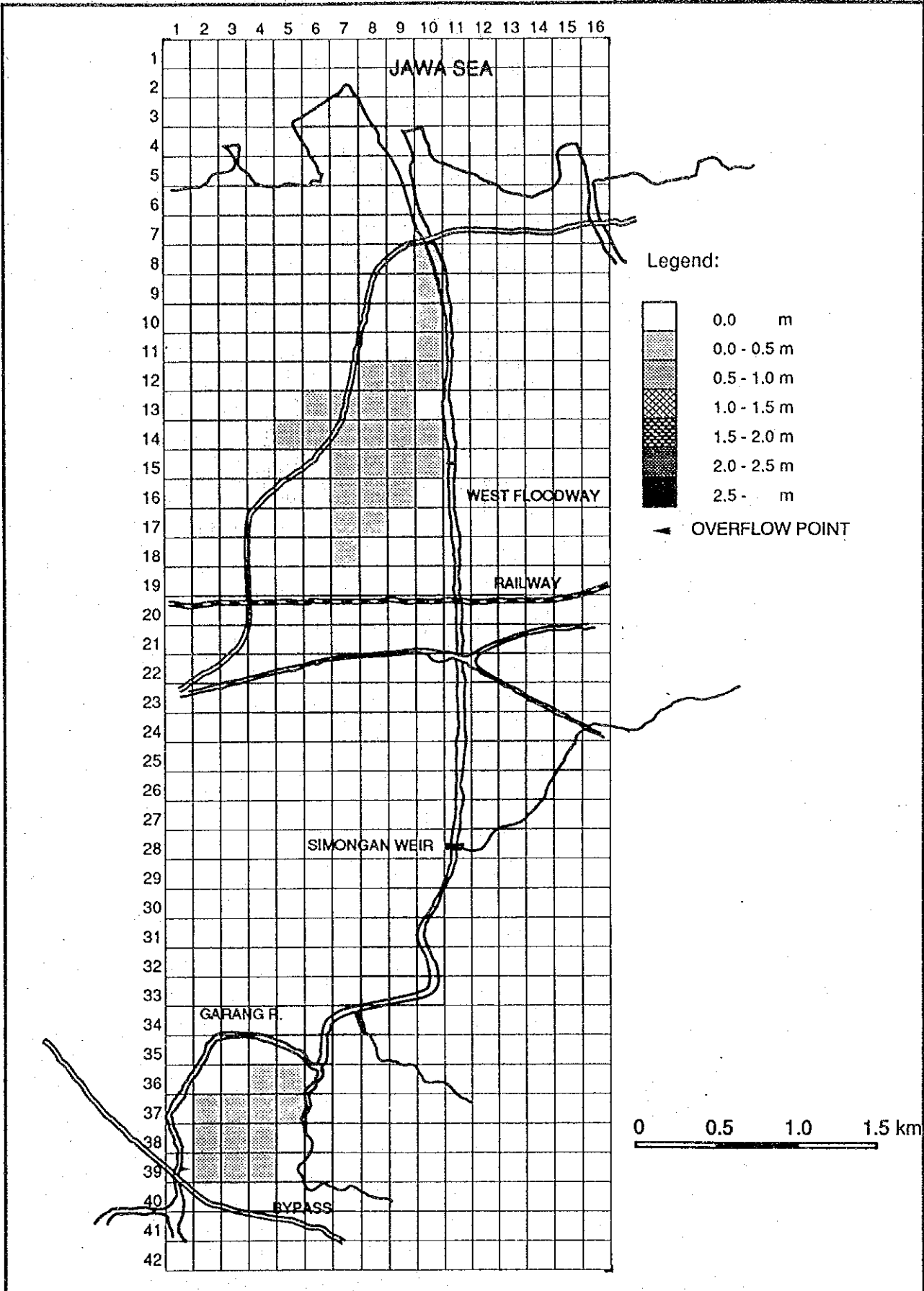
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URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
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Fig. 4.5 (2/2)
PROBABLE FLOOD RUN-OFF HYDROGRAPH



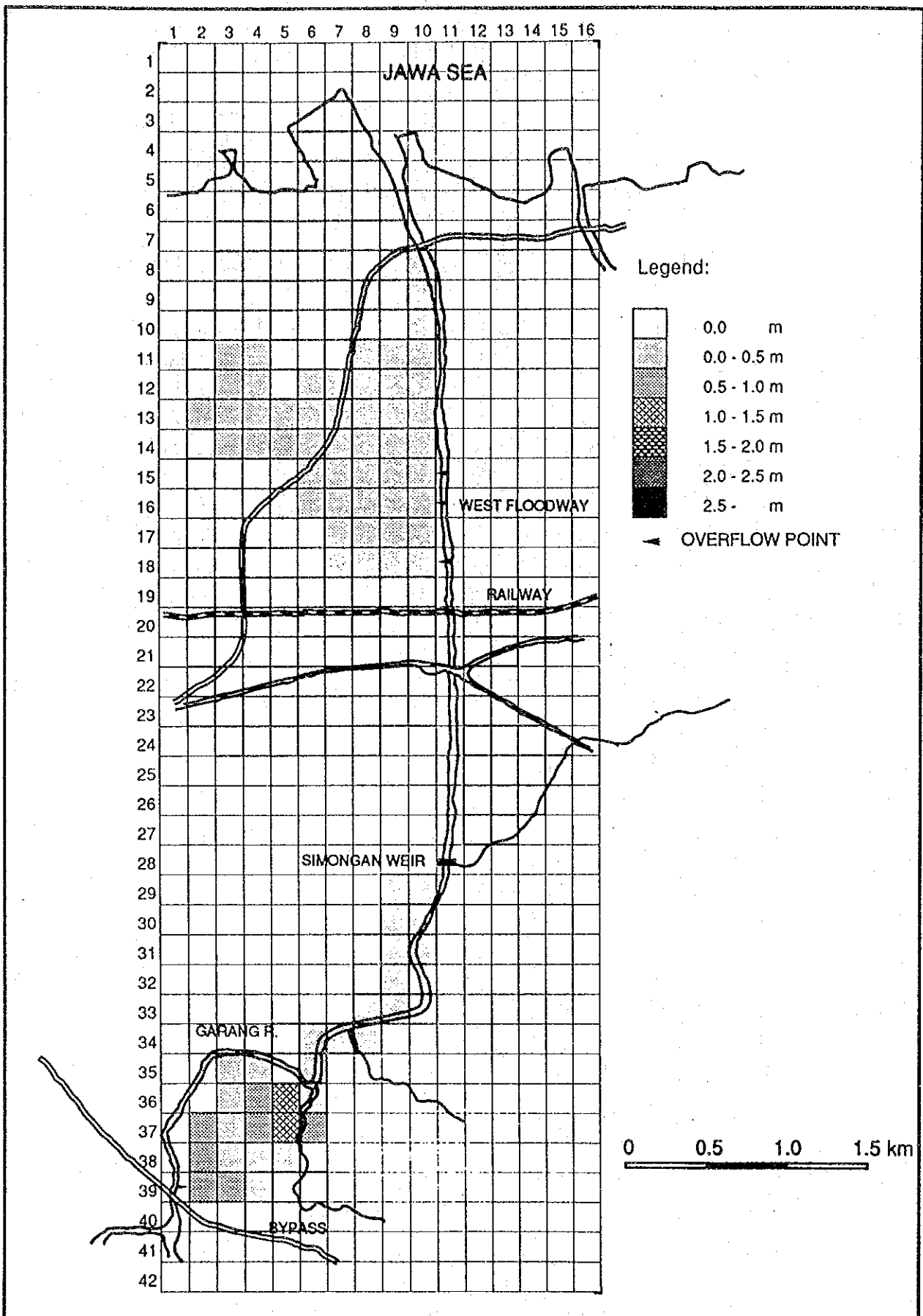
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Fig. 4.6
 MODEL HYETOGRAPH AND HYDROGRAPH OF PMP
 FOR JATIBARANG DAM



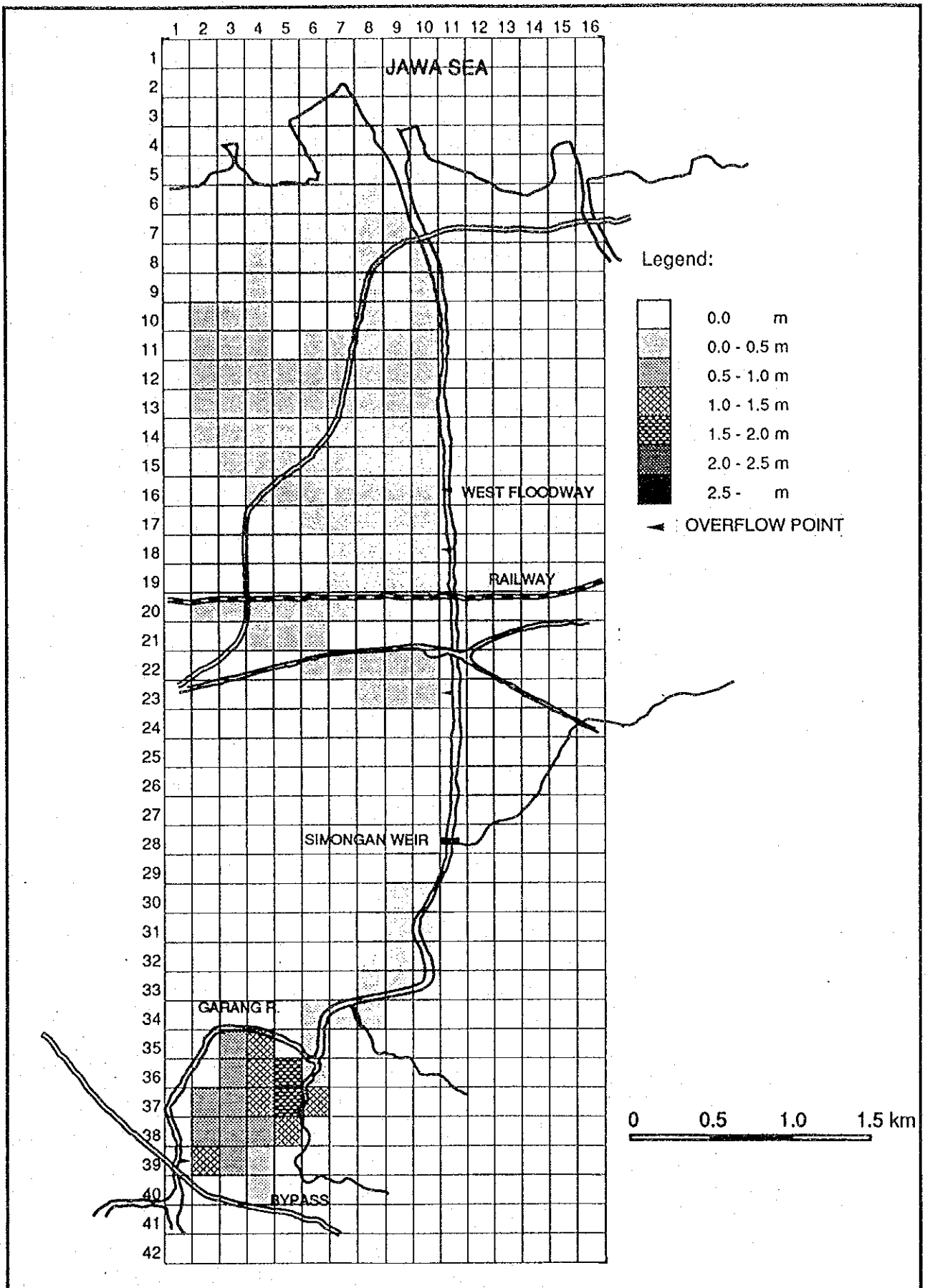
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Fig. 4.7 (1/4)
 PROBABLE INUNDATION AREA OF GARANG RIVER
 WITHOUT PROJECT (10-YEAR RETURN PERIOD)



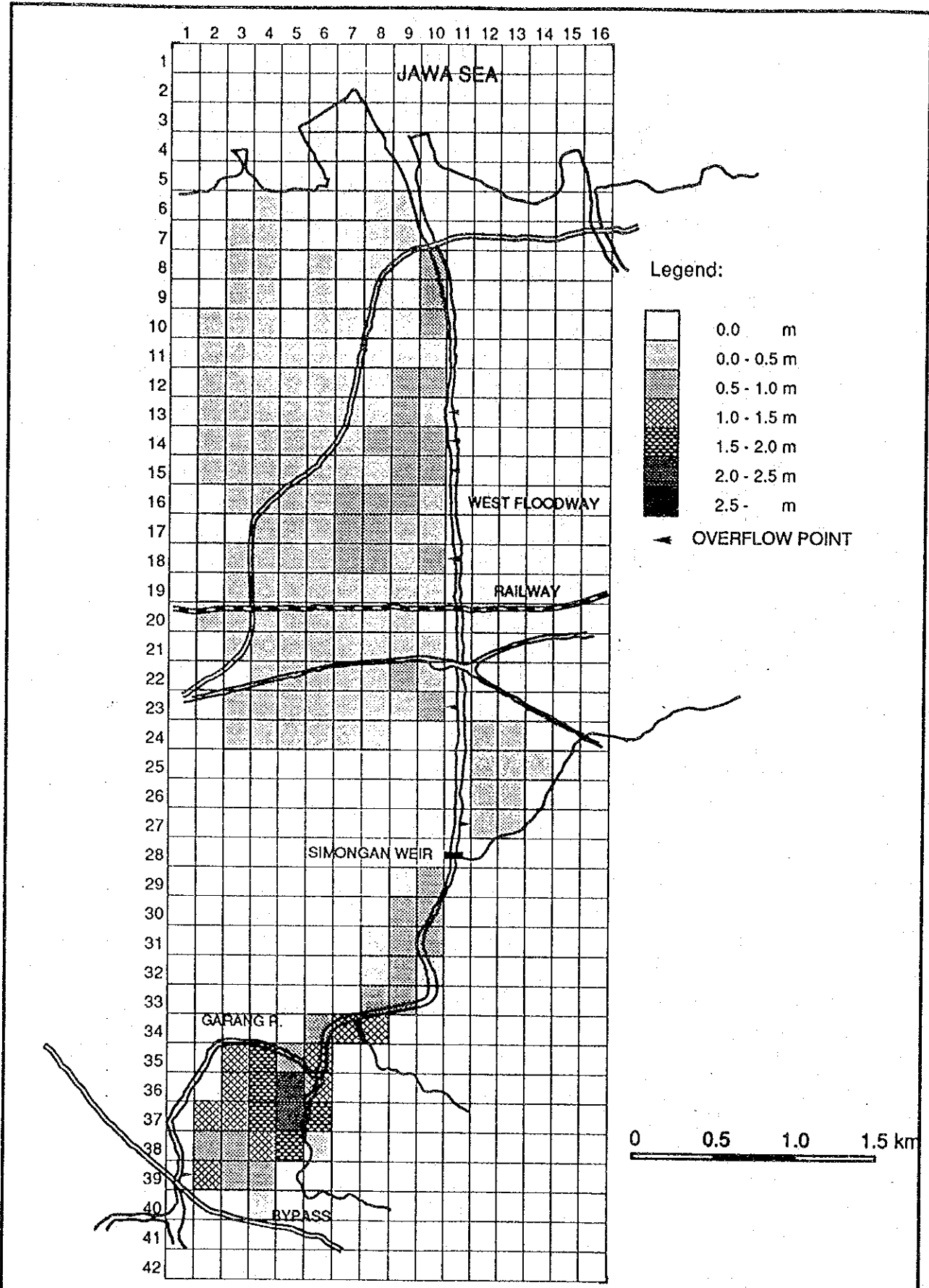
MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
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Fig. 4.7 (2/4)
 PROBABLE INUNDATION AREA OF GARANG RIVER
 WITHOUT PROJECT (25-YEAR RETURN PERIOD)



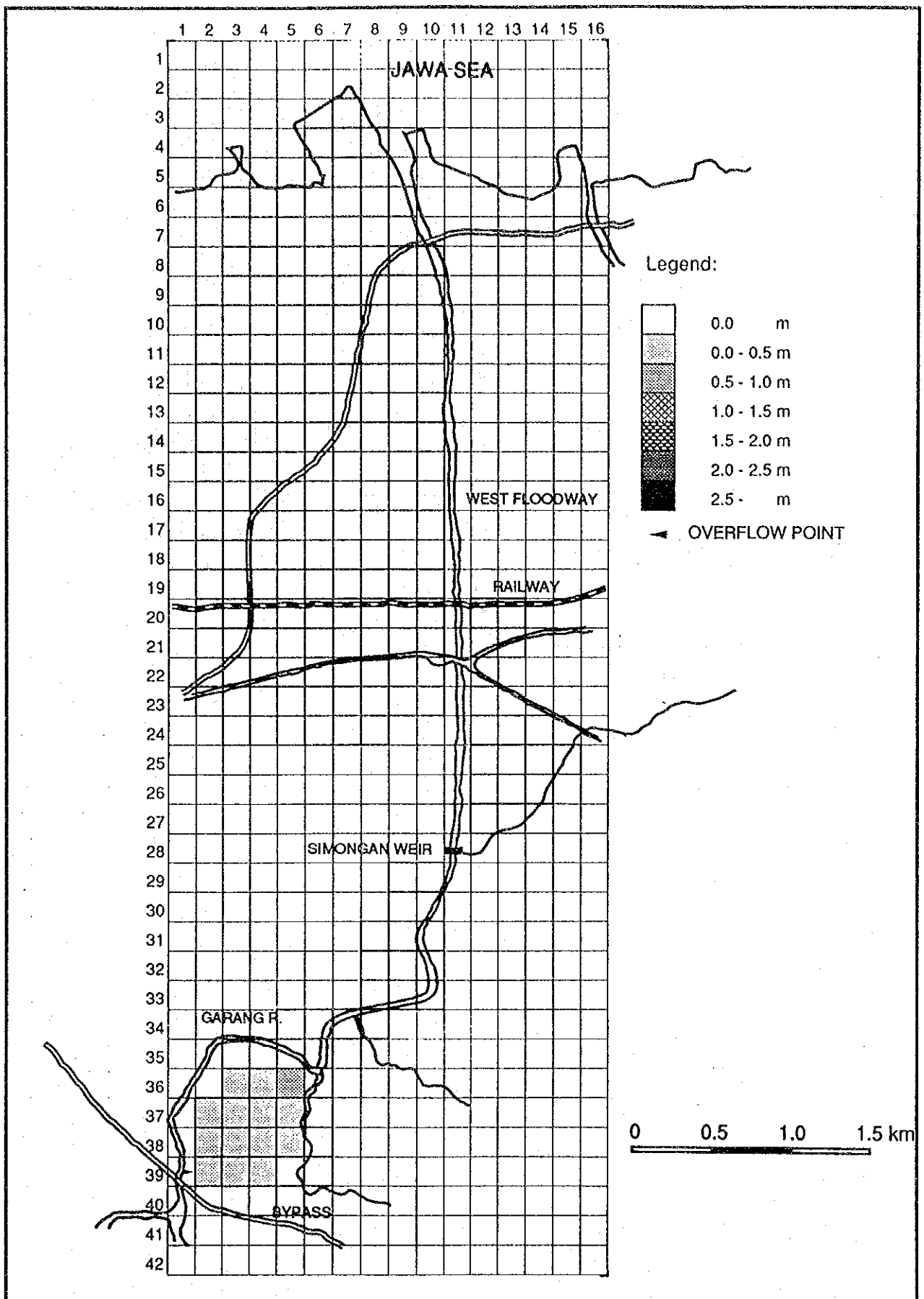
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Fig. 4.7 (3/4)
 PROBABLE INUNDATION AREA OF GARANG RIVER
 WITHOUT PROJECT (50-YEAR RETURN PERIOD)



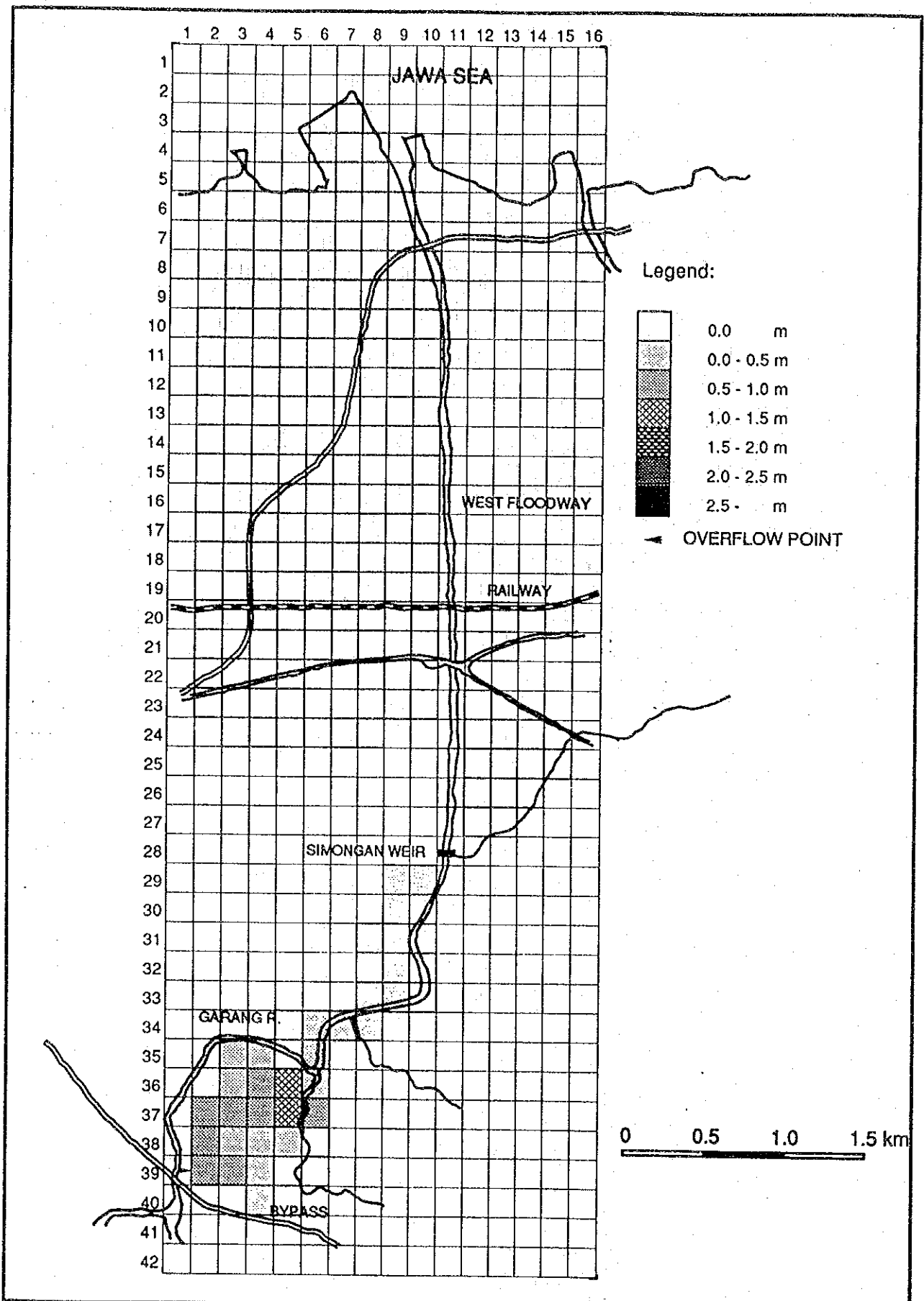
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Fig. 4.7 (4/4)
 PROBABLE INUNDATION AREA OF GARANG RIVER
 WITHOUT PROJECT (100-YEAR RETURN PERIOD)



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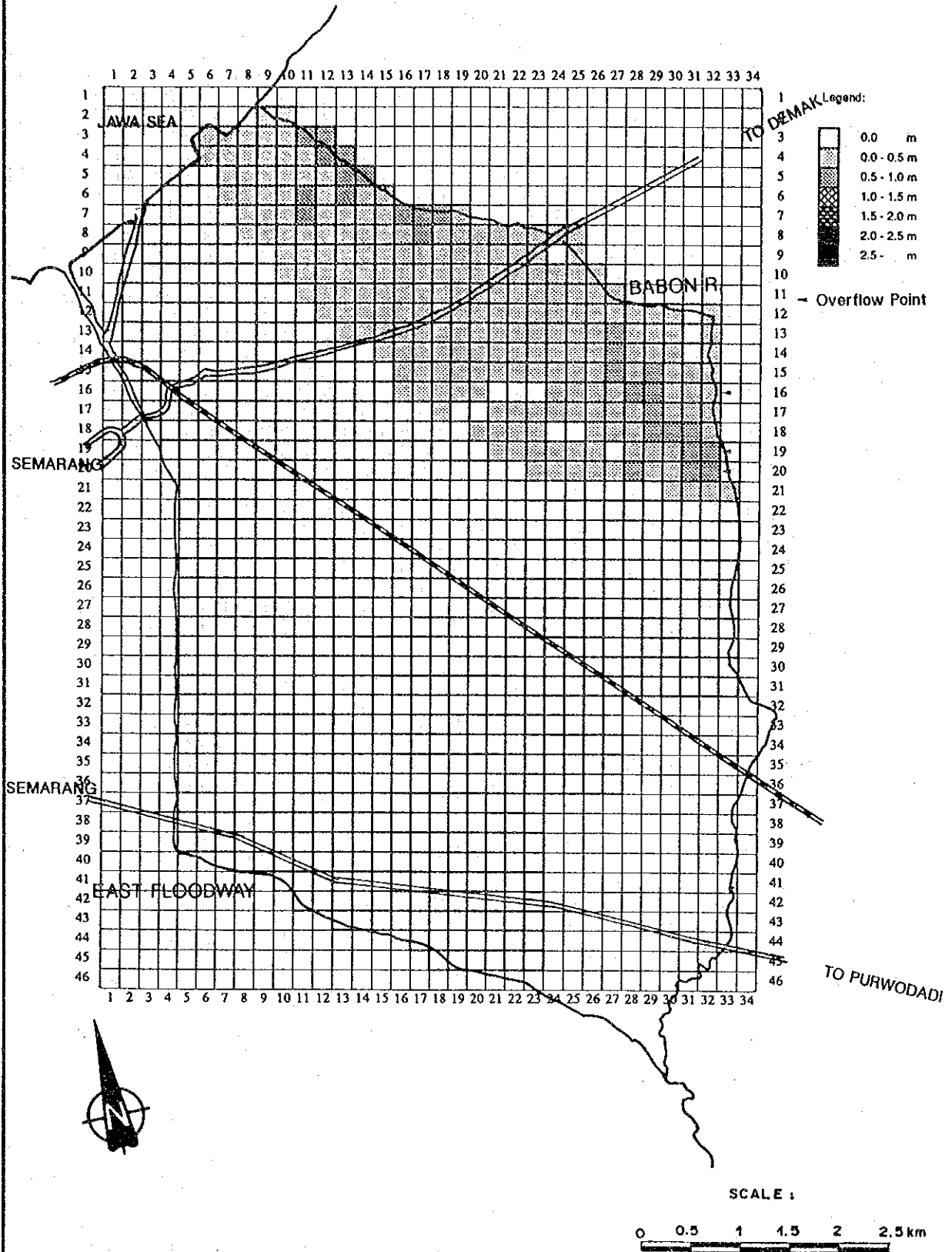
Fig. 4.8 (1/2)
 PROBABLE INUNDATION AREA OF GARANG RIVER
 WITH PROJECT (50-YEAR RETURN PERIOD)



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 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
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Fig. 4.8 (2/2)
 PROBABLE INUNDATION AREA OF GARANG RIVER
 WITH PROJECT (100-YEAR RETURN PERIOD)

Babon, 5 year



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 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
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Fig. 4.9 (1/5)
 PROBABLE INUNDATION AREA OF BABON RIVER.
 (5-YEAR RETURN PERIOD)

Babon, 10 year

