

*TABLES*

Table 1.1 Members of JICA Advisory Committee

Item No.	Name	Designation
1.	Yuichi KATO	Flood Control Planner (Chairman)
2.	Kunihiro YANADA	River Planner (Member)
3.	Kohjiro MATSUMOTO	JICA Coordinator (Member)

Table 1.2 Members of JICA Study Team

Item No.	Name	Designation
1.	Katsuhisa ABE	Team Leader
2.	Hitoshi KIN	Flood Control/River Planner (Asst. Team Leader)
3.	Toshinori OSHITA	Urban Drainage Planner
4.	Shin-ichiro MATSUMOTO	Hydrologist/Hydraulic Engineer/Flood Damage Analyst
5.	Yuichi HATA	Geologist/Soil Mechanics Engineer
6.	Hiroshi SHIMIZU	Structural Design Engineer
7.	Shuji KAKU	Construction Planner/Cost Estimator
8.	Tatsuro TASHINO	Socio-Economist/Project Economist
9.	Tsutomu KURIHARA	Environmental Analyst
10.	Hideo SUGIYAMA	Survey Expert
11.	Akira SASAKI	Coordinator

**Table 1.3 Members of Steering Committee**

Item No.	Name	Designation
1.	Teodoro T. Encarnacion	Undersecretary (Chairman)
2.	Manuel M. Bonoan	Assistant Secretary for Planning (Member)
3.	Antonio A. Alpasan	Project Director/PMO-Major Flood Control and Drainage (Member)
4.	Bienvenido C. Leuterio	Director IV, Bureau of Construction (Member)
5.	Tetsuaki Iwakiri	DPWH-JICA River Expert (Member)

**Table 1.4 Members of Steering Working Group**

Item No.	Name	Designation
1.	Trino-Trinidad G. Meris	Director III, Planning Service (Chairman)
2.	Jose C. Guanzon	Project Manager II, Central Labor Base Unit (Co-Chairman)
3.	Jose Gloria	Project Manager III, PMO-Feasibility Studies (Member)
4.	Manuel S. Alconis	Engineer V, PED-Planning Service (Member)
5.	Sofia T. Santiago	Engineer V, Bureau of Design (Member)
6.	Jaime Magnaye	Engineer IV, DPD-Planning Service (Member)
7.	Resito V. David	Engineer III, PMO-Major Flood Control Projects (Member)
8.	Salvador Passe	Environmental Expert, Environmental Management Bureau, DENR (Member)

Table 1.5 Local Counterpart Personnel

Item No.	Name	Designation
1.	Manuel S. Alconis	Team Leader
2.	Napoleon S. Famadico	River/Flood Control Engineer (Asst. Team Leader)
3.	Rowen Pascua	Urban Drainage Planner
4.	Johnny Montano	Urban Drainage Planner
5.	Carlos P. Zamora	Structural Design Engineer
6.	Aquilina T. Decillos	Cost Estimator/Construction Planner
7.	Emma Fortes	Cost Estimator/Construction Planner
8.	Lirio M. Carla	Socio-Economist
9.	Rolando Aujero	Socio-Economist
10.	Edmundo A. Olaso	Hydro/Hydraulic Flood Damage Analyst
11.	Elmo F. Atillano	Geologist/Soil Mechanics Engineer
12.	Domingo C. Rosario	Survey Expert
13.	Marcelino Tolentino, Jr.	Survey Expert
14.	Belinda I. Fajardo	Environmental Expert
15.	Jesus O. Averilla	Environmental Expert
16.	Rolindo M. Perez	Coordinator

Table 2.1 Mean Monthly Rainfall and Maximum Daily Rainfall in the Study Area

No.	City	Station	Mean monthly rainfall distribution												Annual Rainfall	Max. Daily Rainfall
			Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.		
1	Laoag	Laoag	4.4	2.2	2.0	19.6	137.9	355.4	392.3	516.3	357.0	115.2	37.9	9.3	1,949.5	510.3
2	Iligan	Tuguegarao	26.5	14.2	26.3	47.2	132.6	177.4	218.4	281.1	194.2	286.3	321.7	98.0	1,823.9	746.0
3	Olongapo	Iba	2.3	4.0	13.0	26.2	330.9	636.1	848.8	1,089.8	556.6	258.4	92.7	33.9	3,892.7	471.8
4	Batangas	Ambulong	20.5	7.3	20.9	40.2	152.4	299.3	339.8	344.9	314.5	263.5	221.0	93.3	2,117.6	765.8
5	Lucena	Tayabas	155.1	72.3	72.3	103.2	227.5	257.9	260.6	172.6	316.1	512.7	519.9	413.7	3,083.9	557.7
6	P.Princesa	P.Princesa	29.1	15.4	28.6	42.8	153.4	203.7	191.6	189.9	221.5	215.2	221.5	132.2	1,644.9	269.3
7	Legaspi	Legaspi	293.2	188.6	157.9	153.4	167.9	255.0	266.0	280.9	271.2	340.5	479.9	475.0	3,329.5	484.6
8	Iloilo	Iloilo	39.9	19.1	27.1	47.7	117.9	255.2	313.2	363.7	266.8	264.1	174.8	64.2	1,953.7	303.0
9	Cebu	Macian	78.1	62.3	41.5	29.1	54.8	149.9	157.0	136.5	167.3	148.3	131.4	103.8	1,260.0	374.0
10	Tacloban	Tacloban	281.7	204.1	139.6	118.9	142.4	160.8	167.0	135.5	161.5	197.2	279.0	305.3	2,293.0	204.0
11	Ormoc	Merida	143.0	81.9	84.0	75.9	133.7	155.9	253.2	235.2	241.5	303.0	233.3	173.2	2,113.8	259.1
12	Zamboanga	Zamboanga	43.9	44.2	37.7	51.0	94.8	142.3	135.1	128.5	145.1	192.4	108.7	88.1	1,211.8	193.2
13	Davao	Davao City	104.5	97.1	86.7	146.7	183.7	189.6	148.3	174.7	170.5	170.1	129.1	86.3	1,687.3	174.3

Source: PAGASA

Table 2.2 Population Growth and Density: 1970, 1975, 1980 and 1990 Census

Region Province City/Municipality	Census Population (1000)				Ave. Pop. Growth (%/annum)			Land Area (sq.km.)	1990 Pop. Density (p./km <sup>2</sup> )
	1970	1975	1980	1990	1975/70	1980/75	1990/80		
	<b>Philippines</b>	<b>36,684.5</b>	<b>42,070.7</b>	<b>48,098.5</b>	<b>60,703.2</b>	<b>2.8</b>	<b>2.7</b>	<b>2.4</b>	<b>300,000</b>
<b>I. Ilocos</b>	<b>2,488.4</b>	<b>2,726.2</b>	<b>2,922.9</b>	<b>3,550.6</b>	<b>1.8</b>	<b>1.4</b>	<b>2.0</b>	<b>12,840</b>	<b>277</b>
Ilocos Norte	343.4	371.7	390.7	461.7	1.6	1.0	1.7	3,399	136
Laoag City	61.7	66.3	69.6	83.8	1.4	1.0	1.9	108	779
<b>II. Cagayan Valley</b>	<b>1,463.4</b>	<b>1,665.2</b>	<b>1,919.1</b>	<b>2,340.5</b>	<b>2.6</b>	<b>2.9</b>	<b>2.0</b>	<b>26,838</b>	<b>87</b>
Isabela	648.8	730.4	870.6	1,080.3	2.4	3.6	2.2	10,665	101
Ilagan	62.1	70.1	79.3	99.1	2.4	2.5	2.3	1,394	71
<b>III. Central Luzon</b>	<b>3,615.5</b>	<b>4,210.1</b>	<b>4,802.8</b>	<b>6,199.0</b>	<b>3.1</b>	<b>2.7</b>	<b>2.6</b>	<b>18,231</b>	<b>340</b>
Zambales	343.0	416.3	444.0	563.0	3.9	1.3	2.4	3,714	152
Olongapo City	107.8	147.1	156.4	193.3	6.4	1.2	2.1	103	1,872
<b>IV. Southern Tagalog</b>	<b>4,456.3</b>	<b>5,213.8</b>	<b>6,118.6</b>	<b>8,263.1</b>	<b>3.2</b>	<b>3.3</b>	<b>3.1</b>	<b>46,924</b>	<b>176</b>
Batangas	926.3	1,032.0	1,174.2	1,476.8	2.2	2.6	2.3	3,166	466
Batangas City	108.9	125.4	143.6	185.0	2.9	2.7	2.6	283	654
Quezon	902.9	1,025.9	1,129.3	1,372.4	2.6	1.9	2.0	8,707	158
Luzena City	77.0	92.3	107.9	150.6	3.7	3.2	3.4	69	2,199
Palawan	236.6	300.1	371.8	528.3	4.9	4.4	3.6	14,896	35
Puerto Princesa	37.8	45.7	60.2	92.1	3.9	5.7	4.3	2,107	44
<b>V. Bicol</b>	<b>2,966.9</b>	<b>3,193.7</b>	<b>3,477.0</b>	<b>3,910.0</b>	<b>1.5</b>	<b>1.7</b>	<b>1.2</b>	<b>17,633</b>	<b>222</b>
Albay	674.0	728.8	809.2	903.8	1.6	2.1	1.1	2,553	354
Legaspi City	84.1	88.4	99.8	121.1	1.0	2.5	2.0	154	788
<b>VI. Western Visayas</b>	<b>3,618.3</b>	<b>4,146.4</b>	<b>4,525.6</b>	<b>5,393.3</b>	<b>2.8</b>	<b>1.8</b>	<b>1.8</b>	<b>20,223</b>	<b>267</b>
Iloilo	1,168.0	1,313.0	1,433.6	1,765.5	2.4	1.8	2.1	5,324	332
Iloilo City	209.7	227.0	244.8	309.5	1.6	1.5	2.4	56	5,527
<b>VII. Central Visayas</b>	<b>3,032.7</b>	<b>3,387.3</b>	<b>3,787.4</b>	<b>4,594.1</b>	<b>2.2</b>	<b>2.3</b>	<b>1.9</b>	<b>14,951</b>	<b>307</b>
Cebu	1,634.2	1,818.4	2,091.6	2,646.5	2.2	2.8	2.4	5,088	520
Cebu City	347.1	413.0	490.3	610.4	3.5	3.5	2.2	281	2,173
<b>VIII. Eastern Visayas</b>	<b>2,381.4</b>	<b>2,599.7</b>	<b>2,799.5</b>	<b>3,054.5</b>	<b>1.8</b>	<b>1.5</b>	<b>0.9</b>	<b>21,432</b>	<b>143</b>
Leyte	1,110.6	1,203.1	1,320.6	1,485.8	1.6	1.9	1.2	6,268	237
Tacloban City	84.6	89.5	105.0	136.9	1.1	3.2	2.7	464	295
Ormoc City	76.5	80.7	102.5	129.5	1.1	4.9	2.4	101	1,283
<b>IX. Western Mindanao</b>	<b>1,869.0</b>	<b>2,047.9</b>	<b>2,528.5</b>	<b>3,158.5</b>	<b>1.8</b>	<b>4.3</b>	<b>2.2</b>	<b>18,685</b>	<b>169</b>
Zamboanga del Sur	890.2	1,002.9	1,183.8	1,544.5	2.4	3.4	2.7	8,052	192
Zamboanga City	199.9	265.0	343.7	442.3	5.8	5.3	2.6	1,415	313
<b>XI. Southern Mindanao</b>	<b>2,200.7</b>	<b>2,714.6</b>	<b>3,346.8</b>	<b>4,458.8</b>	<b>4.3</b>	<b>4.3</b>	<b>2.9</b>	<b>31,693</b>	<b>141</b>
Davao del Sur	785.4	936.3	1,133.6	1,482.7	3.6	3.9	2.7	6,378	232
Davao City	392.5	484.7	641.4	849.9	4.3	5.8	2.9	2,211	384

Source: 1) Philippines 1980, Population, Land Area and Density: 1970, 1975 and 1980, NCSO  
 2) 1990 Census of Population and Housing, Report No.2: Population by Province, City and Municipality, National Summary, Philippines, December 1990, NSO

Table 2.3 (1/2) Gross Regional Domestic Product at Current Prices by Region Concerned:  
1985 to 1990

No.	Region	Gross Regional Domestic Product (in Billion Pesos)						GRDP per Capita(Pesos)	
		1985	1986	1987	1988	1989	1990	1985	1990*1
	Philippines	571.9	608.9	685.1	802.5	922.6	1,066.2	10,461	17,565
NCR.	Metro Manila	169.2	185.4	213.9	256.1	302.6	345.9	24,372	43,524
I.	Ilocos	25.3	29.5	31.7	34.7	39.3	43.8	6,478	10,094
II.	Cagayan Valley	14.8	15.0	16.9	19.2	22.2	25.5	5,864	9,437
III.	Central Luzon	53.2	54.6	59.8	70.1	77.2	94.2	9,743	15,192
IV.	Southern Tagalog	79.6	83.8	93.4	109.9	125.3	147.6	11,222	17,863
V.	Bicol	18.3	18.7	19.8	22.8	26.7	30.9	4,663	7,896
VI.	Western Visayas	42.6	44.5	49.2	57.6	65.0	75.4	8,375	13,978
VII.	Central Visayas	35.7	38.3	43.4	51.8	60.5	70.3	8,500	15,309
VIII.	Eastern Visayas	16.2	16.3	18.2	21.7	25.3	28.5	5,280	9,323
IX.	Western Mindanao	18.7	19.7	21.1	23.9	27.2	31.6	6,539	10,013
XI.	Southern Midanao	44.1	45.9	54.4	62.5	68.6	78.3	11,497	17,550
		Percentage Distribution by Region (%)						Ratio of Region to Country of GRDP/capit	
	Philippines	100.0	100.0	100.0	100.0	100.0	100.0	1.00	1.00
NCR.	Metro Manila	29.6	30.4	31.2	31.9	32.8	32.4	2.33	2.48
I.	Ilocos	4.4	4.9	4.6	4.3	4.3	4.1	0.62	0.57
II.	Cagayan Valley	2.6	2.5	2.5	2.4	2.4	2.4	0.56	0.54
III.	Central Luzon	9.3	9.0	8.7	8.7	8.4	8.8	0.93	0.86
IV.	Southern Tagalog	13.9	13.8	13.6	13.7	13.6	13.8	1.07	1.02
V.	Bicol	3.2	3.1	2.9	2.8	2.9	2.9	0.45	0.45
VI.	Western Visayas	7.5	7.3	7.2	7.2	7.0	7.1	0.80	0.80
VII.	Central Visayas	6.2	6.3	6.3	6.5	6.6	6.6	0.81	0.87
VIII.	Eastern Visayas	2.8	2.7	2.7	2.7	2.7	2.7	0.50	0.53
IX.	Western Mindanao	3.3	3.2	3.1	3.0	2.9	3.0	0.63	0.57
XI.	Southern Midanao	7.7	7.5	7.9	7.8	7.4	7.3	1.10	1.00

Source: 1992 Philippine Statistical Yearbook, October 1992, NSCB

Revised estimates as of October 1991

Note: \*1 Applied the 1990 census population

Table 2.3(2/2)

Gross Regional Domestic Product at Current Prices by Region Concerned:  
1985 to 1990(2/2)

No. Region	Gross Regional Domestic Product (in Billion Pesos)						GRDP per Capita(Pesos)	
	1985	1986	1987	1988	1989	1990	1985	1990*1
Philippines	571.9	591.4	619.7	658.5	697.8	712.7	10,461	11,740
NCR. Metro Manila	169.2	175.2	187.2	204.3	222.9	225.4	24,372	28,364
I. Ilocos	25.3	27.2	27.1	28.1	30.0	30.2	6,478	6,956
II. Cagayan Valley	14.8	15.1	15.5	16.1	16.5	16.7	5,864	6,175
III. Central Luzon	53.2	54.2	57.2	61.5	63.9	68.4	9,743	11,033
IV. Southern Tagalog	79.6	82.9	87.9	92.6	99.2	101.3	11,222	12,265
V. Bicol	18.3	18.4	18.1	19.1	20.3	20.5	4,663	5,247
VI. Western Visayas	42.6	43.8	45.3	47.1	49.2	50.1	8,375	9,284
VII. Central Visayas	35.7	37.5	39.7	43.0	44.9	46.6	8,500	10,149
VIII. Eastern Visayas	16.2	16.0	16.2	17.3	17.8	18.1	5,280	5,910
IX. Western Mindanao	18.7	19.4	19.4	19.8	20.5	21.2	6,539	6,711
XI. Southern Mindanao	44.1	45.7	48.7	49.6	50.8	50.8	11,497	11,401
							Average Growth Rate of GRDP per Capita: 1990/1985 (%/annum)	
							Annual Growth Rate (%)	
Philippines	-7.3	3.4	4.8	6.3	6.0	2.1		2.3
NCR. Metro Manila	-9.1	3.5	6.9	9.1	9.1	1.2		3.1
I. Ilocos	0.3	7.7	-0.4	3.8	6.5	0.7		1.4
II. Cagayan Valley	-10.4	2.1	2.8	3.9	2.6	0.8		1.0
III. Central Luzon	-5.7	2.0	-5.6	7.4	3.8	7.1		2.5
IV. Southern Tagalog	-8.4	4.2	6.0	5.3	7.1	2.2		1.8
V. Bicol	-5.1	0.4	-1.6	6.0	6.0	1.1		2.4
VI. Western Visayas	-8.2	2.8	3.3	4.0	4.3	1.9		2.1
VII. Central Visayas	-10.3	5.2	5.9	8.3	4.3	3.9		3.6
VIII. Eastern Visayas	-7.4	-1.1	1.1	6.6	2.9	1.5		2.3
IX. Western Mindanao	-7.1	3.4	0.0	2.1	3.9	3.2		0.5
XI. Southern Mindanao	-4.5	3.6	6.6	1.9	2.4	0.1		-0.2

Source: 1992 Philippine Statistical Yearbook, October 1992, NSCB

Revised estimates as of October 1991

Note: \*1 Applied the 1990 census population



**Table 2.4 (1/2) Population and Density by Urban/Rural Area in 13 Selected Cities:  
1990 Census**

City	Urban/Rural Area	Land Area (ha)	1990 Census Population			Density (p./ha)	Number of Households (Families)
			Urban (persons)	Rural (persons)	Total (persons)		
1. Laoag City		10,750	38,875	44,881	83,756	7.8	16,866
	1 Poblacion (City Proper)	520	37,624	-	37,624	72.4	7,610
	2 Other Urban Area	148	1,251	-	1,251	8.5	246
	3 Rural Area	10,083	-	44,881	44,881	4.5	9,010
2. Ilagan		139,360	22,261	76,859	99,120	0.7	18,891
	1 Poblacion (City Proper)	518	12,419	-	12,419	24.0	2,269
	2 Other Urban Area	1,512	9,842	-	9,842	6.5	1,822
	3 Rural Area	137,330	-	76,859	76,859	0.6	14,800
3. Olongapo City		10,330	193,327	-	193,327	18.7	42,623
	1 Poblacion (City Proper)	10,330	193,327	-	193,327	18.7	42,623
	2 Other Urban Area	0	-	-	-	-	-
	3 Rural Area	0	-	-	-	-	-
4. Batangas City		28,300	90,748	94,222	184,970	6.5	35,048
	1 Poblacion (City Proper)	195	19,401	-	19,401	99.5	3,836
	2 Other Urban Area	2,871	71,347	-	71,347	24.9	13,423
	3 Rural Area	25,234	-	94,222	94,222	3.7	17,789
5. Lucena City		6,850	150,624	-	150,624	22.0	29,240
	1 Poblacion (City Proper)	6,850	150,624	-	150,624	22.0	29,240
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	-	-	-	-	-	-
6. Puerto Princesa City		210,670	47,917	44,230	92,147	0.4	17,616
	1 Poblacion (City Proper)	1,470	32,040	-	32,040	21.8	5,903
	2 Other Urban Area	1,098	15,877	-	15,877	14.5	3,132
	3 Rural Area	208,102	-	44,230	44,230	0.2	8,581
7. Legaspi City		15,370	83,226	37,890	121,116	7.9	22,222
	1 Poblacion (City Proper)	3,627	83,226	-	83,226	22.9	15,340
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	11,743	-	37,890	37,890	3.2	6,882
8. Iloilo City		5,600	309,505	-	309,505	55.3	56,617
	1 Poblacion (City Proper)	5,600	309,505	-	309,505	55.3	56,617
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	-	-	-	-	-	-
9. Cebu City		28,090	610,417	-	610,417	21.7	114,708
	1 Poblacion (City Proper)	28,090	610,417	-	610,417	21.7	114,708
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	-	-	-	-	-	-

Table 2.4 (2/2) Population and Density by Urban/Rural Area in 13 Selected Cities:  
1990 Census

City	Urban/Rural Area	Land Area (ha)	1990 Census Population			Density (p./ha)	Number of Households (Families)
			Urban (persons)	Rural (persons)	Total (persons)		
10.	Tacloban City	10,090	136,891	-	136,891	13.6	24,897
	1 Poblacion (City Proper)	10,090	136,891	-	136,891	13.6	24,897
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	-	-	-	-	-	-
11.	Ormoc City	46,430	58,393	71,063	129,456	2.8	24,895
	1 Poblacion (City Proper)	67	14,833	-	14,833	221.4	2,850
	2 Other Urban Area	6,842	43,560	-	43,560	6.4	8,235
	3 Rural Area	39,521	-	71,063	71,063	1.8	13,810
12.	Zamboanga City	141,470	354,814	87,531	442,345	3.1	81,321
	1 Poblacion (City Proper)	36,414	354,814	-	354,814	9.7	64,834
	2 Other Urban Area	-	-	-	-	-	-
	3 Rural Area	105,056	-	87,531	87,531	0.8	16,487
13.	Davao City	221,130	624,757	225,190	849,947	3.8	159,976
	1 Poblacion (City Proper)	3,690	254,536	-	254,536	69.0	48,358
	2 Other Urban Area	12,941	370,221	-	370,221	28.6	69,536
	3 Rural Area	204,499	-	225,190	225,190	1.1	42,082

Source: 1) 1990 Census of Population and Housing, Report 2-39A, Ilocos Norte, NSO  
2) 1990 Census of Population and Housing, Report 2-43B, Isabela, NSO  
3) 1990 Census of Population and Housing, Report 2-99C, Zambales, NSO  
4) 1990 Census of Population and Housing, Report 2-71C, Olongapo City, NSO  
5) 1990 Census of Population and Housing, Report 2-13D, Batangas, NSO  
6) 1990 Census of Population and Housing, Report 2-73D, Palawan, NSO  
7) 1990 Census of Population and Housing, Report 2-80D, Quezon, NSO  
8) 1990 Census of Population and Housing, Report 2-5E, Albay, NSO  
9) 1990 Census of Population and Housing, Report 2-41F, Iloilo, NSO  
10) 1990 Census of Population and Housing, Report 2-42F, Iloilo City, NSO  
11) 1990 Census of Population and Housing, Report 2-25G, Cebu, NSO  
12) 1990 Census of Population and Housing, Report 2-29G, Cebu City, NSO  
13) 1990 Census of Population and Housing, Report 2-51H, Leyte, NSO  
14) 1990 Census of Population and Housing, Report 2-102I, Zamboanga del Sur, NSO  
15) 1990 Census of Population and Housing, Report 2-100I, Zamboanga City, NSO  
16) 1990 Census of Population and Housing, Report 2-32K, Davao del Sur, NSO  
17) 1990 Census of Population and Housing, Report 2-33K, Davao City, NSO  
18) 1990 Census Maps, NSO

Table 2.5 Status of Land Classification by Province including Target City:  
1991

Region	Total Land Area	Agriculture	Forestry	Pasture	Settlements	(unit: sq.km.)		
						Mining and Quarrying	Inland Fishery	Open Land*
Philippines	300,000	88,443	114,753	7,082	7,197	882	6,758	74,885
NCR Metro Manila	636	40	-	-	590	-	6	-
I. Ilocos	21,568	3,755	6,660	293	690	642	489	9,039
II. Cagayan Valley	36,403	5,314	18,664	813	294	-	784	10,714
III. Central Luzon	18,231	7,309	3,405	485	563	-	842	5,627
IV. Southern Tagalog	46,924	14,614	20,813	1,006	724	14	1,431	8,322
V. Bicol	17,633	8,273	3,791	1,830	422	-	68	3,249
VI. Western Visayas	20,223	7,846	4,080	213	903	106	447	6,628
VII. Central Visayas	14,951	5,737	2,416	185	921	12	33	5,647
VIII. Eastern Visayas	21,432	5,787	8,495	97	339	-	84	6,630
IX. Western Mindanao	18,685	8,472	5,217	171	346	-	332	4,147
X. Southern Mindanao	31,693	6,021	17,054	1,006	581	-	245	6,786

Source: Handbook on Land and Other Physical Resources, 1984, National Land Use Committee, NEDA

Note: \* Open Land refers to residual land with low potentials for development but may still be devoted to any of the broad land uses.

Table 2.6 Summary of Flood Conditions

(1982 - 1992)

	URBAN CENTER	MAJOR CAUSES OF FLOOD	MAXIMUM DAILY RAINFALL		FLOOD CONDITIONS			REMARKS
			DATE	DEPTH (mm.)	AREA (ha.)	DEPTH (cm.)	DURATION (hr.)	
1.	Laoag	- overbank flow of river - inadequate drainage system	09/09/89	437	210	200	12	
2.	Iligan	- overbank flow of river	01/08/86	345	46	60-250	5-48	
3.	Olongapo	- overbank flow of river due to volcanic ash siltation - inadequate drainage system	20/06/85	422	26	30-125	2-8	
4.	Batangas	- overbank flow of river - inadequate drainage system	24/08/90	284	118	100-120	12	
5.	Lacena	- overbank flow of river - inadequate drainage system	14/07/83	254	11	30-120	0.3-24	
6.	Puerto Princesa	- inadequate drainage system	30/09/83	226	19	15-30	1-3	
7.	Legaspi	- overbank flow of river due to volcanic ash siltation - inadequate drainage system	14/02/89	254	316	30-100	8-24	
8.	Iloilo	- overbank flow of river - inadequate drainage system	05/11/84	256	1,004	30-200	1-24	
9.	Cebu	- overbank flow of river - inadequate drainage system	19/12/91	374	187	30-50	1-3	
10.	Tacloban	- overbank flow of river - inadequate drainage system	12/03/91	204	79	10-100	6-48	
11.	Ormoc	- overbank flow of river - inadequate drainage system	Not Avail.		200	50-300	0.5-1	
12.	Zamboanga	- overbank flow of river - inadequate drainage system	29/09/90	193	112	10-210	0.3-24	
13.	Davao	- overbank flow of river - inadequate drainage system	08/10/85	150	57	20-150	1-24	

Note:

- (1) Source: DPWH District Office/City Engineer's Office (by interview)
- (2) Flood Conditions indicated only within the city proper

Table 2.7 Summary of Flood Damage

(1982 - 1992)

Chartered City	Casualty		Population Affected		Homeless		Houses Destroyed		Infra-Structure (Mill. Pesos)	Crops		Private Properties (Mill. Pesos)
	Dead	Injured	Families	Persons	Families	Persons	Totally	Partially		Livestocks	Fishes	
1. Laoag City	4	5	22,080	98,497	230	1,380	230	4,009	83,282	13,166		7,407
2. Ilagan, Isabela												
3. Olongapo City	12	6	10,468	55,508	188	1,128	188	564	11,384			
4. Batangas City	18	1	3,549	19,126	1,387	8,322	1,387	562	42,830	3,700		2,200
5. Lucena City	2	-	2,429	11,432	1	6	1	-	12,280			
6. P. Princessa City	4	4	2,877	13,938	1,117	6,702	1,117	1,508				
7. Legaspi City	37	51	44,647	251,442	15,623	93,738	15,623	13,461	15,081	17,106		1,861
8. Iloilo City	2	10	22,011	130,321	4,022	24,132	4,022	17,857	151,198	129,175		16,218
9. Cebu City	49	66	123,026	638,209	30,091	180,546	30,091	81,078	104,224	0,728		172,881
10. Tacloban City	23	35	32,318	188,557	7,951	47,706	7,951	32,318	29,589	309,500		64,300
11. Ormoc City	4,561	84	39,691	238,309	3,193	19,158	3,193	12,470	411,959	40,100		108,010
12. Zamboanga City	3	50	1,488	8,083	160	960	160	377	57,710	7,656		27,300
13. Davao City	10	4	5,257	13,875	139	834	139	1,551	6,524			5,244

Source: Office of Civil Defence (OCD), DND

Table 2.8 Existing Flood Control Structures/Works

Name of City	Name of River	Flood Control Facilities						
		Dike	Revetment/Wall	Dredging	Super Dike	Others	Length (m)	Type
Laong	Laong	--	Rb. Conc.	2,754	381	4	4	closing dike 1,370m cut-off 3,340m
Dagan	Dagan	--	Rb. Conc.	100	--	1	--	--
Olongapo	Sra Rita	--	Rb. Conc.	1,284	--	--	--	--
Batangas	Kalumpang	--	Rb. Conc.	765	--	--	--	--
Luzon	Tuyabas-Iyam	--	Rb. Conc.	145	--	--	--	--
	Tuyabas-Dunaga	--	Rb. Conc.	868	--	--	--	--
Puerto Princesa		--	--	--	--	--	--	--
Legaspi	Yawa	--	Rb. Conc.	2,925	--	--	--	--
	Macabalo	--	Rb. Conc.	N/A	--	--	--	--
Iloilo	Jaro	--	Rb. Conc.	2,585	--	--	--	--
Cebu	Subangtaku	--	Rb. Conc.	N/A	1,900	--	--	--
	Lahug	Earth	Rb. Conc.	N/A	3,250	--	--	--
	Gudalupe	Boulder	Rb. Conc.	N/A	1,500	--	--	--
	Kinalanasan	--	Rb. Conc.	N/A	--	--	--	--
	Blacio	--	Rb. Conc.	N/A	--	--	--	--
Tacloban	Mangonbangon	--	Rb. Conc.	2,170	1,482	--	--	--
	Abucay	--	Rb. Conc.	N/A	--	--	--	--
Ormoc	Anilao	Earth	Rb. Conc.	1,073	500	--	--	--
		--	Gabion	350	--	--	--	--
	Malbasag	--	Rb. Conc.	767	--	--	--	--
Zamboanga	Tunaga	--	Rb. Conc.	460	--	--	--	--
Davao	Davao	--	Rb. Conc.	2,316	--	--	--	--

Table 2.9. Existing Drainage Facilities

Name of City	City Proper Area (ha)	Drainage Area (ha)	Covering Ratio (%)	Drainage Facilities (Pipe/channel)					Total (m)	Others
				Channel (m)	Main (m)	Secondary (m)	Tertiary (m)			
Laoag	520	165	31.7	2,030	2,778	10,340	7,590	22,738		
Iligan	518	51	9.8		920	100	13,090	14,110		
Olongapo	10,330	30	0.3	3,352	674	3,196		7,222		
Batangas	195	64	32.8		2,270	3,169		5,439		
Lucena	6,850	37	0.5		5,560	1,600		7,160		
Puerto Princesa	1,470	165	11.2		1,930	1,950		3,880		
Legaspi	3,627	73	2.0		4,080	2,925		7,005		
Iloilo	5,600	454	8.1		3,800	24,150		27,950		
Cebu	28,090	319	1.1	2,200	11,200	3,260	39,190	55,850	Diversion L=900m	
Tacloban	10,090	164	1.6	2,600	5,400	3,900	1,700	13,600		
Ormoc	67	44	65.7	580	1,100	1,810		3,490		
Zamboanga	36,414	119	0.3	7,250	1,700	9,540		18,490		
<b>Davao</b>	<b>3,690</b>	<b>876</b>	<b>23.7</b>	<b>15,019</b>	<b>2,790</b>	<b>1,080</b>		<b>18,889</b>		

Covering Ratio = Drainage Service area / City Proper Area x 100 (%)

Table 2.10 Prioritization of Flood Control and Drainage Project

Priority Factor	(1) Laoag	(2) Iligan	(3) Olongapo	(4) Butangar	(5) Lucena	(6) Puerto Prinsesa	(7) Legaspi	(8) Iloilo	(9) Cebu	(10) Tacloban	(11) Ormoc	(12) Zamboanga	(13) Davao
<b>1. NECESSITY</b>	3	2	2	2	2	1	3	3	2	2	3	2	2
(1) Flood Area	3	1	1	2	1	1	3	3	2	1	3	2	1
(2) Flood Depth	3	3	2	3	2	1	2	3	1	2	3	3	2
(3) Flood Duration	2	3	2	2	3	2	3	3	2	3	1	3	3
(4) Population Affection	2	1	2	1	1	1	3	3	3	3	3	1	1
<b>2. URGENCY</b>	3	3	3	2	3	2	3	2	3	3	3	3	3
(1) River Capacity	3	3	3	3	3	1	3	2	2	3	3	3	3
(2) Drainage Development	3	3	3	2	3	3	3	3	3	3	1	3	3
(3) Casualties	1	1	1	1	1	1	2	1	2	2	3	2	1
<b>3. BENEFIT</b>	1	1	1	1	1	1	1	2	2	3	3	1	1
(1) Total Amount	2	1	1	1	1	1	1	3	3	3	3	2	1
(2) Amount per Capita	1	1	1	1	1	1	1	1	1	1	3	1	1
<b>4. REGIONAL EQUALITY</b>	3	2	3	3	3	2	3	3	3	3	3	3	3
(1) River Project	3	3	3	3	3	1	3	3	3	3	3	3	3
(2) Drainage Project	3	1	3	3	3	2	3	2	2	2	3	3	2
Integrated Evaluation	10	8	9	8	9	6	10	10	10	11	12	9	9



**Table 3.1 Subbasins of the Rivers in the Master Plan Area**

Urban Center	River	Subbasin	Catchment Area (km <sup>2</sup> )	River Length (km)		
Iloilo	Iloilo	IL-1	39.7	11.3		
		IL-2	27.5	13.5		
		IL-3	16.0	4.0		
		IL-4	9.9	9.6		
		Sub-total	93.1	38.4		
	Jaro	JA-1	117.8	23.4		
		JA-2	82.4	20.5		
		JA-3	13.1	12.4		
		JA-4	100.4	38.9		
		JA-5	66.4	15.5		
		JA-6	32.0	11.5		
	Sub-total	412.1	122.2			
	Cebu	Bulacao	BU-1	5.5	5.0	
			BU-2	5.2	4.9	
Sub-total			10.7	9.9		
Kinalumsan		KI-1	10.6	7.5		
		KI-2	7.2	4.2		
		Sub-total	17.8	11.7		
Guadalupe		GU-1	14.4	6.6		
		GU-2	1.9	2.0		
		Sub-total	16.3	8.6		
Lahug		LA-1	4.4	5.7		
		LA-2	1.9	2.5		
		Sub-total	6.3	8.2		
Subang Daku		SU-1	6.4	4.8		
		SU-2	6.2	4.0		
	Sub-total	12.6	8.8			
Ormoc	Anilao	AN-1	8.4	5.5		
		AN-2	8.7	7.0		
		AN-3	1.2	1.8		
		AN-4	6.9	10.5		
		Sub-total	25.2	24.8		
	Malbasag	MA-1	5.6	5.7		
		MA-2	5.5	5.0		
		Sub-total	11.1	10.7		
		Tacloban	Burayan	BU-1	3.6	2.5
				BU-2	2.9	2.4
Sub-total	6.5			4.9		
Mangonbangon	MA-1		4.0	2.8		
	MA-2		0.9	2.5		
	Sub-total		4.9	5.3		
Abucay	AB-1	2.1	2.4			
	AB-2	0.3	0.5			
	Sub-total	2.4	2.9			

**Table 3.2(1/2) Design Discharge of Urban Drainage Area  
(Iloilo & Cebu)**

City	Channel No.	Drainage Area (km <sup>2</sup> )	Channel Length (m)	Drain Length (m)	Average Velocity (m/s)	Time of Conocat. (min)	Rainfall Intensity (mm/hr)					Runoff Coeff.	Design Discharge (m <sup>3</sup> /s)					Spec. Discharge (m <sup>3</sup> /s/km <sup>2</sup> )	
							1-yr	2-yr	3-yr	5-yr	10-yr		1-yr	2-yr	3-yr	5-yr	10-yr	3-yr	5-yr
<b>Iloilo</b>																			
	<b>1. Ilogore Creek</b>																		
	Is-1	8.02	3,600	7,500	1.2	114.2	19	35	39	48	57	0.44	18.7	34.0	38.5	47.1	55.8	4.8	5.9
	Is-2	3.31	1,300	3,900	1.2	64.2	27	52	58	70	82	0.44	17.6	33.5	37.5	45.2	53.2	7.1	8.5
	<b>2. Bo. Obbrero Creek</b>																		
	Bo-1	3.89	800	4,700	0.8	107.9	20	36	41	50	59	0.57	12.2	22.3	25.2	30.8	36.5	6.5	7.9
	Bo-2	2.30	1,300	3,900	0.8	91.3	22	41	46	56	66	0.58	8.2	15.1	17.0	20.7	24.5	7.4	9.0
	Bo-3	1.25	2,600	2,600	0.8	64.2	27	52	58	70	82	0.61	5.7	10.9	12.2	14.7	17.3	9.8	11.8
	<b>3. Rizal Creek</b>																		
	Ri-1	0.50	2,000	2,000	1.2	37.8	35	69	77	91	107	0.61	2.9	5.9	6.5	7.7	9.0	13.0	15.5
<b>Cebu</b>																			
	<b>1. Mabolo Creek</b>																		
	Ma-1 (Lahug Diversion)	3.28	3,900	3,900	3.0	31.7	33	78	89	105	124	0.68	20.5 (3.2)	44.0 (3.2)	49.7 (3.2)	58.5 (3.2)	#REF! 3.2	17.9	21.1
	<b>2. Lahug Tributary</b>																		
	La-1	0.65	1,000	1,900	1.5	31.1	33	78	89	106	124	0.61	3.7	8.6	9.8	11.7	13.7	15.1	18.0
	La-2	0.22	900	900	1.5	20.0	42	95	107	125	144	0.63	1.6	3.7	4.1	4.8	5.6	18.8	21.8
	<b>3. Tinago Creek</b>																		
	Ti-1	1.10	400	2,700	2.0	32.5	32	77	87	104	122	0.74	7.3	17.3	19.8	23.6	27.7	18.0	21.4
	Ti-2	0.90	600	2,300	2.0	29.2	35	81	92	109	128	0.77	6.7	15.6	17.7	21.0	24.5	19.7	23.3
	Ti-3	0.43	1,700	1,700	2.0	24.2	38	88	100	117	136	0.80	3.7	8.4	9.5	11.2	13.0	22.2	26.0
	<b>4. Pahina Central - Kalubihan Drainage Main</b>																		
	Pa-1	1.00		2,250	3.5	20.7	41	94	106	123	143	0.80	9.2	20.9	23.5	27.4	31.7	23.5	27.4
	<b>5. Calamba Drainage Main</b>																		
	Ca-1	0.79		2,000	4.5	17.4	45	101	113	130	150	0.73	7.2	16.1	18.0	20.7	23.9	22.8	26.3
	<b>6. Sta. Teresita Village Drainage Main</b>																		
	St-1	3.80	200	3,200	4.0	23.3	39	90	101	118	138	0.38	15.6	35.9	40.6	47.5	55.2	10.7	12.5
	St-2	2.94	3,000	3,000	4.0	22.5	40	91	103	120	139	0.33	10.7	24.5	27.7	32.3	37.5	9.4	11.0
	<b>7. Basak-san Nicolas Drainage Main</b>																		
	Bas-1	0.67		1,200	4.5	14.4	49	107	119	136	157	0.69	6.2	13.7	15.3	17.5	20.1	22.8	26.1
	<b>8. Sto. Nino Creek</b>																		
	Sto.-1	5.11	600	5,200	2.0	53.3	23	58	67	82	98	0.42	14.0	34.4	39.8	48.9	58.2	7.8	9.6
	Sto.-2	3.82	4,600	4,600	2.0	48.3	25	61	71	86	103	0.37	9.9	24.1	27.8	33.9	40.3	7.3	8.9
	<b>9. Barangay Inayawan Drainage Channel</b>																		
	Bar.-1	1.29		1,600	3.0	18.9	43	98	110	127	147	0.66	10.2	23.1	25.9	30.0	34.7	20.1	23.3

Table 3.2(2/2) Design Discharge of Urban Drainage Area  
(Ormoc & Tacloban)

City	Channel No.	Drainage Area (km <sup>2</sup> )	Channel Length (m)	Drain Length (m)	Average Velocity (m/s)	Time of Concen. (min)	Rainfall Intensity (mm/hr)					Runoff Coeffi.	Design Discharge (m <sup>3</sup> /s)					Spec. Discharge (m <sup>3</sup> /s/km <sup>2</sup> )	
							1-yr	2-yr	3-yr	5-yr	10-yr		1-yr	2-yr	3-yr	5-yr	10-yr	3-yr	5-yr
<b>Ormoc</b>																			
	1. Lotao Creek																		
	Lot-1	1.03	500	1,700	1.7	26.7	26	48	58	68	229	0.49	3.6	6.8	8.1	9.5	32.1	7.8	9.3
	Lot-2	0.44	1,200	1,200	1.7	21.8	29	54	64	76	259	0.54	1.9	3.6	4.2	5.0	17.1	9.7	11.4
	2. City Proper Creek																		
	Cit-1	0.32	900	900	2.2	16.8	33	62	74	87	303	0.69	2.0	3.8	4.5	5.4	18.6	14.2	16.8
<b>Tacloban</b>																			
	1. Abucay River																		
	Abu-1	2.38	2,400	2,400	1.2	43.3	40	63	68	77	87	0.44	11.6	18.2	19.8	22.5	25.4	8.3	9.5
	2. Naga-naga Creek																		
	Nag-1	1.21	600	2,800	1.0	56.7	33	53	59	67	76	0.48	5.4	8.6	9.4	10.8	12.3	7.8	9.0
	Nag-2	1.00	2,200	2,200	1.0	46.7	38	60	65	75	84	0.48	5.1	8.0	8.7	9.9	11.2	8.7	9.9
	3. Mangonbanga River																		
	Man-1	5.12	4,900	4,900	1.4	68.3	29	47	52	60	69	0.45	18.8	30.3	33.3	38.5	43.9	6.5	7.5
	4. Langhas Lirang Creek																		
	Lan-1	4.38	4,100	4,100	1.3	62.6	31	50	55	63	72	0.47	17.9	28.7	31.5	36.3	41.3	7.2	8.3
	5. Sagkahan Creek																		
	Sag-1	0.14	500	500	1.5	15.6	66	98	104	114	125	0.62	1.6	2.4	2.5	2.7	3.0	18.0	19.6
	6. Pleasantville Creek																		
	Ple-1	1.25	500	1,600	1.0	36.7	44	68	74	84	94	0.52	7.9	12.4	13.4	15.1	17.0	10.7	12.1
	Ple-2	0.88	600	1,100	1.0	28.3	51	78	84	93	104	0.49	6.1	9.3	10.0	11.2	12.5	11.4	12.7
	Ple-3	0.37	500	500	1.0	18.3	62	92	99	108	120	0.45	2.9	4.3	4.6	5.0	5.5	12.4	13.6
	7. Burayan River																		
	Bur-1	6.90	5,200	5,200	0.8	118.3	19	32	35	42	48	0.43	15.9	26.2	29.1	34.3	39.6	4.2	5.0
	Bur-3	1.41	2,300	2,300	0.8	57.9	33	53	58	66	75	0.45	5.8	9.3	10.2	11.7	13.3	7.2	8.3

Table 3.3 Soil Grading for Embankment Materials

Name of Soil	Soil Classification (classified by plasticity chart)	Evaluation	Attention to Construction	Counter Measure
Coarse soil	Gravel	Suitable	Too high permeability	Cut-off of water Sodding
	Gravelly soil	Suitable		
	Sand	Suitable	Erosion of slopes by high permeability	Cut-off of water Sodding
	Sandy soil	Suitable		
Fine soil	Silt	Suitable	A case contained water, difficult compaction by mechanical earth work	Drying, Soil stabilization
	Clay			
	Volcanic clay			
	Organic soil	Necessary counter measure	For highly water content, difficult compaction and plastic by mechanical earth	Lowering of water content Soil stabilization Mechanical stabilization
	Highly organic soil	Unsuitable	Highly water content Impossible compaction Highly compressibility Instability by wet and drying	

Table 3.4 Population Density and Average Family Size at 1990 Census

Province/City	1990 Census Population	Land Area (ha)	Density (Persons/ha)	Number of Households	Family Size (Persons/Family)
1. Iloilo Province	1,762,604	532,400	3	320,499	5.50
Iloilo City	307,620	5,600	55	56,617	5.43
- Arevalo	25,064	414	61	4,581	5.47
- City Proper	56,103	236	237	10,774	5.21
- Jaro	79,326	2,441	32	14,642	5.42
- La Paz	66,186	939	71	12,242	5.41
- Mandurriao	29,752	1,201	25	5,237	5.68
- Molo	51,189	369	139	9,141	5.60
2. Cebu Province	2,638,290	508,840	5	506,109	5.21
Cebu City	604,630	28,090	22	114,708	5.27
- Cebu Urban	541,674	4,820	112	102,446	5.29
- Cebu Rural	62,956	23,270	3	12,262	5.13
3. Leyte Province	1,483,563	626,830	2	287,872	5.15
Tacloban City	136,415	10,090	14	24,897	5.48
Ormoc City	129,224	46,430	3	24,895	5.19
- Ormoc Urban*1	42,612	377	113	8,053	5.29
City Proper	14,761	96	154	2,850	5.18
Outskirts	27,851	281	99	5,203	5.35
- Ormoc Rural	86,612	46,053	2	16,842	5.14
Rural Core*2	15,992	-	-	3,119	5.13
Rural Area	70,620	-	-	13,723	5.15
4. Total of 4 Cities	1,177,889	90,210	13	221,117	5.33

Source: (1) Cebu City Profile 1993 (City Mayor's Office)

(2) City Development Plan, Ormoc City (City Planning and Development Office)

(3) 1990 Census of Population and Housing, Cebu, Iloilo and Leyte (NSO)

Note: \*1 The following 38 Barangays are located in urbanized areas:

29 Barangays in City Proper; Aletria; Bagong Buhay; Batuan; Can-adieng; Cogon; Dona Feliza Mejia; Don Felipe Larrazabal; Punta; and San Isidro.

\*2 Counted as urban population in the 1990 census.

**Table 3.5 Present Land Use in Selected Four Cities**

Land Use Category	Iloilo*1		Cebu		Tacloban		Ormoc	
	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)
<b>1. Built-up Area</b>								
1) Residential Area	1,713.7	30.6	2,293.5	66.0	328.7	17.9	332.7	32.0
2) Commercial Area	297.1	5.3	545.9	15.7	128.8	7.0	29.3	2.8
3) Institutional Area	268.2	4.8	113.9	3.3	130.6	7.1	69.7	6.7
4) Industrial Area	120.0	2.1	154.7	4.5	-	-	4.2	0.4
Sub-total	2,399.0	42.8	3,108.0	89.4	588.1	31.9	435.9	41.9
<b>2. Natural/Green Space Area</b>								
1) Park, Open-spaces, etc.	76.1	1.4	147.4	4.2	35.6	1.9	12.4	1.2
2) Agricultural Land	2,887.0	51.6	0.0	0.0	-	-	-	-
- Crop Field	1,853.5	33.1	0.0	0.0	-	-	-	-
- Upland Field	256.8	4.6	0.0	0.0	-	-	-	-
- Fishpond, Saltbeds	776.7	13.9	0.0	0.0	-	-	-	-
3) Not Identified	237.9	4.2	219.6	6.3	1,217.7	66.1	590.8	56.9
Sub-total	3,201.0	57.2	367.0	10.6	1,253.3	68.1	603.2	58.1
<b>3. Total</b>	<b>5,600.0</b>	<b>100.0</b>	<b>3,475.0</b>	<b>100.0</b>	<b>1,841.4</b>	<b>100.0</b>	<b>1,039.1</b>	<b>100.0</b>

Source: \*1 The land use was identified with the topographic map which drawn as the survey results of JICA in 1994.

\*2 The land use was identified with the topographic map of the scale of 1:50,000 in 1993.

\*3 Covering the town proper and its surrounding areas demarcated by the Ormoc City Government.

**Table 3.6 Number of Dwelling Units by Year Built and by Building Type in Urban Areas: 1980**

Year Built	Iloilo Province			Cebu Province			Leyte Province		
	Type I	Type II	Type III	Type I	Type II	Type III	Type I	Type II	Type III
1976 - 1980	1,564	4,399	12,140	1,719	14,742	26,412	866	3,491	17,000
1971 - 1975	1,477	5,655	8,878	1,660	14,820	17,855	862	2,665	7,320
1961 - 1970	1,108	9,268	8,404	1,833	24,576	19,749	654	4,381	6,874
1951 - 1960	564	5,676	4,167	656	14,174	11,852	246	3,131	3,945
1942 - 1950	235	1,434	2,582	235	5,286	5,327	85	1,422	1,524
1941 or Earlier	151	694	323	65	2,394	2,520	94	1,154	985
Total	5,099	27,126	36,494	6,168	75,992	83,715	2,807	16,244	37,648
Grand Total		68,719			165,875			56,699	
- Weighted Average of Year Built	1968	1965	1968	1969	1965	1967	1969	1963	1970
- Average Age(yrs)	12	15	12	11	15	13	11	17	10
- Average Age of All Types		13			14			12	

Source: 1980 Census of Population and Housing: Iloilo, Cebu and Leyte, NSO, NEDA

Note: Building types are classified on the basis of construction materials as follows:

	Outer Walls	Roof
Type I	Galvanized iron, Concrete, tile, etc.	Galvanized iron, Concrete, tile, etc.
Type II	Wood, Plywood, Mixed, Asbestos, etc.	Asbestos
Type III	Cogon, Nipa, Salvaged materials, etc.	Cogon, Nipa, Salvaged materials, etc.

**Table 3.7 Number of Dwelling Units by Type of Unit and by Floor Area: 1980**

Floor Area (sq.m.)	Iloilo City			Cebu City			Tacloban City		
	Single House	Duplex	Others	Single House	Duplex	Others	Single House	Duplex	Others
Less than 30	16,087	327	547	39,978	725	3,977	8,443	77	339
30 - 49	10,836	431	442	17,301	617	1,379	3,698	75	155
50 - 69	4,052	283	228	6,295	392	738	1,929	35	189
70 - 99	3,003	168	230	4,757	402	549	825	45	99
100 - 149	2,132	334	189	4,531	381	510	654	31	49
150 - 199	1,249	116	81	2,244	182	172	308	5	28
200 - 249	660	90	81	1,443	75	111	188	19	30
250 - 299	451	35	15	771	15	81	114	10	10
300 & Over	490	49	34	937	30	177	152	5	52
Total	38,960	1,833	1,847	78,257	2,819	7,694	16,311	302	951
Grand Total		42,640			88,770			17,564	
Weighted Average of Floor Area (sq.m.)									
- Each Type	54	89	71	50	72	53	44	78	73
- All Types		56			51			46	

Source: 1980 Census of Population and Housing: Iloilo, Cebu and Leyte, NSO, NEDA

Table 3.8 Proposed Land Use Plan in Four Cities

Land Use Category	(Unit: ha, %)							
	Iloilo		Cebu		Tacloban		Ormoc	
	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)
1. Built-up Area								
1) Residential Area	2,813.7	43.4	285.8	24.6	1,011.4	54.9	402.6	38.7
2) Commercial Area	619.5	9.6	467.2	40.2	257.5	14.0	117.1	11.3
3) Institutional Area	-	-	20.5	1.8	76.3	4.1	70.2	6.8
4) Industrial Area	669.9	10.3	254.5	21.9	99.4	5.4	299.2	28.8
Sub-total	4,103.1	63.3	1,028.0	88.5	1,444.5	78.4	889.1	85.6
2. Natural/Green Space Area								
1) Park, Open-spaces, etc.	728.9	11.2	86.7	7.5	235.0	12.8	150.0	14.4
2) Agricultural Land	1,290.2	19.9	-	-	161.9	8.8	-	-
- Crop Field	1,207.1	18.6	-	-	-	-	-	-
- Fishpond, Saltbeds	83.1	1.3	-	-	-	-	-	-
3) Grass Land/Swamp	364.2	5.6	-	-	-	-	-	-
4) Not Identified	-	-	47.1	4.1	-	-	-	-
Sub-total	2,383.3	36.7	133.8	11.5	396.9	21.6	150.0	14.4
Total	6,486.4	100.0	1,161.8	100.0	1,841.4	100.0	1,039.1	100.0
	*1		*2		*3		*4	

Source: Land use maps proposed by the city governments

Note: \*1 Covering the entire city territory.

\*2 Covering the urban Barangay classes designated by the Cebu City government.

\*3 Covering the Study Area delineated by the JICA Study Team

\*4 Covering the urban core only demarcated by the Ormoc City government.



**Table 3.9 Inventory of Major Damageable Assets in Target Area**

Item	Iloilo	Cebu	Tacloban	Ormoc
1. Total Target Area (ha)	5,675	3,456	1,900	313
2. Living Quarters				
- Population in 1990 Census	287,794	393,397	117,566	23,021
- Population in 1994	0	0	0	0
- Family Size	5.5	5.3	5.5	5.2
- Housing Units	0	0	0	0
3. Industrial Buildings				
- Manufacturing Industry *1	0	0	0	0
- Trading Industry *2	0	0	0	0
4. Agricultural Lands (ha)				
- Palay Field	2,088	116	739	38
- Fishponds	326	-	-	-

Source: Socio-Economic Profile, Iloilo City, 1991, CPDO

City Development Plan, Ormoc City, 1993-1998, Ormoc City Mayor

Major Development Programs and Projects 1986-1992, Tacloban City, Aquino Admi.

Note: \*1 Assumed to be approximately 1.6 establishments per 1,000 urban people.

\*2 Assumed to be approximately 13.9 establishments per 1,000 population.

**Table 3.10 Unit Construction Cost of Buildings by Type in City of Iloilo: 1994**

Type of Building	Type I	Type II	Type III		Type IV
			Group A	Group B	
1 Dwelling Unit					
1) One-Family	3,750	3,050	2,200	1,450	650
2) Duplex	3,550	2,850	2,000	1,250 -	
3) Apartment	3,550	2,850	2,000	1,250 -	
2 Industrial Building	2,250	1,550	1,025	775 -	
3 Commercial Building	3,350	2,650	1,950	1,450 -	
4 Office Building	3,950	3,250	2,450	1,750 -	
5 School Building	3,250	2,550	1,850	1,350 -	
6 Hospital Building	3,950	3,250	2,450	1,750 -	

Source: Unit Cost in Iloilo City, 1994, City Assessor of Iloilo City

Note: Classification of Buildings are defined referring to their structural characteristics, as follows:

Type I - Reinforced Concrete

Type II - Semi-Concrete

Type III - Strong Materials

    Group A - First grade wooden structural framing

    Group B - Third grade wooden structural framing

Type IV - Temporary makeshift structure

Table 3.11 Average Damageable Value of Palay

Item		Jan.	Fev.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1. Crop Calendar													
2. Planted Area (%)	1st Crop					25	75	100	100	75	25		
	2nd Crop	100	75	25							25	75	100
3. Accumulated Cost (%)	1st Crop					16	38	54	74	85	100		
	2nd Crop	74	85	100							16	38	54
4. Flood Frequency (%)		0	0	1	1	5	17	15	27	13	13	8	0
5. Damageable Value *1 (Pesos/ha)	1st Crop	0	0	0	0	120	1,462	1,927	3,932	1,512	546	0	0
	2nd Crop	0	0	30	0	0	0	0	0	0	155	400	0
		<u>1st Crop</u>			<u>2nd Crop</u>			<u>Total/Average</u>					
6. Yield (ton/ha)		4.2			3.0			3.6					
7. Economic Farmgate Price (Pesos/ton)		4,000			4,000			4,000					
8. Production Cost (Pesos/ha)		8,600			8,600			17,200					
9. Net Income (Pesos/ha)		8,200			3,400			11,600					
10. Damageable Value (Pesos/ha)		9,499			585			10,084 ( = 10,100 )					

Source: (1) Quarterly Review of Commodity Market, Fourth Quarter 1992, World Bank  
 (2) The Panay River Basin-wide Flood Control Study, Supporting Report II, 1985, JICA  
 (3) Study on Ilog-Hilabangan River Basin Flood Control Project, Interim Report, 1991, JICA  
 (4) Feasibility Study on the Improvement of Major Road Sections in Luzon, Visaya, DPWH

Note: \*1 (2)\*(4)\*{(3)\*(8)+(9)}

Table 3.12 Standard Damage Rates for Damageable Properties

Kind of Property	Inundation below Floor Level	Inundation Depth above Floor Level (m)					
		Less than 0.5	0.5 - 0.99	1.0 - 1.99	2.0 - 3.0	More than 3.0	
<b>1. Dwelling Unit</b>							
Building *1	A Group	0.030	0.083	0.126	0.177	0.266	0.344
	B Group	0.030	0.124	0.210	0.308	0.439	0.572
	Household Effects	-	0.086	0.191	0.331	0.499	0.690
<b>2. Industrial Facility</b>							
	Fixed Assets	-	0.180	0.314	0.419	0.539	0.632
	Inventory Stock	-	0.127	0.276	0.379	0.479	0.562
<b>3. Agricultural Products</b>							
		Inundation Depth (m)					
		Less than 0.5	0.5 - 0.99	More than 1.0			
	Palay	0.21	0.24	0.37			
	Prawn	1.00	1.00	1.00			

Source: Criteria for Engineering of River and Sabo Project, Ministry of Construction of Japan

Note: \*1 A Group is applied for flood prone areas having land slope of between 1/500 and 1/1,000.

B Group is for areas having land slope of more than 1/500.

Table 3.13 Characteristics of River Basin in Environmentally Critical Area (ECA)

ITEM	RIVER BASIN											
	ILOILO		CEBU					ORMOC		TACLOBAN		
	Ilo	Jar	Bul	Kin	Gua	Lah	Sub	Ani	Mal	Abu	Man	Bur
National Parks												
Watershed Reserves		○		○								
Wildlife Preserve Sanctuaries												
Potential Tourist Spots												
Habitat for any Endangered or Threatened Species of Indigenous Philippine Wildlife (flora & fauna)		○		○	○	○	○	○	○		○	
Unique Historical, Archaeological or Scientific Interest												
Areas Traditionally Occupied by Cultural Communities or Tribes												
Areas Frequently Visited and/or Hard-hit by Natural Calamities		○			○	○		○	○			
Areas with Critical Slopes			○	○	○	○	○	○	○			
Prime Agricultural Lands	○	○						○	○			
Recharge Areas of Aquifers			○	○	○	○	○	○	○			
Water Bodies		○										
Mangrove Areas		○									○	
Coral Reefs												

Note : Ilo : Iloilo      Jar : Jaro  
 Bul : Bulacao      Kin : Kinalumsan      Gua : Guadalupe      Lah : Lahug      Sub : Subang  
 Daku  
 Ani : Anilao      Mal : Malbasag  
 Abu : Abucay      Man : Mangonbangon      Bur : Burayan

Table 3.14 Results of Water Quality Survey of Rivers in Iloilo City

Sampling Location	Point	Point	Sampling Period	Parameter										
				Color (PCU)	pH	Water-Temp. (°C)	DO (mg/l)	DO (%satur.)	BOD <sub>5</sub> (mg/l)	T-SS (mg/l)	T-DS (mg/l)	Total Coliform (MPN/100ml)	Chloride (mg/l)	Phenols (mg/l)
JARO Middle Reach	River Center		(1)	150	6.9	27.5	5.8	73	4.3	204	364	22x10 <sup>4</sup>	11	0.013
			(2)	75	7.2	28.0	6.5	84	5.7	66	454	30x10 <sup>3</sup>	18	0.004
			(3)	12	6.8	28.5	5.8	75	2	17	921	80x10 <sup>2</sup>	134	0.006
JARO Lower Reach	Bank Side		(1)	100	7.0	27.5	5.6	71	1.8	230	398	17x10 <sup>4</sup>	11	0.017
			(2)	75	7.3	28.0	6.7	86	6.3	100	482	23x10 <sup>3</sup>	18	0.005
			(3)	12	7.0	28.5	5.5	71	1	20	627	23x10 <sup>2</sup>	20	0.007
ILOILO Middle Reach	River Center		(1)	150	7.0	28.4	-	-	7.3	210	483	13x10 <sup>5</sup>	27	0.015
			(2)	50	7.1	29.0	5.5	72	5.8	102	541	24x10 <sup>4</sup>	11	0.004
			(3)	25	7.1	29	-	-	1	15	875	50x10 <sup>2</sup>	138	0.010
ILOILO Lower Reach	Bank Side		(1)	150	7.0	28.5	-	-	6.2	204	459	17x10 <sup>5</sup>	27	0.012
			(2)	50	7.1	29	5.8	76	2.5	88	455	30x10 <sup>3</sup>	10	0.007
			(3)	50	7.1	29	-	-	2	13	649	30x10 <sup>2</sup>	20	0.011
ILOILO Middle Reach	River Center		(1)	75	6.9	28.0	-	-	5.9	32	13,857	13x10 <sup>3</sup>	4,000	0.003
			(2)	40	7.1	27.5	-	-	9.5	31	9,211	50x10 <sup>2</sup>	3,500	ND<0.001
			(3)	12	6.9	28.1	-	-	2	18	28,605	500	16,895	ND<0.001
ILOILO Lower Reach	Bank Side		(1)	50	6.9	28.0	-	-	7.3	22	9,833	50x10 <sup>3</sup>	3,950	0.003
			(2)	50	7.1	27.5	-	-	7.3	29	9,328	30x10 <sup>2</sup>	3,750	ND<0.001
			(3)	50	6.9	28.0	-	-	13	29	10,934	50x10 <sup>2</sup>	5,498	ND<0.001
ILOILO Lower Reach	River Center		(1)	15	7.1	28.7	-	-	5.4	52	43,367	90x10 <sup>2</sup>	13,550	0.001
			(2)	5	7.4	28.2	5.3	68	7.9	33	44,516	50x10 <sup>2</sup>	18,350	0.005
			(3)	50	7.1	28.4	-	-	5	31	11,173	30x10 <sup>2</sup>	5,598	0.003
ILOILO Lower Reach	Bank Side		(1)	10	7.1	28.3	-	-	7.1	60	44,167	24x10 <sup>3</sup>	15,300	0.002
			(2)	5	7.4	28.2	5.3	68	6.5	71	43,756	50x10 <sup>3</sup>	17,350	0.004
			(3)	25	7.1	28.5	-	-	7	23	34,171	30x10 <sup>2</sup>	18,394	0.005

Note: 1. Sampling Period (1) : June 19, 1994; (2) : July 19, 1994; (3) : August 15, 1994

2. T-SS : Total Suspended Solids; T-DS : Total Dissolved Solids; Chloride as Cl; Phenols : Phenolic Substances as Phenols

Table 3.15 Results of Water Quality Survey of Rivers in Ormoc City

Sampling Location	Point	Sampling Period	Color (PCU)	pH	Water-Temp. (°C)	DO		BOD <sub>5</sub> (mg/l)	T-SS (mg/l)	T-DS (mg/l)	Total Coliform (MPN/100ml)	Chloride (mg/l)	Phenols (mg/l)
						(mg/l)	(% satur.)						
ANILAO	River Center	(1)	15	6.9	28.0	6.6	85	4.8	10	163	-	1	ND<0.001
		(2)	10	6.9	28.1	7.9	100	5.5	18	169	17x10 <sup>4</sup>	1.5	0.004
		(3)	12	6.9	28.3	6.8	88	1	9	196	50x10 <sup>4</sup>	1	0.003
Middle Reach	Bank Side	(1)	15	7.0	28.0	6.4	82	4.9	7	167	-	1.5	0.007
		(2)	10	6.8	28.2	7.3	94	8.5	14	181	13x10 <sup>4</sup>	1.8	0.002
		(3)	10	6.9	28.2	6.5	84	1	7	198	30x10 <sup>3</sup>	1	0.002
ANILAO	River Center	(1)	30	6.9	29.0	4.7	61	9.0	11	1,010	-	440	ND<0.001
		(2)	15	7.0	28.9	5.9	77	9	21	1,409	14x10 <sup>4</sup>	600	0.002
		(3)	25	7.2	29.1	4.8	63	1	16	736	24x10 <sup>5</sup>	264	0.004
Lower Reach	Bank Side	(1)	30	7.0	29.0	4.9	64	9.8	22	2,089	-	912	ND<0.001
		(2)	15	6.8	29.0	5.9	77	9.8	11	1,449	50x10 <sup>4</sup>	675	0.007
		(3)	10	7.2	29.0	4.6	60	3	10	1,237	50x10 <sup>4</sup>	700	0.008
MALBASAG	River Center	(1)	20	6.9	27.2	5.7	72	5.3	8	210	-	0.8	ND<0.001
		(2)	10	6.7	27.0	5.6	71	4.5	20	245	13x10 <sup>4</sup>	2	ND<0.001
		(3)	10	6.9	27.3	5.7	72	2	14	204	50x10 <sup>3</sup>	1	ND<0.001
Middle Reach	Bank Side	(1)	30	6.9	27.1	5.4	68	8.8	8	223	-	1.5	ND<0.001
		(2)	10	6.8	27.0	5.4	68	6.5	19	249	14x10 <sup>4</sup>	2	ND<0.001
		(3)	10	6.9	27.5	5.8	74	1	10	215	24x10 <sup>3</sup>	1	ND<0.001
MALBASAG	River Center	(1)	40	6.8	28.5	4.9	64	8.0	10	311	-	62	ND<0.001
		(2)	15	6.8	28.3	5.2	67	8.5	6	274	13x10 <sup>4</sup>	30	ND<0.001
		(3)	5	6.9	28.5	4.4	57	1	12	148	11x10 <sup>4</sup>	2	ND<0.001
Lower Reach	Bank Side	(1)	40	6.8	28.5	4.6	60	17.4	10	331	-	93	ND<0.001
		(2)	15	6.7	28.3	5.4	70	6.5	20	257	24x10 <sup>4</sup>	24	ND<0.001
		(3)	10	7.0	28.5	4.3	56	1	15	210	50x10 <sup>4</sup>	2	ND<0.001

Note: 1. Sampling Period (1) : June 21, 1994; (2) : July 20, 1994; (3) : August 15, 1994

2. T-SS : Total Suspended Solids; T-DS : Total Dissolved Solids; Chloride : Chloride as Cl<sub>2</sub>; Phenols : Phenolic Substances as Phenols

Table 4.1 Unit Cost of River/Drainage Structures

Item No.	Item of Work	Remark	Unit	Unit : peso	
				TOTAL COST	TOTAL COST
				Iloilo, Cebu	Ormoc, Tacloban
1	Revetment	H=6.0 m	m	17,500	-
2		H=3.0 m, LWC	m	-	7,400
3		H=3.0 m, HWC	m	-	3,600
4	Retraining Wall	H=3.8 m	m3	7,900	7,200
5	Bridge		m2	22,989	23,403
6	Concrete Dike		m	20,000	-
7	Diversion	Conc. Weir H=4 m	m	118,000	-
8	Sluice	Type 1(1*1*1,L=12m)	no.	737,700	-
9		Type 2(D=1000,L=10 m)	no.	249,700	-
10		D=600,L=5m	no.	-	173,900
11	Jetty		m3	500	-
12	Invert Siphon	D=0.8 m	no.	898,100	-
13		D=1.0 m	no.	979,400	-
14	Silt Dam	Anilaol	no.	-	7,530,000
15	Box Culvert		no.	24,200	-
16	Drops	H=1.0 m	m	50,700	8,300
17		H=1.5 m	m	53,300	50,700
18		H=1.75 m	m	-	52,000
19	Bridge Protection		m2	5,130	-
20	MCF Protection		m2	148	-



Table 4.2 River Improvement Project Cost of Master Plan in Iloilo City

Work Items	Unit	Unit Cost (Pesos)	Jaro River		Iloilo River		Madruga River		Total	
			Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)
<b>I. Main Construction Cost</b>				900,521	268,786		147,888		1,317,196	
<b>1. Preparatory Works</b>				74,423	22,214		12,222		108,859	
<b>2. Main Work</b>				744,233	222,138		122,222		1,088,592	
(1) Excavation	m3	83	3,069,000	254,727	0	0	75,000	6,225	3,144,600	
(2) Embankment	m3	79	463,000	36,577	0	0	0	0	36,577	
(3) Backfill	m3	132	0	0	63,000	8,316	72,000	9,504	17,820	
(4) Dredging	m3	73	0	0	23,000	1,679	20,000	1,460	3,139	
(5) Revetment	m3	71	0	0	563,000	39,973	250,000	17,750	57,723	
	m3	55	32,000	1,760	420,000	23,100	0	452,000	24,860	
	m	11,900	0	0	0	0	1,100	13,090	13,090	
	m	17,500	10,900	190,750	0	0	0	0	190,750	
	m	19,400	1,000	19,400	0	0	0	0	19,400	
	m	27,800	1,600	44,480	0	0	1,800	50,040	94,520	
	m	29,400	0	0	300	8,820	0	0	8,820	
(6) MFC Protection	m2	150	275,000	41,250	0	0	0	0	41,250	
(7) Sodding	m2	19	252,000	4,788	20,000	380	2,900	55	5,223	
(8) Gravel Pavement	m2	105	152,000	15,960	26,000	380	5,400	567	19,257	
(9) Concrete Dike	m	20,000	0	0	4,780	95,600	0	0	95,600	
(10) Diversion Works										
a. Lapaz Floodway	m	106,800	52	5,554	0	0	0	0	5,554	
b. Jaro Floodway	m	221,000	44	9,724	0	0	0	0	9,724	
c. Groundstill	m	27,100	68	15,028	0	0	0	0	15,028	
(11) Sluice	m	27,100	80	2,168	0	0	0	0	2,168	
Type A1	m	772,900	2	1,546	0	0	0	0	1,546	
Type A2	m	1,364,200	0	0	1	1,364	1	1,364	2,728	
Type A3	m	2,085,500	0	0	2	2,086	1	2,086	4,171	
Type B0.6	m	148,700	0	0	2	297	0	0	297	
Type B1.0x1	m	192,500	6	1,155	1	193	0	0	1,348	
Type B1.0x2	m	385,000	3	1,155	0	0	2	770	1,925	
Type B1.0x3	m	577,500	1	578	0	0	0	0	578	
(12) Jetty	m3	500	5,900	2,950	0	0	0	0	2,950	
(13) Invert Siphon	m	829,900	1	830	0	0	0	0	830	
(14) Bridge	m	948,900	2	1,898	0	0	0	0	1,898	
(15) Bridge Protection	m2	22,989	4,000	91,956	1,100	25,288	840	19,311	136,555	
	m2	5,130	0	0	2,400	12,312	0	0	12,312	
<b>3. Miscellaneous Works</b>				81,866	24,435		13,444		119,745	
<b>II. Compensation Cost</b>				457,553	51,909		68,197		577,659	
(1) Land Acquisition	m2	1,052	370,000	389,240	38,000	37,872	36,000	444,000	467,048	
Residential A	m2	40	562,000	22,480	0	0	0	0	22,480	
Farm Land	m2	50	94,000	4,700	82,000	4,100	0	0	86,000	
Fish Pond	m2	5	125,000	625	0	0	0	0	625	
Other	m	111,900	362	40,508	70	7,833	271	30,325	78,666	
(2) House Compensation				67,904	16,035		10,804		94,743	
<b>III. Administration Cost</b> (5% of I+II)				213,897	50,510		34,033		298,440	
<b>IV. Physical Contingency</b> (15% of I+II+III) Total of I to IV				1,639,875	387,240		260,923		2,288,037	
<b>V. Engineering Services</b> (1.6% of I to IV)				144,083	43,006		23,662		210,751	
<b>Grand Total</b>				1,783,928	430,245		284,585		2,498,788	

Table 4.3 River Improvement Project Cost of Master Plan in Cebu City

Work Items	Unit	Unit Cost (Pesos)	Dulacso		Kinabumasan		Guadalupe		Labug		Subsag Daku		Total	
			Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)
<b>I. Main Construction Cost</b>				89,617	166,504		169,813		217,487		245,115		888,536	
1. Preparatory Works				7,406	13,761		14,034		17,974		20,257		79,433	
2. Main Work				74,064	137,606		140,342		179,742		202,574		734,328	
(1) Excavation	m3	83	297,000	24,651	143,000	11,869	27,390	330,000	12,417	374,000	31,042	1,293,600	107,369	
(2) Embankment	m3	132	36,000	4,752	0	0	0	0	0	0	0	36,000	4,752	
(3) Rejuvenant	m	9,600	1,340	12,864	0	0	0	0	0	0	0	1,340	12,864	
(4) Retaining Wall	m	7,100	0	0	3,000	21,300	21,087	4,180	29,678	2,950	20,945	13,100	83,010	
H=2.8m	m	7,300	0	0	0	0	0	8,000	58,400	0	0	8,000	58,400	
H=3.1m	m	7,700	0	0	4,600	35,420	0	0	0	5,000	36,500	9,600	73,920	
H=3.6m	m	7,900	0	0	2,800	22,120	0	0	0	3,420	27,018	6,220	49,138	
H=3.8m	m	8,300	0	0	0	0	6,400	53,120	0	0	0	6,400	53,120	
H=4.3m	m	2,658	0	0	2,520	6,698	600	1,595	2,400	6,379	13,396	10,560	28,068	
(5) Backfill Conc.	m3	19	39,200	745	0	0	0	0	0	0	0	39,200	745	
(6) Sodding	m2	105	15,900	1,670	0	0	0	0	0	0	0	15,900	1,670	
(7) Gravel Pavement	m2	49,900	0	0	12	599	0	0	0	0	12	599	1,198	
(8) Drops	m	50,700	244	12,371	0	0	0	0	0	232	11,762	476	24,133	
H=1.0m	m	52,700	0	0	0	0	0	0	11	580	0	11	580	
H=1.4m	m	53,300	0	0	96	5,117	36	1,919	55	2,932	0	187	9,967	
H=1.5m	m	54,500	0	0	0	0	18	977	0	0	0	18	977	
H=1.7m	m	22,989	740	17,012	1,500	34,484	1,490	34,254	2,140	49,196	59,312	8,450	194,257	
(9) Bridges for Labug River Mouth	no.	20,160,000	0	0	0	0	0	0	1	20,160	0	1	20,160	
<b>3. Miscellaneous Works</b>				8,147	15,137		15,438		19,772		22,283		80,776	
<b>II. Compensation Cost</b>				110,614	279,213		367,239		424,694		547,718		1,729,477	
(1) Land Acquisition	Residential A	5,150	18,000	92,700	267,800	5,300	27,295	19,870	102,331	102,000	525,300	197,170	1,015,426	
B	m2	8,000	0	0	0	40,000	38,130	305,040	0	0	0	43,130	345,040	
C	m2	11,100	0	0	25,700	285,270	0	0	0	0	0	25,700	285,270	
Farm Land	m2	170	82,000	13,940	0	0	0	0	0	0	0	82,000	13,940	
(2) House Compensation	no.	101,900	39	3,974	112	11,413	144	14,674	170	17,323	220	685	69,802	
<b>III. Administration Cost</b>				10,012	22,286		26,853		32,109		39,642		130,901	
(5% of I+II)				31,536	70,200		84,586		101,143		124,871		412,337	
<b>IV. Physical Contingency</b>				241,780	538,203		648,490		775,433		957,345		3,161,251	
(15% of I+II+III)				14,339	26,641		27,170		34,798		39,218		142,166	
Total of I to IV				256,118	564,843		675,660		810,231		996,564		3,303,417	
<b>V. Engineering Services</b>														
(1.6% of I to IV)														
<b>Grand Total</b>														

Table 4.4 River Improvement Project Cost of Master Plan in Ormoc City

Work Items	Unit	Unit Cost (Pesos)	Anilao river		Malbasag River		Total		
			Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	Quantity	Amount (1000 P)	
<b>I. Main Construction Cost</b>				154,474		104,221		258,695	
<b>1. Preparatory Works</b>				12,766		8,613		21,380	
<b>2. Main Work</b>				127,664		86,133		213,797	
(1) Excavation	m3	81	166,000	13,446	225,000	18,225	391,000	31,671	
(2) Embankment	m3	108	38,000	4,104	6,500	702	44,500	4,806	
(3) Backfill	m3	71	60,000	4,260	45,000	3,195	105,000	7,455	
(4) Retention	(H=4m, LWC)	m	8,100	3,600	29,160	0	0	3,600	29,160
	(H=4m, HWC)	m	4,300	3,600	15,480	0	0	3,600	15,480
	(H=3m, LWC)	m	7,400	0	0	1,410	10,434	1,410	10,434
	(H=3m, HWC)	m	3,600	0	0	1,410	5,076	1,410	5,076
(5) Retaining Wall	H=3.8m	m	7,200	0	0	2,190	15,768	2,190	15,768
(6) MFC Protection		m2	148	21,000	3,108	10,225	1,513	31,225	4,621
(7) Sodding		m2	16	16,000	256	6,300	101	22,300	357
(8) Gravel Pavement		m2	66	11,000	726	10,800	713	21,800	1,439
(9) Drops	H=1.0m	m	48,300	0	0	35	1,691	35	1,691
	H=1.5m	m	50,700	40	2,028	64	3,245	104	5,273
	H=1.75m	m	52,000	80	4,160	0	0	80	4,160
(10) Sluice	Type A2	no.	1,352,600	2	2,705	0	0	2	2,705
	Type B0.6	no.	130,700	1	131	4	523	5	654
(11) Slit Dam	Anilao 1	no.	7,530,000	1	7,530	0	0	1	7,530
	Anilao 2	no.	5,670,000	1	5,670	0	0	1	5,670
	Malbasag	no.	9,070,000	0	0	1	9,070	1	9,070
(12) Maintenance Road for Slit Dams		m	1,500	800	1,200	600	900	1,400	2,100
(13) Bridge		m2	23,403	1,440	33,700	640	14,978	2,080	48,678
<b>3. Miscellaneous Works</b>				14,043		9,475		23,518	
<b>II. Compensation Cost</b>				29,148		25,301		54,450	
(1) Land Acquisition	Residential A	m2	0	0	0	0	0	0	0
	B	m2	280	34,800	9,744	39,700	11,116	74,500	20,860
	C	m2	1,000	0	0	0	0	0	0
	Farm Land	m2	5	0	0	0	0	0	0
	Forest, Wasteland	m2	1	13,400	13	32,700	33	46,100	46
(2) House Compensation		no.	91,900	211	19,391	154	14,153	365	33,544
<b>III. Administration Cost</b> (5% of I+II)				9,181		6,476		15,657	
<b>IV. Physical Contingency</b> (15% of I+II+III)				28,920		20,400		49,320	
<b>Total of I to IV</b>				221,724		156,398		378,122	
<b>V. Engineering Services</b> (16% of I. to IV)				24,716		16,675		41,391	
<b>Grand Total</b>				246,439		173,073		419,513	

Table 4.5 Drainage Improvement Project Cost of Master Plan in Iloilo City

ILOILO CITY (1/5.1/3)

Work Items	Unit	Unit Cost (Peso)	Ingore Creek (5000 m)		Bo.Obrero Creek (400 m)		Rizal Creek (620 m)		Total
			Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	
<b>I Main Construction</b>									
1. Preparatory Works				4,263	3,631	675			8,569
2. Main Works									
(1) Excavation	m3	83	103,000	8,568	73,000	6,072	2,200	183	178,200
(2) Revelement	m2	1,400	10,200	14,280	10,400	14,560	700	980	21,300
(3) Concrete	m3	12,700	0	0	800	10,160	440	5,588	1,240
(4) Bridge	m2	23,000	860	19,780	240	5,520	0	0	1,100
<b>Total Amount of Works</b>				42,628	36,312	6,751			85,691
<b>3. Miscellaneous Works (10% of 1+2)</b>				4,689	3,994	743			9,426
<b>Total of I</b>				51,579	43,938	8,169			103,686
<b>II Compensation</b>									
(1) Land	m2		46,000	8,400	8,500	6,825	0	0	54,500
(2) House	no.	111,900	17	1,902	57	6,378	41	4,588	115
<b>III Administration (5% of I+II)</b>				3,094	2,857	638			6,589
<b>IV Physical Contingency (15% of I+II+III)</b>				9,746	9,000	2,009			20,755
<b>Total of I,II,III, and IV</b>				74,722	68,998	15,404			159,123
<b>V Engineering Services (16% of I)</b>				8,253	7,030	1,307			16,590
<b>Grand Total</b>				82,975	76,028	16,711			175,713

Table 4.6(1/2) Drainage Improvement Project Cost of Master Plan in Cebu City

CEBU CITY (1/5.1/3)

Work Items	Unit	Unit Cost (Peso)	Mabolo Creek (1930 m)		Lahug Tributary (1680 m)		Tinago Creek (1220 m)		Pahina Central M.D. (1100 m)		Calamba Drainage Area M.D. (830 m)	
			Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)
<b>I Main Construction</b>				1,711	1,385	2,813						2,191
1. Preparatory Works												
2. Main Works												
(1) Excavation	m3	83	19,968	1,661	4,121	343	10,846	902	3,465	288	2,490	207
(2) Revetment	m2	1,400	10,375	14,525	8,910	12,474	10,699	14,979	0	0	0	0
(3) Concrete	m3	12,700	0	0	0	0	820	10,414	3,037	38,574	1,709	21,706
(4) Bridge	m2	23,000	40	920	45	1,035	80	1,840	0	0	0	0
<b>Total Amount of Works</b>				17,106	13,852	28,135				38,862		21,913
<b>3. Miscellaneous Works (10% of 1+2)</b>				1,882	1,524	3,095				4,275		2,410
<b>Total of I</b>				20,699	16,760	34,043				47,023		26,514
<b>II Compensation</b>												
(1) Land	m2		24,170	124,476	6,428	47,064	5,950	30,643	0	0	0	0
(2) House	no.	101,900	9	966	10	1,040	2	238	0	0	0	0
<b>III Administration (5% of I+II)</b>				7,307	3,243	3,246				2,351		1,326
<b>IV Physical Contingency (15% of I+II+III)</b>				23,017	10,216	10,225				7,406		4,176
<b>Total of I, II, III, and IV</b>				176,464	78,323	78,395				56,780		32,016
<b>V Engineering Services (16% of I)</b>				3,312	2,682	5,447				7,524		4,242
<b>Grand Total</b>				179,776	81,004	83,842				64,304		36,258

Table 4.6(2/2) Drainage Improvement Project Cost of Master Plan in Cebu City

CEBU CITY (1/5.1/3)

Work Items	Unit	Unit Cost (Peso)	Sta. Teresita (530 m)		Basak-san Nicolas (860 m)		Sto. Niho Creek (1200 m)		Barangsy Inayawan (1500 m)		Total
			Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	
<b>I Main Construction</b>											
1. Preparatory Works											
2. Main Works											
(1) Excavation	m3	83	2,625	218	4,485	373	23,441	1,950	13,221	1,100	84,662
(2) Revetment	m2	1,400	0	0	0	0	3,691	5,168	6,861	9,605	40,536
(3) Concrete	m3	12,700	2,404	30,532	1,690	21,468	0	0	0	0	9,661
(4) Bridge	m2	23,000	0	0	0	0	40	920	80	1,840	285
<b>Total Amount of Works</b>				30,750		21,841		8,037		12,544	193,041
<b>3. Miscellaneous Works (10% of 1+2)</b>											
<b>Total of I</b>				37,208		26,428		9,725		15,179	233,579
<b>II Compensation</b>											
(1) Land	m2	101,900	0	0	0	0	13,200	67,980	19,000	97,850	371,542
(2) House	no.		0	0	0	0	5	527	7	759	3,530
<b>III Administration (5% of I+II)</b>				1,860		1,321		3,912		5,689	30,256
<b>IV Physical Contingency (15% of I+II+III)</b>				5,860		4,162		12,322		17,922	95,307
<b>Total of I, II, III, and IV</b>				44,929		31,912		94,466		137,399	730,683
<b>V Engineering Services (16% of I)</b>				5,953		4,228		1,556		2,429	37,373
<b>Grand Total</b>				50,882		36,140		96,022		139,828	768,056

Table 4.7 Drainage Improvement Project Cost of Master Plan in Ormoc City  
 OROMOC CITY (1/5,1/3)

Work Items	Unit	Unit Cost (Peso)	Lotao Creek (1200 m)		City Proper Creek (630 m)		Total
			Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	
<b>I Main Construction</b>				589	665	1,254	
1. Preparatory Works							
2. Main Works							
(1) Excavation	m3	77	5,700	437	646	49	6,346
(2) Revetment	m2	1,400	2,300	3,220	2,043	2,860	4,343
(3) Concrete	m3	12,700	150	1,905	0	0	150
(4) Bridge	m2	23,400	14	328	160	3,744	174
<b>Total Amount of Works</b>				5,889	6,653	12,542	
<b>3. Miscellaneous Works (10% of 1+2)</b>				648	732	1,380	
<b>Total of I</b>				7,126	8,050	15,176	
<b>II Compensation</b>							
(1) Land	m2		4,000	4	2,583	723	6,583
(2) House	no.	91,900	13	1,195	7	643	20
<b>III Administration (5% of I+II)</b>				416	471	887	
<b>IV Physical Contingency (15% of I+II+III)</b>				1,311	1,483	2,794	
<b>Total of I, II, III, and IV</b>				10,052	11,371	21,423	
<b>V Engineering Services (16% of I)</b>				1,140	1,288	2,428	
<b>Grand Total</b>				11,192	12,659	23,851	

Table 4.8(1/2) Drainage Improvement Project Cost of Master Plan in Tacloban City

TACLOBAN CITY (1/5, 1/3)

Work Items	Unit	Abucay River (1700 m)		Naga-naga Creek (1000 m)		Mangonbangan River (4000 m)		Langhas Lirang Creek (3750 m)		Sagkahan Creek (380 m)		
		Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	
<b>I Main Construction</b>			184		118		3,295		4,471		268	
1. Preparatory Works												
2. Main Works												
(1) Excavation	m3	77	438	3,240	248	40,670	3,116	74,450	5,704	474	36	
(2) Revetment	m2	1,368	0	0	0	20,102	27,495	26,464	36,196	1,247	1,705	
(3) Concrete	m3	12,700	0	0	0	0	0	0	0	0	0	
(4) Bridge	m2	23,403	60	1,404	40	936	100	2,340	120	2,808	40	936
<b>Total Amount of Works</b>			1,842		1,184		32,951		44,709		2,678	
<b>3. Miscellaneous Works (10% of 1+2)</b>			203		130		3,625		4,918		295	
<b>Total of I</b>			2,229		1,433		39,871		54,097		3,240	
<b>II Compensation</b>												
(1) Land	m2	19,720	1,919	1,800	192	40,570	31,782	52,000	16,201	1,330	1,397	
(2) House	no.	4	400	0	40	66	6,095	35	3,252	3	266	
<b>III Administration (5% of I+II)</b>			227		83		3,887		3,678		245	
<b>IV Physical Contingency (15% of I+II+III)</b>			716		262		12,245		11,584		772	
<b>Total of I, II, III, and IV</b>			5,491		2,010		93,881		88,813		5,919	
<b>V Engineering Services (16% of I)</b>			357		229		6,379		8,656		518	
<b>Grand Total</b>			5,848		2,239		100,260		97,468		6,438	



Table 4.8(2/2) Drainage Improvement Project Cost of Master Plan in Tacloban City  
TACLOBAN CITY (1/5,1/3)

Work Items	Unit	Unit Cost (Peso)	Pleasan Creek (1600 m)		Burayan River (3500 m)		Total
			Quantity	Amount (1000 P.)	Quantity	Amount (1000 P.)	
<b>I Main Construction</b>				1,933	4,383		14,652
1. Preparatory Works							
2. Main Works							
(1) Excavation	m3	77	11,268	863	47,300	183,114	14,029
(2) Revetment	m2	1,368	12,132	16,594	28,709	88,654	121,257
(3) Concrete	m3	12,700	0	0	0	0	0
(4) Bridge	m2	23,403	80	1,872	40	936	11,233
Total Amount of Works				19,329	43,827		146,519
<b>3. Miscellaneous Works (10% of 1+2)</b>				2,126	4,821		16,117
Total of I				23,388	53,030		177,288
<b>II Compensation</b>							
(1) Land	m2		16,220	9,603	53,220	10,112	85,441
(2) House	no.	91,900	22	2,056	23	2,126	71,206
III Administration (5% of I+II)				1,752	3,263		13,136
IV Physical Contingency (15% of I+II+III)				5,520	10,280		41,380
Total of I, II, III, and IV				42,320	78,812		317,246
<b>V Engineering Services (16% of I)</b>				3,742	8,485		28,366
<b>Grand Total</b>				46,062	87,297		345,612

Table 4.9 Financial Cost and Economic Cost

(Unit: Million Pesos)

Item	Flood Control Work		Drainage Improvement	Entire City Project
	Entire River	River Basin		
<b>I. Financial Cost</b>				
1. Iloilo City	2,498.8	-	175.7	2,674.5
Jaro River		1,784.0	-	1,784.0
Iloilo & Mandurriao River		714.8	-	714.8
2. Cebu City	3,303.4	-	768.1	4,071.5
Bulacao River		256.1	-	256.1
Kinalumsan River		564.8	-	564.8
Guadalupe River		675.7	-	675.7
Lahug River		810.2	-	810.2
Sabang Daku River		996.6	-	996.6
3. Ormoc City	419.5	-	23.9	443.4
Anilao & Malbasag River		419.5	-	419.5
4. Tacloban City	-	-	230.0	230.0
<b>II. Economic Cost</b>				
1. Iloilo City	2,086.9	-	147.1	2,234.0
Jaro River		1,488.8	-	1,488.8
Iloilo & Mandurriao River		598.2	-	598.2
2. Cebu City	2,734.4	-	636.5	3,370.9
Bulacao River		212.6	-	212.6
Kinalumsan River		468.0	-	468.0
Guadalupe River		558.9	-	558.9
Lahug River		670.7	-	670.7
Sabang Daku River		824.2	-	824.2
3. Ormoc City	351.5	-	20.0	371.5
Anilao & Malbasag River		351.5	-	351.5
4. Tacloban City	-	-	191.3	191.3

**Table 4.10 Benefit of Proposed Project of Drainage Rehabilitation  
in Iloilo City**

**(Unit: Million Pesos in Economic Terms)**

Item	Return Period ( Year )			
	1 *1	2	3	5
<b>Benefit (Reduction of Damage) under Present Condition</b>				
1 Dwelling	6.9	7.4	7.5	7.6
2 Industrial Establishment	1.8	2.4	2.5	2.6
3 Service Establishment	0.3	0.6	0.7	0.8
Sub-Total	9.1	10.4	10.7	11.0
4 Infrastructure Damage	3.2	3.6	3.7	3.9
5 Indirect Damage	1.2	1.4	1.4	1.5
Total	13.5	15.4	15.9	16.4
Annualized Value (Benefit under Present Conditions)	0.1	7.2	9.8	11.9
<b>Projection of Benefit under Future Conditions</b>				
In the year 2000	0.1	10.5	14.3	17.4
In the year 2010	0.1	15.8	21.5	26.1
In the year 2020	0.2	22.3	30.3	36.9

Remark : \*1 Calculated as recurrence interval of 1.01 years

Table 4.11 Comparison of Economic Internal Rate of Return

(Unit: %)

Item	Flood Control Work		Drainage Improvement	Entire City Project
	Entire River	River Basin		
<b>I. Under Future Conditions</b>				
1. Iloilo City	21.9	-	12.7	21.3
Jaro River		21.4	-	-
Iloilo & Mandurriao River		23.2	-	-
2. Cebu City	19.8	-	26.5	21.1
Bulacao River		26.1	-	-
Kinalumsan River		22.6	-	-
Guadalupe River		22.8	-	-
Lahug River		19.5	-	-
Sabang Daku River		14.0	-	-
3. Ormoc City	28.6	-	11.9	27.8
Anilao & Malbasag River		28.6	-	-
4. Tacloban City	-	-	27.8	27.8
<b>II. Under Present Conditions</b>				
1. Iloilo City	13.9	-	5.6	13.5
Jaro River		13.8	-	-
Iloilo & Mandurriao River		14.3	-	-
2. Cebu City	10.4	-	14.8	11.2
Bulacao River		14.7	-	-
Kinalumsan River		12.5	-	-
Guadalupe River		12.9	-	-
Lahug River		10.2	-	-
Sabang Daku River		5.7	-	-
3. Ormoc City	21.1	-	5.9	20.4
Anilao & Malbasag River		21.1	-	-
4. Tacloban City	-	-	20.2	20.2

Table 4.12 Environmental Interaction Matrix of Flood Control Plan in Iloilo

MAJOR ACTIVITIES ( which may cause IMPACTS)		ENVIRONMENTAL FACTORS													
		Physico-Chemical				Ecological			Socio-Economic						
Project Stage	Activities	Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								-	--			---		--
	Initial Site Clearing					-		-							
Construction	Labor Mobilization								+		-		,	-	-
	Channel Improvement	--			---	-	--	--	+	-	+	-	-	--	
	Floodways		-		-	-	-	--	+	--	+	-	-	--	
	Replacement (Bridge, etc.)	--			--		--	--	+		+	--	-		--
	Drainage Channel Improvement	-			---		-	--	+	-	+	-	-	-	
	Drainage Diversion		-		---	-		--	+	--	+	--	-		
Operation	River Channel	+++		+	++	+	+	+++	+++	+++		++	+++	+++	++
	Floodway	+++		-		-	-	--	+++	+++		++	+++	+++	++
	Drainage	+++		-	+++		+	+++	+++	+++		++	+++	+++	++

Note: + : Positive (Beneficial) Impact      - : Negative (Adverse) Impact

Impact Categories:    + or - : Possible but Minor Impact  
 ++ or -- : Minor to Moderate Impact  
 +++ or --- : Moderate to Major Impact

Table 4.13 Environmental Interaction Matrix of Flood Control Plan in Cebu

MAJOR ACTIVITIES (which may cause IMPACTS)		ENVIRONMENTAL FACTORS													
		Physico-Chemical				Ecological			Socio-Economic						
Project Stage	Activities	Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								--	---			---		---
	Initial Site Clearing					-									
Construction	Labor Mobilization								+						
	Channel Improvement	-			---	-	-	-	+	-	+	---	---	---	
	Replacement (Bridge, etc.)	-			---			-	+		+	---	-		-
	Drainage Channel Improvement	-			---			-	+	-	+	---	---	---	
Operation	River Channel	+++		+	+++	+	+	+++	+++	+++		++	+++	+++	++
	Drainage	+++	--		+++			+++	+++	+++		+++	+++	+++	+++

Note: + : Positive (Beneficial) Impact      - : Negative (Adverse) Impact

Impact Categories:      + or - : Possible but Minor Impact  
                                   ++ or -- : Minor to Moderate Impact  
                                   +++ or --- : Moderate to Major Impact

Table 4.14 Environmental Interaction Matrix of Flood Control Plan in Ormoc

MAJOR ACTIVITIES ( which may cause IMPACTS)		ENVIRONMENTAL							FACTORS						
Project Stage	Activities	Physico-Chemical				Ecological			Socio-Economic						
		Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								-	--			---		--
	Initial Site Clearing					-		,							
Construction	Labor Mobilization								+		--		-	-	--
	Channel Improvement	--			--	--	-	--	+	-	+	-	-	-	--
	Slit Dam					--	-	--	+	-	+				
	Replacement (Bridge, etc.)	--			--	-	--	--	+		+	--	-		--
	Drainage Channel Improvement				--	-	-	-	+	-	+	-	-	-	
Operation	River Channel	+++		++		++	+	+++	+++	+++		+	+++	++	++
	Drainage	+++	-	-	++		+	++	+++	+++		++	+++	+++	++

Note: + : Positive (Beneficial) Impact      - : Negative (Adverse) Impact

Impact Categories:    + or - : Possible but Minor Impact  
 ++ or -- : Minor to Moderate Impact  
 +++ or --- : Moderate to Major Impact

Table 4.15 Environmental Interaction Matrix of Flood Control Plan in Tacloban

MAJOR ACTIVITIES ( which may cause IMPACTS)		ENVIRONMENTAL							FACTORS						
		Physico-Chemical				Ecological			Socio-Economic						
Project Stage	Activities	Surface Water	Ground Water	Topography	Air, Noise & Offensive Odor	Terrestrial Species	Aquatic Species	Aesthetic Aspects	Economic Activities	Land Use	Demography & Manpower	Transportation	Housing & Community Infrastructure	Health & Social Services	Life Style & Community
Pre-Construction	Right-of-Way Acquisition								-	-			-		-
	Initial Site Clearing					-									
Construction	Labor Mobilization								+		--		-	-	--
	Replacement (Bridge, etc.)	-			--	-		--	+		+	--	-		--
	Drainage Channel Improvement	--			--	-		--	+		+	--	--		
Operation	Drainage	+++	-	-	++	+	+++	+++	+++	+++		++	+++	+++	++

Note: + : Positive (Beneficial) Impact      - : Negative (Adverse) Impact

Impact Categories:      + or - : Possible but Minor Impact  
 ++ or -- : Minor to Moderate Impact  
 +++ or --- : Moderate to Major Impact



Table 5.1 Disbursement Schedule of Urgent Plan

Unit: million peso

	Iloilo			Ormoc		
	River	Drainage	Total	River	Drainage	Total
I. Main Construction Cost	747.9	101.0	848.9	226.3	6.7	233.0
II Compensation Cost	232.0	22.8	254.8	44.4	0.7	45.1
III Administration Cost	49.0	6.2	55.2	13.5	0.4	13.9
IV Contingency						
for Main con. & Admi.	119.5	16.1	135.6	36.0	1.1	37.1
for Compen.	34.8	3.4	38.2	6.7	0.1	6.8
V Engineering Services						
for Detail Design	74.8	10.1	84.9	22.6	0.7	23.3
for Construction	44.9	6.1	51.0	13.6	0.4	14.0
<b>Total</b>	<b>1,302.9</b>	<b>165.7</b>	<b>1,468.6</b>	<b>363.1</b>	<b>10.1</b>	<b>373.2</b>

Iloilo City	1st year	2nd year	3rd year	4th year	5th year	6th year	Total
	D/D	Compensation		Construction			
I. Main Construction Cost				249.3	299.8	299.8	848.9
II Compensation Cost		127.4	127.4	0.0	0.0	0.0	254.8
III Administration Cost				16.3	19.4	19.4	55.1
IV Contingency		19.1	19.1	39.8	47.9	47.9	173.8
V Engineering Services	85.0			15.0	18.0	18.0	136.0
<b>Total</b>	<b>85.0</b>	<b>146.5</b>	<b>146.5</b>	<b>320.4</b>	<b>385.1</b>	<b>385.1</b>	<b>1,468.6</b>

note: Construction work for river is 3 years and for drainage is last 2 years.

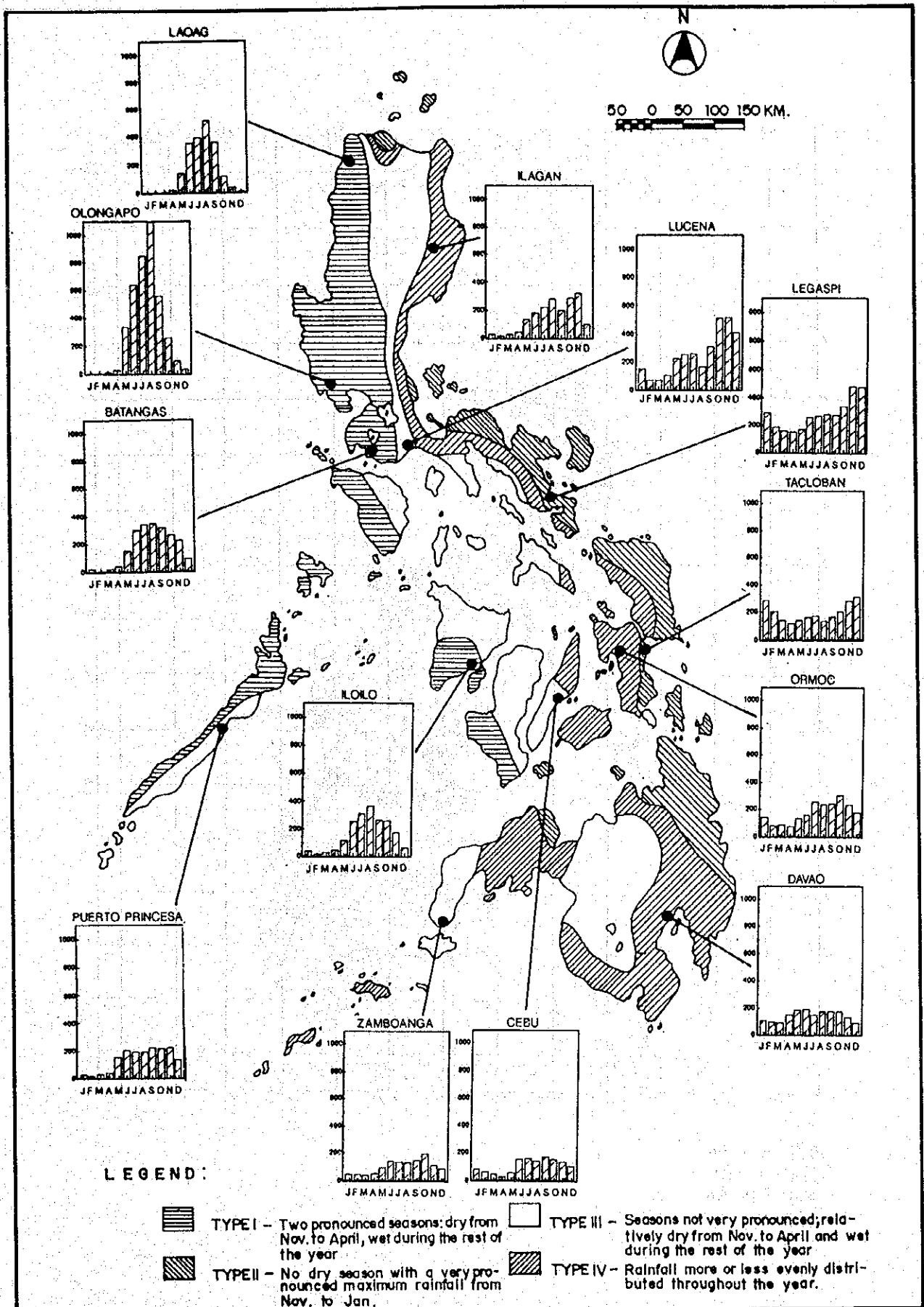
Ormoc City	1st year	2nd year	3rd year	4th year	5th year	Total
	D/D	Compensation		Construction		
I. Main Construction Cost				113.2	120.0	233.2
II Compensation Cost		22.6	22.6	0.0	0.0	45.2
III Administration Cost				7.0	7.0	14.0
IV Contingency		3.4	3.4	18.0	19.0	43.8
V Engineering Services	23.0			7.0	7.0	37.0
<b>Total</b>	<b>23.0</b>	<b>26.0</b>	<b>26.0</b>	<b>145.2</b>	<b>153.0</b>	<b>373.2</b>

note: Construction work for river is 2 years and for drainage is last year.

*FIGURES*

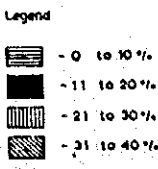
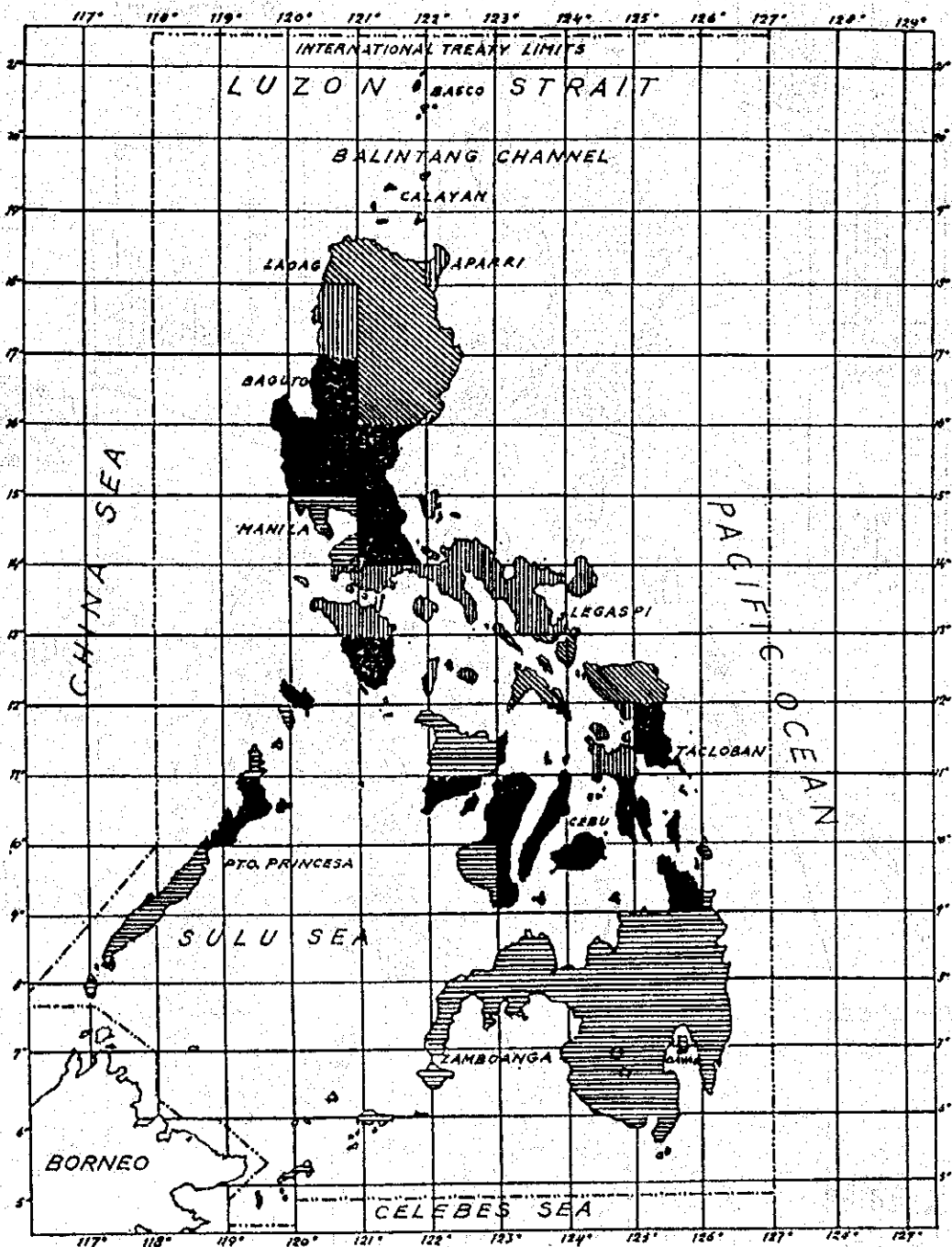






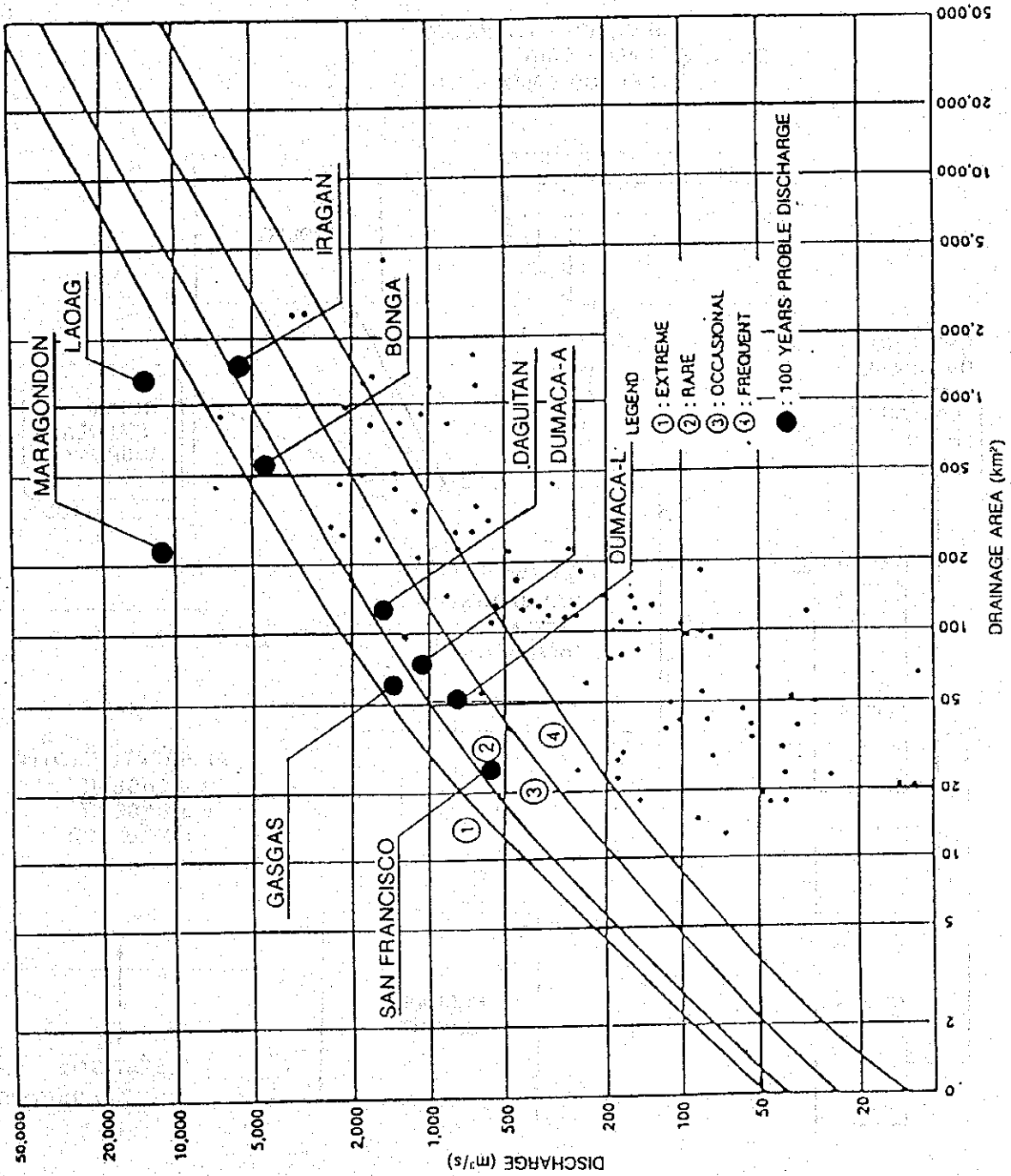
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Fig. 2.1  
Climate Classification



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Fig. 2.2  
 Mean Percentage Frequencies of Tropical Cyclone  
 Passage in Different Parts of the Philippines



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Fig. 2.3  
Relation of Runoff to Size of Drainage Area in the  
Philippines

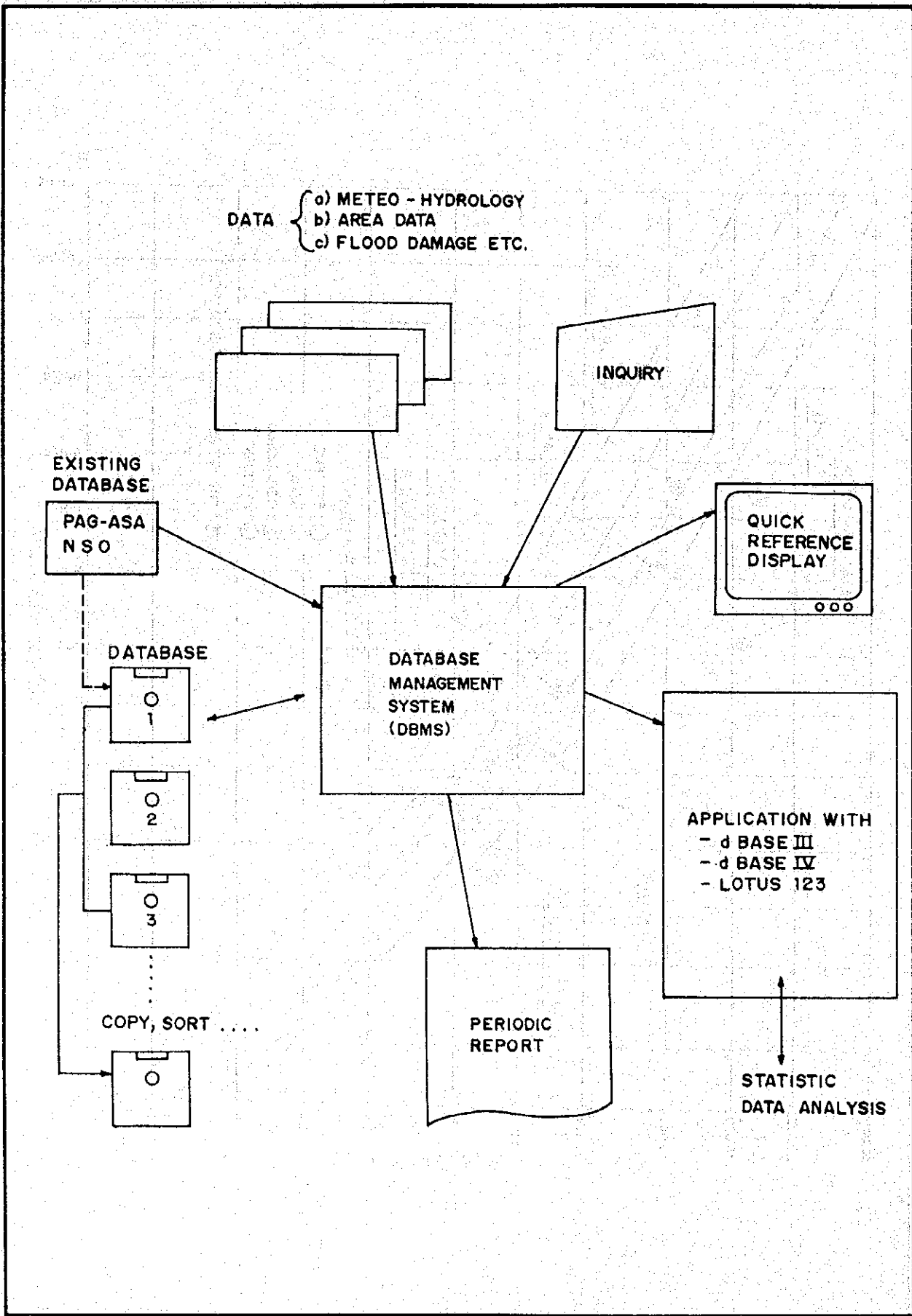
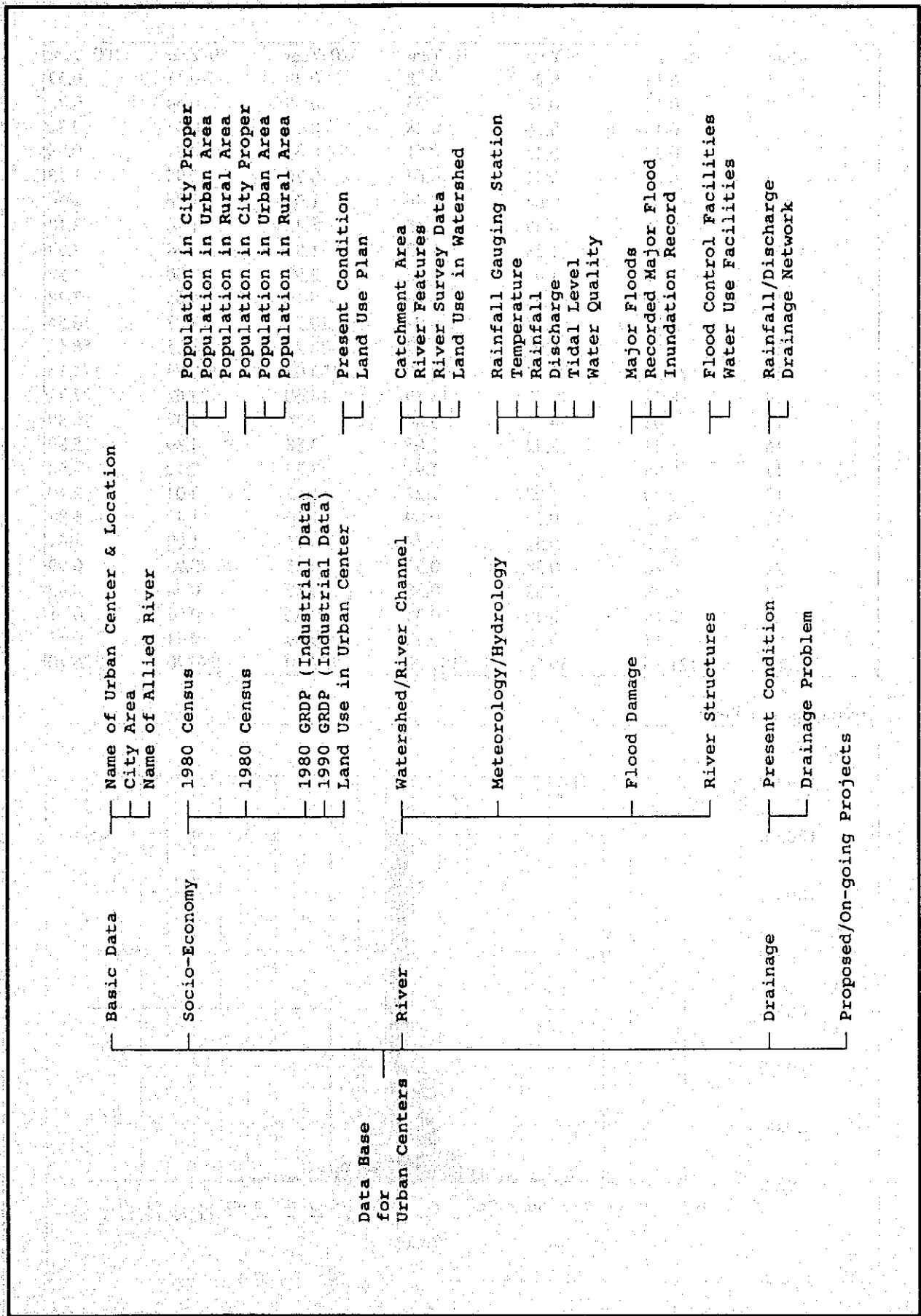


Fig. 2.4  
 Outline of Database System



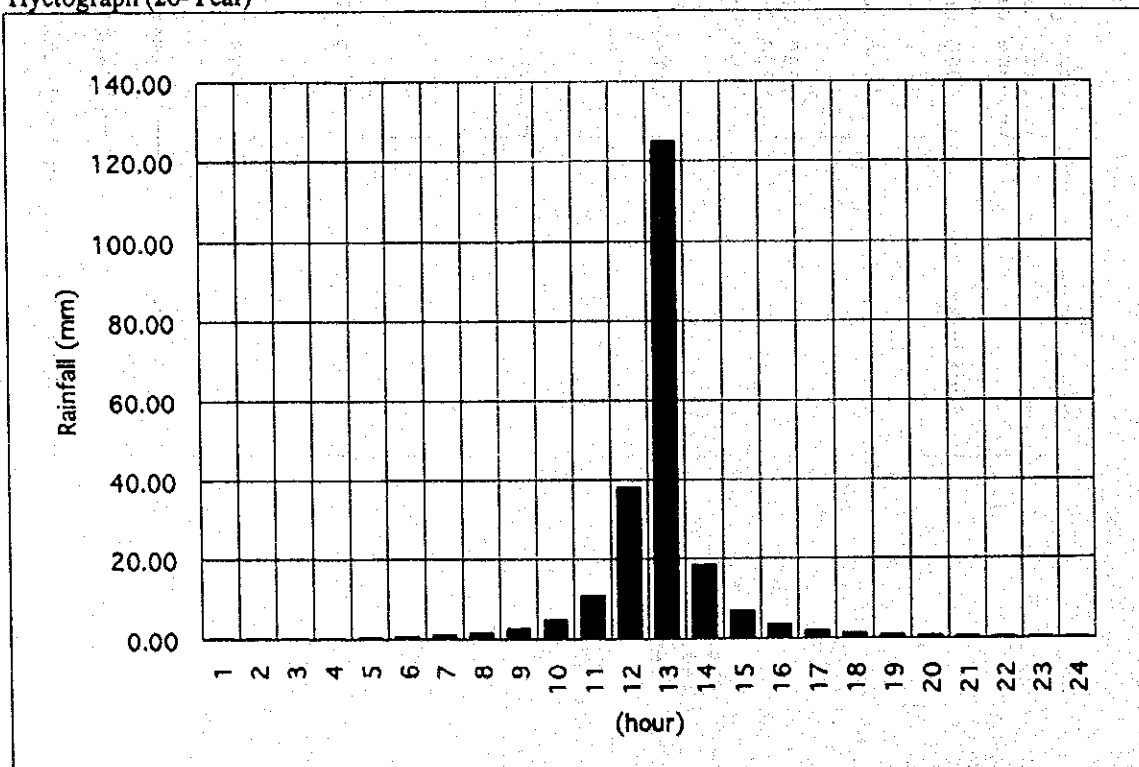


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Fig. 2.5  
 Structure of Database for Flood Control Plan in Urban Centers

Hour	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year
1	0.14	0.26	0.28	0.39	0.41	0.57
2	0.14	0.26	0.35	0.39	0.54	0.71
3	0.14	0.26	0.38	0.52	0.68	0.71
4	0.28	0.38	0.51	0.65	0.81	0.99
5	0.28	0.51	0.64	0.78	0.95	1.13
6	0.42	0.64	0.76	1.03	1.36	1.56
7	0.56	0.89	1.15	1.42	1.76	2.12
8	0.84	1.28	1.53	1.94	2.44	2.97
9	1.26	1.91	2.42	2.97	3.80	4.52
10	2.10	3.32	4.20	5.17	6.65	7.78
11	4.77	7.14	8.91	10.99	13.98	16.54
12	18.50	26.03	31.82	38.27	48.05	56.12
13	75.27	92.24	108.20	125.03	150.94	174.16
14	8.42	12.23	15.29	18.60	23.62	27.71
15	3.08	4.72	5.86	7.24	9.37	10.89
16	1.54	2.42	3.05	3.88	4.89	5.80
17	0.98	1.53	1.91	2.33	3.12	3.68
18	0.70	1.02	1.27	1.55	2.04	2.40
19	0.42	0.77	0.89	1.16	1.49	1.84
20	0.42	0.51	0.76	0.91	1.09	1.41
21	0.28	0.38	0.51	0.65	0.95	0.99
22	0.28	0.38	0.38	0.52	0.68	0.85
23	0.14	0.26	0.35	0.52	0.54	0.71
24	0.14	0.26	0.28	0.39	0.54	0.57
Total	121.10	159.60	191.70	227.30	280.70	326.70

Hyetograph (20-Year)



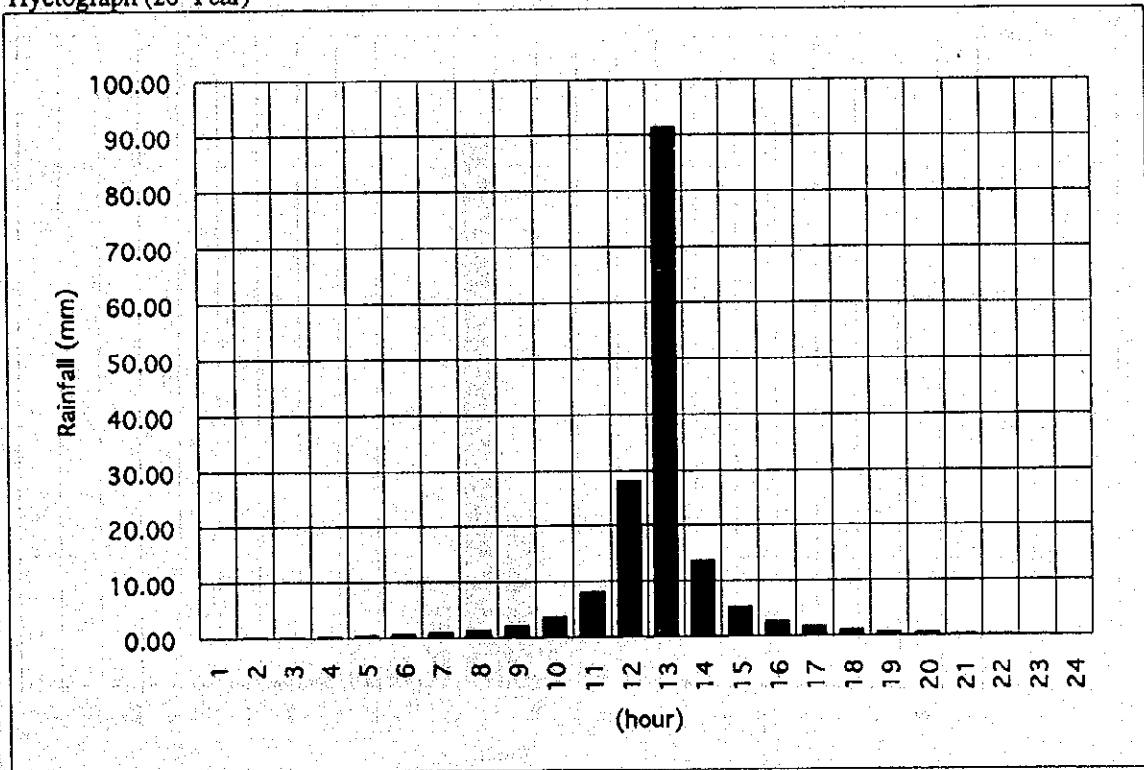
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Fig. 3.1(1/4)  
Design Hyetograph, Iloilo

Hour	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year
1	0.11	0.19	0.20	0.26	0.32	0.40
2	0.11	0.19	0.26	0.34	0.42	0.49
3	0.11	0.19	0.26	0.34	0.50	0.57
4	0.12	0.29	0.36	0.43	0.58	0.65
5	0.23	0.38	0.45	0.60	0.75	0.90
6	0.23	0.48	0.63	0.77	1.00	1.14
7	0.35	0.67	0.81	1.03	1.33	1.47
8	0.46	0.86	1.16	1.46	1.83	2.13
9	0.81	1.34	1.79	2.24	2.82	3.27
10	1.38	2.39	3.14	3.87	4.82	5.56
11	3.00	5.26	6.81	8.18	10.13	11.69
12	12.68	19.71	24.19	28.32	34.04	38.34
13	61.65	73.37	82.26	91.41	103.29	112.56
14	5.42	9.19	11.56	13.86	16.94	19.29
15	1.96	3.44	4.48	5.42	6.73	7.77
16	1.04	1.82	2.33	2.84	3.65	4.17
17	0.58	1.05	1.43	1.81	2.24	2.62
18	0.35	0.77	0.99	1.21	1.49	1.80
19	0.23	0.57	0.72	0.86	1.08	1.31
20	0.23	0.38	0.54	0.69	0.83	0.98
21	0.12	0.29	0.45	0.52	0.66	0.74
22	0.11	0.29	0.36	0.43	0.50	0.65
23	0.11	0.19	0.26	0.34	0.42	0.49
24	0.11	0.19	0.26	0.27	0.33	0.41
Total	91.50	123.50	145.70	167.50	196.70	219.40

Hyetograph (20-Year)



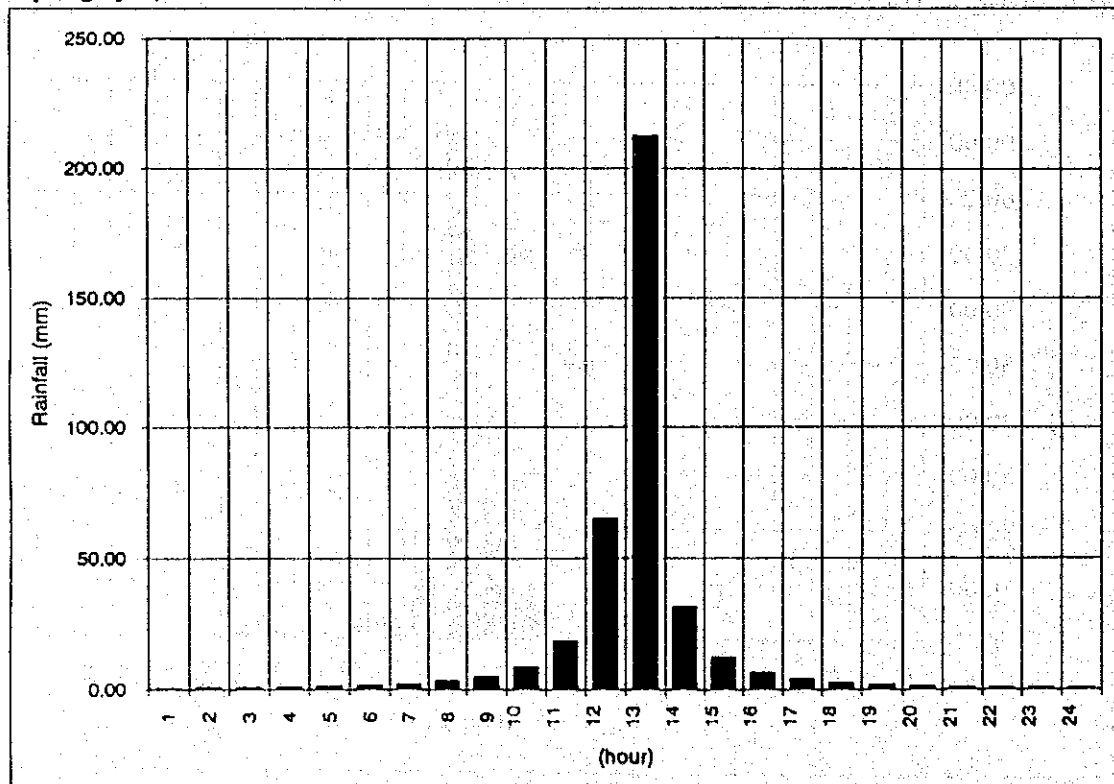
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Fig. 3.1(2/4)  
Design Hyetograph, Cebu

Hour	5-Year	10-Year	20-Year	50-Year	100-Year
1	0.26	0.52	0.52	0.78	0.79
2	0.52	0.52	0.78	0.78	1.05
3	0.52	0.78	0.78	1.04	1.32
4	0.52	0.78	1.04	1.31	1.58
5	0.78	1.04	1.30	1.57	1.84
6	1.05	1.30	1.81	2.09	2.63
7	1.57	1.82	2.33	2.87	3.42
8	2.09	2.59	3.37	4.18	4.74
9	3.14	4.15	5.18	6.27	7.38
10	5.49	7.26	8.81	10.97	12.65
11	12.30	15.57	18.66	22.99	26.61
12	45.52	55.52	65.33	78.37	88.78
13	170.05	191.46	212.83	243.72	266.34
14	21.19	26.46	31.63	38.66	44.26
15	7.85	10.12	12.44	15.41	17.65
16	4.19	5.45	6.48	8.10	9.48
17	2.62	3.37	4.15	4.96	5.80
18	1.83	2.33	2.85	3.40	3.95
19	1.31	1.56	2.07	2.61	2.90
20	1.05	1.30	1.56	1.83	2.11
21	0.78	1.04	1.30	1.57	1.84
22	0.52	0.78	1.04	1.31	1.32
23	0.52	0.52	0.78	1.04	1.05
24	0.52	0.52	0.78	0.78	1.05
Total	286.21	336.74	387.80	456.62	510.54

Hyetograph (20-Year)



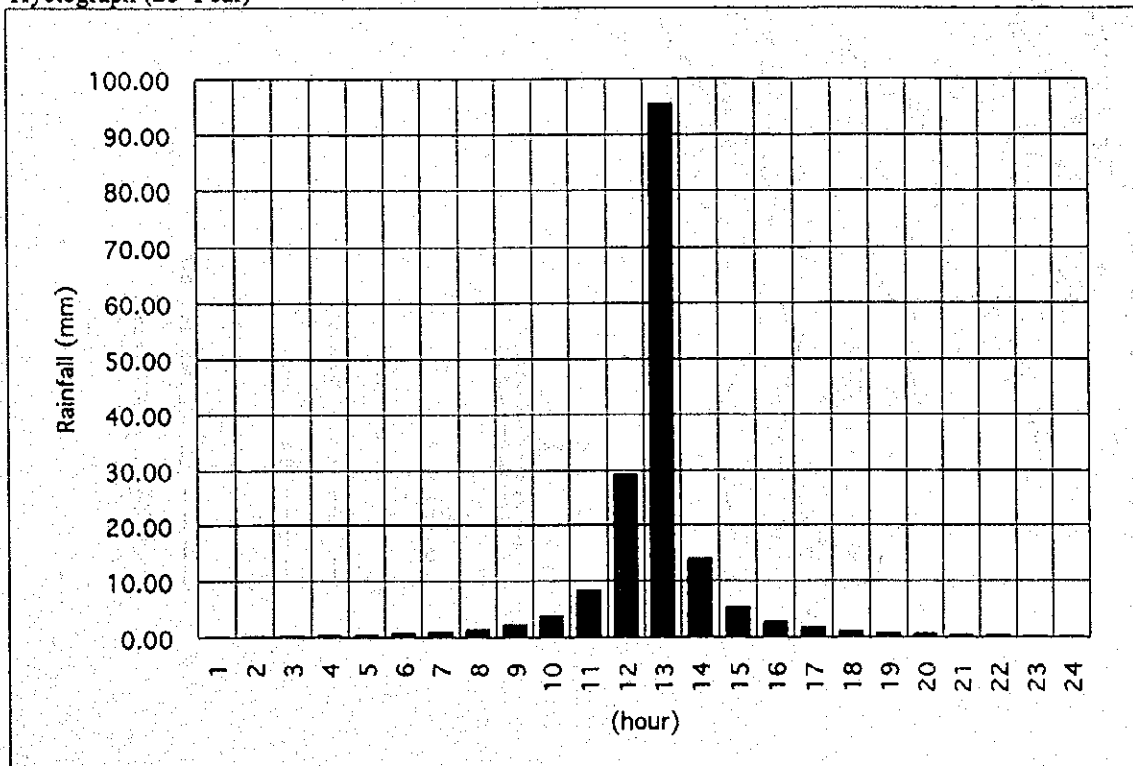
THE STUDY ON THE FLOOD CONTROL FOR RIVERS  
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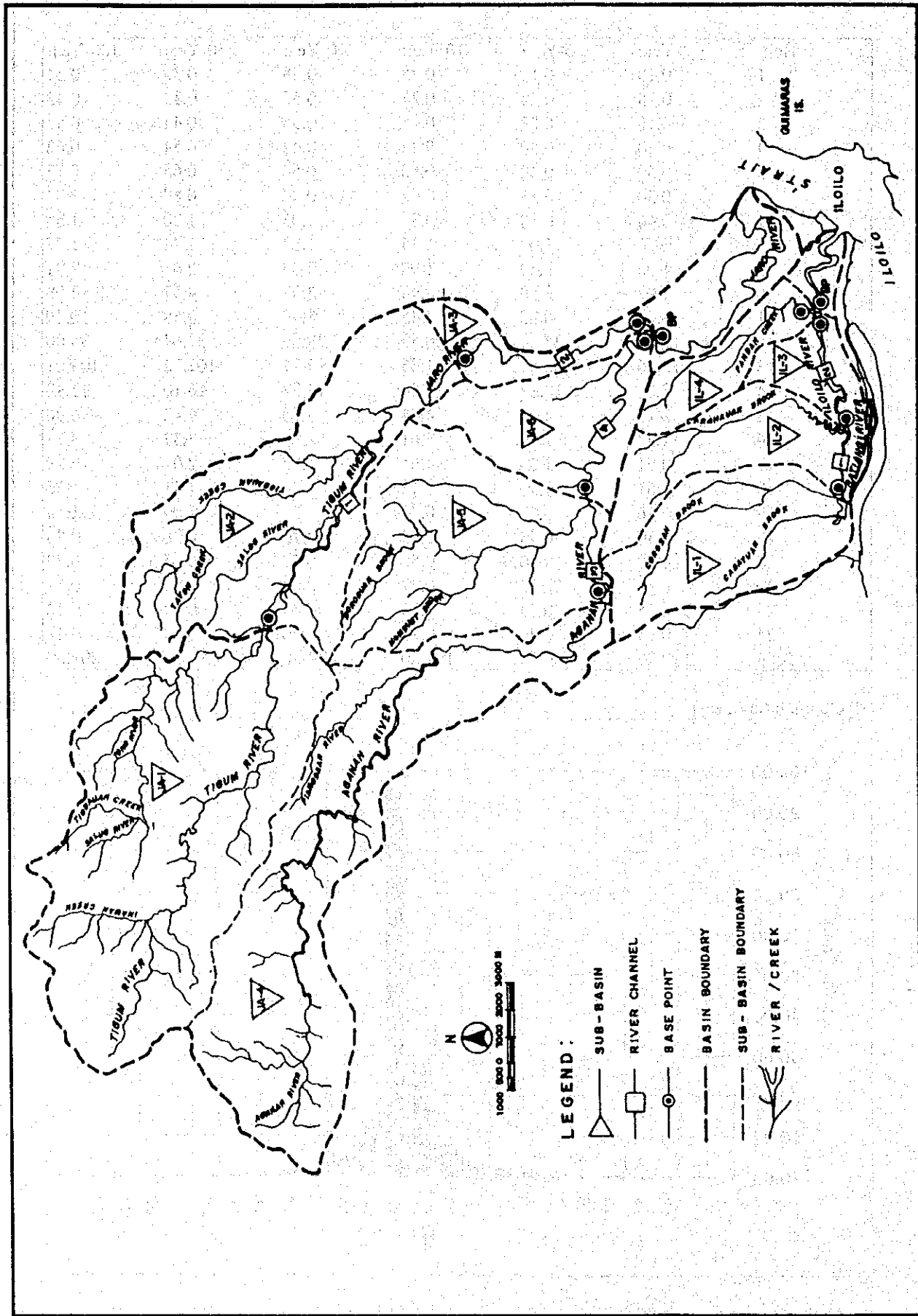
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 3.1(3/4)  
Design Hyetograph, Ormoc

Hour	2-Year	5-Year	10-Year	20-Year	50-Year	100-Year
1	0.10	0.15	0.25	0.28	0.33	0.31
2	0.15	0.24	0.27	0.35	0.33	0.42
3	0.15	0.27	0.35	0.35	0.44	0.52
4	0.20	0.30	0.37	0.47	0.54	0.62
5	0.30	0.40	0.50	0.58	0.65	0.73
6	0.30	0.53	0.62	0.82	0.87	1.04
7	0.46	0.80	0.87	1.05	1.20	1.35
8	0.76	1.07	1.24	1.52	1.74	1.87
9	1.06	1.60	1.99	2.33	2.61	2.91
10	1.97	2.80	3.48	3.97	4.57	4.99
11	4.25	6.28	7.45	8.40	9.58	10.49
12	17.30	23.24	26.58	29.39	32.64	35.00
13	78.16	86.81	91.65	95.77	101.52	105.01
14	7.61	10.82	12.66	14.22	16.10	17.43
15	2.73	4.01	4.84	5.60	6.42	6.96
16	1.37	2.14	2.61	2.92	3.37	3.74
17	0.91	1.34	1.61	1.87	2.07	2.29
18	0.61	0.93	1.12	1.28	1.41	1.56
19	0.46	0.67	0.75	0.93	1.09	1.14
20	0.30	0.53	0.62	0.70	0.76	0.83
21	0.30	0.40	0.50	0.58	0.65	0.73
22	0.15	0.32	0.37	0.47	0.54	0.52
23	0.15	0.25	0.25	0.35	0.44	0.42
24	0.15	0.20	0.25	0.30	0.33	0.42
Total	119.90	146.10	161.20	174.50	190.20	201.30

Hyetograph (20-Year)

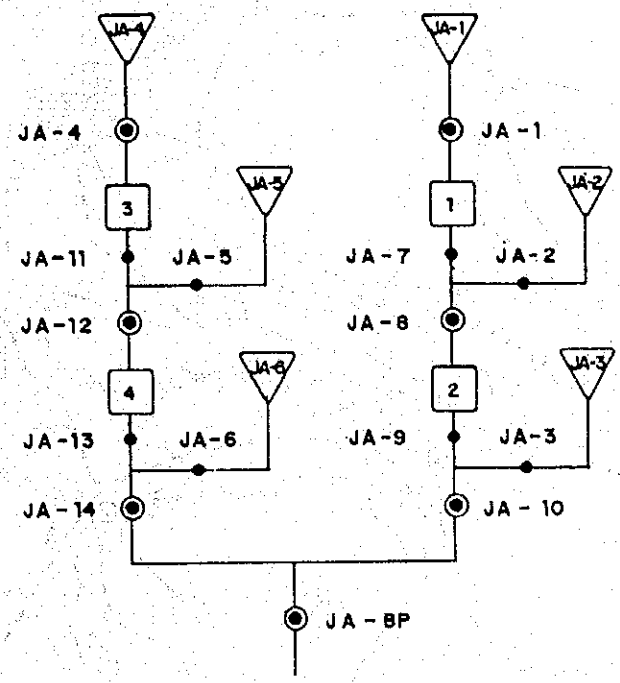




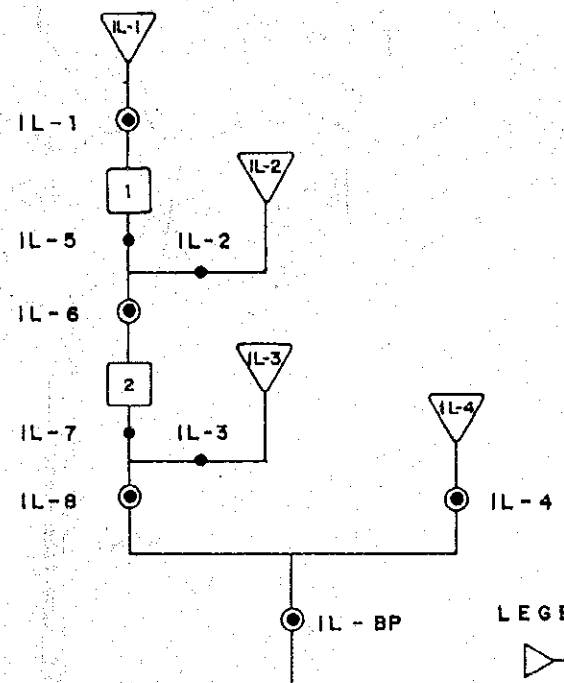
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


Fig. 3.2  
 Basin Division, Iloilo

JARO RIVER



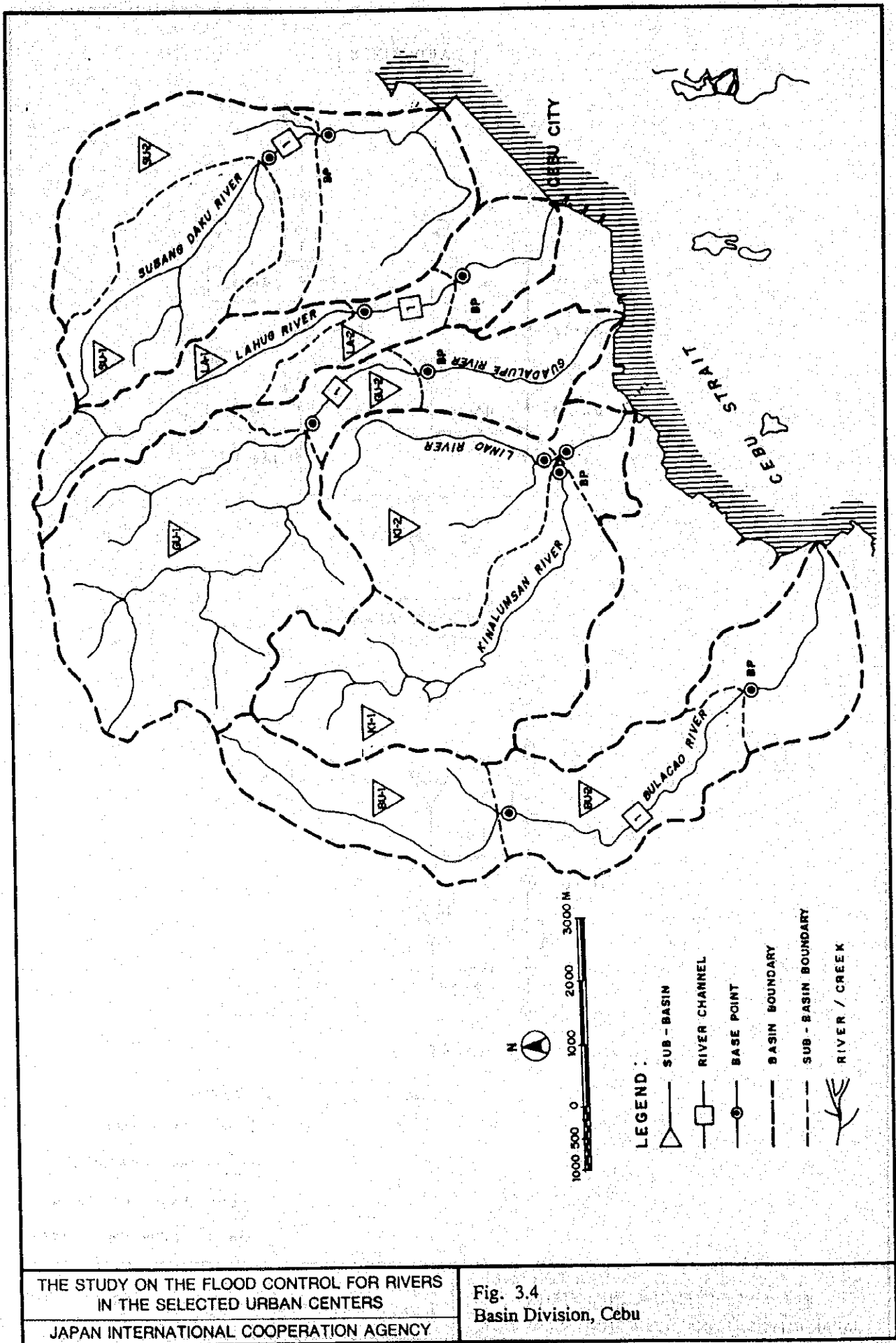
ILOILO RIVER



- LEGEND :
-  SUB-BASIN
  -  RIVER CHANNEL
  -  BASE POINT (BP-NO.)
  -  REFERENCE POINT

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Fig. 3.3  
Jaro River and Iloilo River System Model



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Fig. 3.4  
 Basin Division, Cebu