

Table 3-22 (1/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-ALL

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			724,068		1,062,265	1,786,333	
1. Preparatory Works			57,239		83,974	141,212	
2. Main Works							
(1) Excavation 1 Common	m3 3,181,979	16	50,912	51	162,281	213,193	EX-1
2 Gravel	m3	20		61			EX-2
(2) Embankment 1 Left	m3 1,097,283	27	29,627	78	85,588	115,215	EM-1-L
Right	m3 1,551,226	27	41,883	78	120,996	162,879	EM-1-R
Popont	m3 1,405,364	21	29,513	57	80,106	109,618	EM-1-P
Embankment 2 Left	m3	40		124			EM-2-L
Right	m3 479,081	40	19,163	124	59,406	78,569	EM-2-R
(3) Conc.Dike	m 2,500	13,011	32,528	11,875	29,688	62,216	AG-R-12
(4) Sodding	m2 2,648,320	15	39,725			39,725	SO
(5) Revetment & B.Protection	Type A-1 m 2,680	6,974	18,691	4,967	13,311	32,002	AG-R-1
Type A-2	m 670	11,096	7,434	7,850	5,260	12,694	AG-R-2
Type B-1	m 4,200	5,809	24,396	2,692	11,305	35,701	AG-R-3
Type B-2	m 1,050	9,702	10,187	4,528	4,754	14,941	AG-R-4
Type C	m 1,300	7,757	10,084	3,935	5,115	15,199	AG-R-5
Type D	m 500	11,626	5,813	8,241	4,121	9,934	AG-R-6
Type I	m 8,000	3,383	27,066	1,886	15,088	42,154	AG-R-7
Type II	m 6,400	7,672	49,099	5,089	32,569	81,669	AG-R-8
Type III	m 5,194	6,569	34,120	4,257	22,113	56,233	AG-R-9
Spurdike	m	1,331		765			AG-R-10
Type IV	m 2,100	10,821	22,723	7,974	16,746	39,470	AG-R-11
PopontR-1m		2,827		2,230			AG-R-13
PopontR-2m	119	14,941	1,778	10,092	1,201	2,979	AG-R-14
(6) Groin	L=30m 54	114,906	6,205	110,883	5,938	12,193	GR-2
(7) Sluice-Way	Type A-1 pc. 9	332,056	2,856	317,284	2,729	5,584	AG-S-1-1
Type A-2	pc. 3	385,655	1,080	411,705	1,153	2,233	AG-S-1-2
Type B	pc. 6	962,703	5,776	1,524,088	9,145	14,921	AG-S-2
Type C-1	pc. 2	1,093,281	1,640	1,974,788	2,962	4,602	AG-S-3-1
Type C-2	pc. 8	1,600,524	12,804	3,286,159	26,289	39,093	AG-S-3-2
Type D	pc. 1	1,872,648	1,873	4,364,433	4,364	6,237	AG-S-4
Type E	pc.	743,459		919,532			AG-S-5
(8) Box-Culvert	Popont pc. 2	447,824	896	580,695	1,161	2,057	BXC
(9) Diversion C. & Closing Dike	m 120	5,239,017	5,239	5,875,940	5,876	11,115	PDS
(10) Demolishment	Concrete m3 7,520	25,166	3,020	58,383	7,006	10,026	AG-R-15
Metal	ton	617	4,640	1,000	7,520	12,160	DC
(11) Bridge	Newly m2 8,524	806		1,485			DM
(12) Drainage Ditch	m2	6,239	53,181	8,611	73,400	126,531	BC
(13) Well	D=8m pc. 715	265		195			DT
(14) Pavement	Concrete m2 11,250	12,000	8,580	8,000	5,720	14,300	WL
Asphalt	m2 14,642	101	1,136	151	1,699	2,835	PC
Gravel	m2 216,147	64	937	572	8,375	9,312	PA
		36	7,781	31	6,701	14,482	PG
Total of Main Works			572,386		839,736	1,412,121	
3. Miscellaneous Works			94,444		138,556	233,000	
II. Compensation			398,000			398,000	COM-F
III. Administration			109,217			109,217	
IV. Physical Contingency			184,693		159,340	344,032	
Total of I,II,III and IV			1,415,977		1,221,605	2,637,582	
V. Engineering Services			28,581		257,232	285,813	
Grand Total			1,444,558		1,478,837	2,923,396	

Table 3-22 (2/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-1

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				283,576		509,585	793,161	
1. Preparatory Works				22,417		40,283	62,700	
2. Main Works								
(1) Excavation 1 Common	m3	3,102,548	16	49,641	51	158,230	207,871	EX-1
2 Gravel	m3		20		61			EX-2
(2) Embankment 1 Left	m3	298,133	27	8,050	78	23,254	31,304	EM-1-L
Right	m3	1,189,370	27	32,113	78	92,771	124,884	EM-1-R
Popont	m3		21		57			EM-1-P
Embankment 2 Left	m3		40		124			EM-2-L
Right	m3		40		124			EM-2-R
(3) Conc.Dike	m		13,011		11,875			AG.R-12
(4) Sodding	m2	602,314	15	9,035			9,035	SO
(5) Revetment & B.Protection Type A-1	m	1,880	6,974	13,112	4,967	9,338	22,449	AG.R-1
Type A-2	m	470	11,096	5,215	7,850	3,690	8,905	AG.R-2
Type B-1	m	2,760	5,809	16,032	2,692	7,429	23,460	AG.R-3
Type B-2	m	690	9,702	6,694	4,528	3,124	9,818	AG.R-4
Type C	m		7,757		3,935			AG.R-5
Type D	m		11,626		8,241			AG.R-6
Type I	m		3,383		1,886			AG.R-7
Type II	m		7,672		5,089			AG.R-8
Type III	m	3,694	6,569	24,267	4,257	15,727	39,993	AG.R-9
Spurdike	m		1,331		765			AG.R-10
Type IV	m		10,821		7,974			AG.R-11
PopontR-1m			2,827		2,230			AG.R-13
PopontR-2m			14,941		10,092			AG.R-14
(6) Groin L=30m		15	114,906	1,724	110,883	1,663	3,387	GR-2
(7) Sluice-Way Type A-1	pc.	1	332,056	332	317,284	317	649	AG.S-1-1
Type A-2	pc.		385,655		411,705			AG.S-1-2
Type B	pc.	2	962,703	1,925	1,524,088	3,048	4,974	AG.S-2
Type C-1	pc.	1	1,093,281	1,093	1,974,788	1,975	3,068	AG.S-3-1
Type C-2	pc.	5	1,600,524	8,003	3,286,159	16,431	24,433	AG.S-3-2
Type D	pc.		1,872,648		4,364,433			AG.S-4
Type E	pc.		743,459		919,532			AG.S-5
(8) Box-Culvert Popont	pc.		447,824		580,695			BXC
(9) Diversion C. & Closing Dike	pc.	1	5,239,017	5,239	5,875,940	5,876	11,115	PDS
m		120	25,166	3,020	58,383	7,006	10,026	AG.R-15
(10)Demolishment Concrete	m3	5,000	617	3,085	1,000	5,000	8,085	DC
Metal	ton		806		1,485			DM
(11)Bridge Newly	m2	5,344	6,239	33,341	8,611	46,017	79,358	BC
(12)Drainage Ditch	m2		265		195			DT
(13)Well D=8m	pc.		12,000		8,000			WL
(14)Pavement Concrete	m2		101		151			PC
Asphalt	m2		64		572			PA
Gravel	m2	62,535	36	2,251	31	1,939	4,190	PG
Total of Main Works				224,170		402,834	627,005	
3. Miscellaneous Works				36,988		66,468	103,456	
II. Compensation				116,000			116,000	COM-F
III. Administration				45,458			45,458	
IV. Physical Contingency				66,755		76,438	143,193	
Total of I,II,III and IV				511,789		586,023	1,097,812	
V. Enginnering Services				12,691		114,215	126,906	
Grand Total				524,479		700,238	1,224,717	

Table 3-22 (3/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st Stage; FINANCIAL COST)

River : Agno River

Stretch : AG-2

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks	
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)			
I Main Construction			126,410		165,089	291,498		
1. Preparatory Works			9,993		13,051	23,043		
2. Main Works								
(1) Excavation 1 Common	m3	16		51			EX-1	
2 Gravel	m3	20		61			EX-2	
(2) Embankment 1 Left	m3	546,490	27	14,755	78	42,626	57,381 EM-1-L	
Right	m3	207,450	27	5,601	78	16,181	21,782 EM-1-R	
Popont	m3		21		57		EM-1-P	
Embankment 2 Left	m3		40		124		EM-2-L	
Right	m3		40		124		EM-2-R	
(3) Conc.Dike	m	2,500	13,011	32,528	11,875	29,688	62,216 AG.R-12	
(4) Sodding	m2	621,563	15	9,323			9,323 SO	
(5) Revetment & B. Protection	Type A-1 m		6,974		4,967		AG.R-1	
Type A-2 m			11,096		7,850		AG.R-2	
Type B-1 m	800	5,809	4,647	2,692	2,153	6,800	AG.R-3	
Type B-2 m	200	9,702	1,940	4,528	906	2,846	AG.R-4	
Type C m		7,757		3,935			AG.R-5	
Type D m		11,626		8,241			AG.R-6	
Type I m	1,350	3,383	4,567	1,886	2,546	7,113	AG.R-7	
Type II m		7,672		5,089			AG.R-8	
Type III m		6,569		4,257			AG.R-9	
Spurdike m		1,331		765			AG.R-10	
Type IV m		10,821		7,974			AG.R-11	
PopontR-1m		2,827		2,230			AG.R-13	
PopontR-2m		14,941		10,092			AG.R-14	
(6) Groin L=30m		114,906		110,883			GR-2	
(7) Sluice-Way Type A-1	pc.	1	332,056	332	317,284	317	649	AG.S-1-1
Type A-2	pc.		385,655		411,705			AG.S-1-2
Type B	pc.	2	962,703	1,925	1,524,088	3,048	4,974	AG.S-2
Type C-1	pc.		1,093,281		1,974,788			AG.S-3-1
Type C-2	pc.		1,600,524		3,286,159			AG.S-3-2
Type D	pc.		1,872,648		4,364,433			AG.S-4
Type E	pc.		743,459		919,532			AG.S-5
(8) Box-Culvert Popont	pc.		447,824		580,695			BXC
(9) Diversion C. & Closing Dike	pc.		5,239,017		5,875,940			PDS
(10) Demolishment Concrete	m3	2,320	617	1,431	1,000	2,320	3,751	DC
Metal	ton		806		1,485			DM
(11) Bridge Newly	m2	3,180	6,239	19,840	8,611	27,383	47,223	BC
(12) Drainage Ditch	m2		265		195			DT
(13) Well D=8m	pc.		12,000		8,000			WL
(14) Pavement Concrete	m2	11,250	101	1,136	151	1,699	2,835	PC
Asphalt	m2		64		572			PA
Gravel	m2	52,815	36	1,901	31	1,637	3,539	PG
Total of Main Works			99,929		130,505		230,434	
3. Miscellaneous Works			16,488		21,533		38,022	
II. Compensation				52,000			52,000	COM-F
III. Administration				17,175			17,175	
IV. Physical Contingency				29,338		24,763	54,101	
Total of I, II, III and IV				224,922		189,852	414,774	
V. Enginnering Services				4,664		41,976	46,640	
Grand Total				229,586		231,828	461,414	

Table 3-22 (4/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-3

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			90,103		94,757	184,860	
1. Preparatory Works			7,123		7,491	14,613	
2. Main Works							
(1) Excavation 1 Common	m3 79,431	16	1,271	51	4,051	5,322	EX-1
2 Gravel	m3	20		61			EX-2
(2) Embankment 1 Left	m3 252,660	27	6,822	78	19,707	26,529	EM-1-L
Right	m3 154,406	27	4,169	78	12,044	16,213	EM-1-R
Popont	m3	21		57			EM-1-P
Embankment 2 Left	m3	40		124			EM-2-L
Right	m3	40		124			EM-2-R
(3) Conc.Dike	m	13,011		11,875			AG.R-12
(4) Sodding	m2 674,820	15	10,122			10,122	SO
(5) Revetment & Type A-1	m 800	6,974	5,579	4,967	3,974	9,553	AG.R-1
B.Protection Type A-2	m 200	11,096	2,219	7,850	1,570	3,789	AG.R-2
Type B-1	m 640	5,809	3,717	2,692	1,723	5,440	AG.R-3
Type B-2	m 160	9,702	1,552	4,528	724	2,277	AG.R-4
Type C	m	7,757		3,935			AG.R-5
Type D	m	11,626		8,241			AG.R-6
Type I	m	3,383		1,886			AG.R-7
Type II	m 2,200	7,672	16,878	5,089	11,196	28,074	AG.R-8
Type III	m 1,500	6,569	9,854	4,257	6,386	16,240	AG.R-9
Spurdike	m	1,331		765			AG.R-10
Type IV	m	10,821		7,974			AG.R-11
PopontR-1m		2,827		2,230			AG.R-13
PopontR-2m		14,941		10,092			AG.R-14
(6) Groin L=30m	30	114,906	3,447	110,883	3,326	6,774	GR-2
(7) Sluice-Way Type A-1	pc. 1	332,056	332	317,284	317	649	AG.S-1-1
Type A-2	pc.	385,655		411,705			AG.S-1-2
Type B	pc. 1	962,703	963	1,524,088	1,524	2,487	AG.S-2
Type C-1	pc.	1,093,281		1,974,788			AG.S-3-1
Type C-2	pc. 1	1,600,524	1,601	3,286,159	3,286	4,887	AG.S-3-2
Type D	pc. 1	1,872,648	1,873	4,364,433	4,364	6,237	AG.S-4
Type E	pc.	743,459		919,532			AG.S-5
(8) Box-Culvert Popont	pc.	447,824		580,695			BXC
(9) Diversion C. & Closing Dike	pc. m	5,239,017		5,875,940			PDS
	m	25,166		58,383			AG.R-15
(10)Demolishment Concrete	m3	617		1,000			DC
Metal	ton	806		1,485			DM
(11)Bridge Newly	m2	6,239		8,611			BC
(12)Drainage Ditch	m2	265		195			DT
(13)Well D=8m	pc.	12,000		8,000			WL
(14)Pavement Concrete	m2	101		151			PC
Asphalt	m2	64		572			PA
Gravel	m2 23,022	36	829	31	714	1,542	PG
Total of Main Works			71,228		74,907	146,135	
3. Miscellaneous Works			11,753		12,360	24,112	
II. Compensation			3,000			3,000	COM-F
III. Administration			9,393			9,393	
IV. Physical Contingency			15,374		14,214	29,588	
Total of I,II,III and IV			117,871		108,970	226,841	
V. Engineering Services			2,958		26,620	29,578	
Grand Total			120,829		135,590	256,419	

Table 3-22 (5/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-4

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				156,071		158,898	314,968	
1. Preparatory Works				12,338		12,561	24,899	
2. Main Works								
(1) Excavation	1 Common	m3		16		51		EX-1
	2 Gravel	m3		20		61		EX-2
(2) Embankment	1 Left	m3		27		78		EM-1-L
	Right	m3		27		78		EM-1-R
	Popont	m3		21		57		EM-1-P
Embankment	2 Left	m3		40		124		EM-2-L
	Right	m3	479,081	40	19,163	124	59,406	78,569 EM-2-R
(3) Conc.Dike		m		13,011		11,875		AG.R-12
(4) Sodding		m2	397,429	15	5,961		5,961	SO
(5) Revetment & B.Protection	Type A-1	m		6,974		4,967		AG.R-1
	Type A-2	m		11,096		7,850		AG.R-2
	Type B-1	m		5,809		2,692		AG.R-3
	Type B-2	m		9,702		4,528		AG.R-4
	Type C	m	1,300	7,757	10,084	3,935	5,115	15,199 AG.R-5
	Type D	m	500	11,626	5,813	8,241	4,121	9,934 AG.R-6
	Type I	m	6,650	3,383	22,498	1,886	12,542	35,040 AG.R-7
	Type II	m	4,200	7,672	32,221	5,089	21,374	53,595 AG.R-8
	Type III	m		6,569		4,257		AG.R-9
	Spurdike	m		1,331		765		AG.R-10
	Type IV	m	2,100	10,821	22,723	7,974	16,746	39,470 AG.R-11
	PopontR-1m			2,827		2,230		AG.R-13
	PopontR-2m			14,941		10,092		AG.R-14
(6) Groin	L=30m		9	114,906	1,034	110,883	998	2,032 GR-2
(7) Sluice-Way	Type A-1	pc.	2	332,056	664	317,284	635	1,299 AG.S-1-1
	Type A-2	pc.		385,655		411,705		AG.S-1-2
	Type B	pc.		962,703		1,524,088		AG.S-2
	Type C-1	pc.		1,093,281		1,974,788		AG.S-3-1
	Type C-2	pc.	1	1,600,524	1,601	3,286,159	3,286	4,887 AG.S-3-2
	Type D	pc.		1,872,648		4,364,433		AG.S-4
	Type E	pc.		743,459		919,532		AG.S-5
(8) Box-Culvert	Popont	pc.		447,824		580,695		BXC
(9) Diverson C. & Closing Dike		pc.		5,239,017		5,875,940		PDS
		m		25,166		58,383		AG.R-15
(10)Denolishment	Concrete	m3		617		1,000		DC
	Metal	ton		806		1,485		DM
(11)Bridge	Newly	m2		6,239		8,611		BC
(12)Drainage Ditch		m2		265		195		DT
(13)Well	D=8m	pc.		12,000		8,000		WL
(14)Pavement	Concrete	m2		101		151		PC
	Asphalt	m2		64		572		PA
	Gravel	m2	44,775	36	1,612	31	1,388	3,000 PG
Total of Main Works				123,376		125,611	248,987	
3. Miscellaneous Works				20,357		20,726	41,083	
II. Compensation					26,000		26,000	COM-F
III. Administration					17,048		17,048	
IV. Physical Contingency					29,868		23,835	53,702
Total of I,II,III and IV				228,987		182,732	411,719	
V. Enginering Services					5,039		45,355	50,395
Grand Total				234,026		228,088	462,114	

Table 3-22 (6/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st Stage;FINANCIAL COST)

River :Agno River

Stretch : POPO

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks	
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)			
I Main Construction			67,909		133,937	201,845		
1. Preparatory Works			5,368		10,588	15,956		
2. Main Works								
(1) Excavation 1 Common	m3	16		51			EX-1	
2 Gravel	m3	20		61			EX-2	
(2) Embankment 1 Left	m3	27		78			EM-1-L	
Right	m3	27		78			EM-1-R	
Popont	m3	1,405,364	29,513	57	80,106	109,618	EM-1-P	
Embankment 2 Left	m3	40		124			EM-2-L	
Right	m3	40		124			EM-2-R	
(3) Conc.Dike	m	13,011		11,875			AG.R-12	
(4) Sodding	m2	352,194	5,283			5,283	SO	
(5) Revetment & B.Protection	Type A-1 m	6,974		4,967			AG.R-1	
Type A-2 m	11,096			7,850			AG.R-2	
Type B-1 m	5,809			2,692			AG.R-3	
Type B-2 m	9,702			4,528			AG.R-4	
Type C m	7,757			3,935			AG.R-5	
Type D m	11,626			8,241			AG.R-6	
Type I m	3,383			1,886			AG.R-7	
Type II m	7,672			5,089			AG.R-8	
Type III m	6,569			4,257			AG.R-9	
Spurdike m	1,331			765			AG.R-10	
Type IV m	10,821			7,974			AG.R-11	
PopontR-1m	2,827			2,230			AG.R-13	
PopontR-2m	119	14,941	1,778	10,092	1,201	2,979	AG.R-14	
(6) Groin L=30m		114,906		110,883			GR-2	
(7) Sluice-Way	Type A-1 pc.	4	332,056	1,195	317,284	1,142	2,338	AG.S-1-1
Type A-2 pc.	3	385,655	1,080	411,705	1,153	2,233	AG.S-1-2	
Type B pc.	1	962,703	963	1,524,088	1,524	2,487	AG.S-2	
Type C-1 pc.	1	1,093,281	547	1,974,788	987	1,534	AG.S-3-1	
Type C-2 pc.	1	1,600,524	1,601	3,286,159	3,286	4,887	AG.S-3-2	
Type D pc.	1,872,648			4,364,433			AG.S-4	
Type E pc.	743,459			919,532			AG.S-5	
(8) Box-Culvert	Popont pc.	2	447,824	896	580,695	1,161	2,057	BXC
(9) Diversion C. & Closing Dike	pc.	5,239,017		5,875,940			PDS	
(10) Demolishment	Concrete m3	200	617	123	1,000	200	323	DC
Metal ton		806		1,485			DM	
(11) Bridge	Newly m2	6,239		8,611			BC	
(12) Drainage Ditch	m2	265		195			DT	
(13) Well	D=8m pc.	715	12,000	8,580	8,000	5,720	14,300	WL
(14) Pavement	Concrete m2		101		151			PC
Asphalt m2	14,642	64	937	572	8,375	9,312	PA	
Gravel m2	33,000	36	1,188	31	1,023	2,211	PG	
Total of Main Works			53,683		105,879	159,562		
3. Miscellaneous Works			8,858		17,470	26,328		
II. Compensation			201,000			201,000	COM-F	
III. Administration			20,142			20,142		
IV. Physical Contingency			43,358		20,091	63,448		
Total of I,II,III and IV			332,409		154,027	486,436		
V. Engineering Services			3,230		29,066	32,295		
Grand Total			335,638		183,093	518,731		

Table 3-23 (1/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-ALL

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				275,485		435,973	711,458	
1. Preparatory Works				21,778		34,464	56,242	
2. Main Works								
(1) Excavation 1 Common	m3	3,633,825	16	58,141	51	185,325	243,466	EX-1
2 Gravel	m3		20		61			EX-2
(2) Embankment 1 Left	m3		27		78			EM-1-L
Right	m3		27		78			EM-1-R
Popont	m3	446,446	21	9,375	57	25,447	34,823	EM-1-P
Embankment 2 Left	m3		40		124			EM-2-L
Right	m3		40		124			EM-2-R
(3) Conc.Dike	m		13,011		11,875			AG-R-12
(4) Sodding	m2	125,179	15	1,878			1,878	SO
(5) Revetment & B.Protection	Type A-1 m	880	6,974	6,137	4,967	4,371	10,508	AG-R-1
Type A-2 m	220	11,096	2,441	7,850	1,727	4,168	AG-R-2	
Type B-1 m	2,880	5,809	16,729	2,692	7,752	24,480	AG-R-3	
Type B-2 m	720	9,702	6,985	4,528	3,260	10,245	AG-R-4	
Type C m	1,200	7,757	9,308	3,935	4,722	14,030	AG-R-5	
Type D m	1,500	11,626	17,439	8,241	12,362	29,802	AG-R-6	
Type I m	6,700	3,383	22,668	1,886	12,636	35,304	AG-R-7	
Type II m	1,450	7,672	11,124	5,089	7,379	18,503	AG-R-8	
Type III m	2,000	6,569	13,138	4,257	8,515	21,653	AG-R-9	
Spurdike m	1,900	1,331	2,530	765	1,454	3,984	AG-R-10	
Type IV m			10,821		7,974			AG-R-11
PopontR-1m	600	2,827	1,696	2,230	1,338	3,034	AG-R-13	
PopontR-2m			14,941		10,092			AG-R-14
(6) Groin L=30m	61	114,906	7,009	110,883	6,764	13,773	GR-2	
(7) Sluice-Way Type A-1 pc.	1	332,056	199	317,284	190	390	AG.S-1-1	
Type A-2 pc.	2	385,655	926	411,705	988	1,914	AG.S-1-2	
Type B pc.	1	962,703	963	1,524,088	1,524	2,487	AG.S-2	
Type C-1 pc.	1	1,093,281	1,421	1,974,788	2,567	3,988	AG.S-3-1	
Type C-2 pc.	0	1,600,524	480	3,286,159	986	1,466	AG.S-3-2	
Type D pc.		1,872,648		4,364,433			AG.S-4	
Type E pc.		743,459		919,532			AG.S-5	
(8) Box-Culvert Popont pc.	18	447,824	8,061	580,695	10,453	18,513	BXC	
(9) Diversion C. & Closing Dike m		5,239,017		5,875,940			PDS	
(10)Demolishment Concrete m3	380	617	234	1,000	380	614	DC	
Metal ton		806		1,485			DM	
(11)Bridge Newly m2	2,046	6,239	12,765	8,611	17,618	30,383	BC	
(12)Drainage Ditch m2		265		195			DT	
(13)Well D=8m pc.	78	12,000	936	8,000	624	1,560	WL	
(14)Pavement Concrete m2	26,780	101	2,705	151	4,044	6,749	PC	
Asphalt m2	38,840	64	2,486	572	22,216	24,702	PA	
Gravel m2		36		31			PG	
Total of Main Works			217,775		344,642	562,417		
3. Miscellaneous Works			35,933		56,866	92,799		
II. Compensation				14,000			14,000	COM-F
III. Administration				36,273			36,273	
IV. Physical Contingency				48,864		65,396	114,260	
Total of I,II,III and IV			374,622		501,369	875,991		
V. Enginnering Services				11,383		102,450	113,833	
Grand Total			386,005		603,819	989,824		

Table 3-23 (2/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-1

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			39,647		105,134	144,782	
1. Preparatory Works			3,134		8,311	11,445	
2. Main Works							
(1) Excavation 1 Common	m3 1,419,900	16	22,718	51	72,415	95,133	EX-1
2 Gravel	m3	20		61			EX-2
(2) Embankment 1 Left	m3	27		78			EM-1-L
Right	m3	27		78			EM-1-R
Popont	m3	21		57			EM-1-P
Embankment 2 Left	m3	40		124			EM-2-L
Right	m3	40		124			EM-2-R
(3) Conc.Dike	m	13,011		11,875			AG.R-12
(4) Sodding	m2	15					SO
(5) Revetment & Type A-1	m	6,974		4,967			AG.R-1
B.Protection Type A-2	m	11,096		7,850			AG.R-2
Type B-1	m 160	5,809	929	2,692	431	1,360	AG.R-3
Type B-2	m 40	9,702	388	4,528	181	569	AG.R-4
Type C	m	7,757		3,935			AG.R-5
Type D	m	11,626		8,241			AG.R-6
Type I	m	3,383		1,886			AG.R-7
Type II	m	7,672		5,089			AG.R-8
Type III	m	6,569		4,257			AG.R-9
Spurdike	m	1,331		765			AG.R-10
Type IV	m	10,821		7,974			AG.R-11
PopontR-1m		2,827		2,230			AG.R-13
PopontR-2m		14,941		10,092			AG.R-14
(6) Groin L=30m		114,906		110,883			GR-2
(7) Sluice-Way Type A-1	pc.	332,056		317,284			AG.S-1-1
Type A-2	pc.	385,655		411,705			AG.S-1-2
Type B	pc.	962,703		1,524,088			AG.S-2
Type C-1	pc.	1,093,281		1,974,788			AG.S-3-1
Type C-2	pc.	1,600,524		3,286,159			AG.S-3-2
Type D	pc.	1,872,648		4,364,433			AG.S-4
Type E	pc.	743,459		919,532			AG.S-5
(8) Box-Culvert Popont	pc.	447,824		580,695			BXC
(9) Diversion C. & Closing Dike	pc.	5,239,017		5,875,940			PDS
(10) Demolishment Concrete	m3	25,166		58,383			AG.R-15
Metal	ton	617		1,000			DC
(11) Bridge Newly	m2 1,171	806	7,306	8,611	10,083	17,389	DM
(12) Drainage Ditch	m2	265		195			DT
(13) Well D=8m	pc.	12,000		8,000			WL
(14) Pavement Concrete	m2	101		151			PC
Asphalt	m2	64		572			PA
Gravel	m2	36		31			PG
Total of Main Works			31,342		83,110	114,452	
3. Miscellaneous Works			5,171		13,713	18,885	
II. Compensation							COM-F
III. Administration			7,239			7,239	
IV. Physical Contingency			7,033		15,770	22,803	
Total of I,II,III and IV			53,919		120,904	174,824	
V. Engineering Services			2,317		20,849	23,165	
Grand Total			56,236		141,753	197,989	

Table 3-23 (3/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd Stage; FINANCIAL COST)

River : Agno River

Stretch : AG-2

Work Items	Unit	Quantity	L.C. Portion		F.C. Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				79,077		101,024	180,100	
1. Preparatory Works				6,251		7,986	14,237	
2. Main Works								
(1) Excavation 1 Common	m3	1,024,075	16	16,385	51	52,228	68,613	EX-1
2 Gravel	m3		20		61			EX-2
(2) Embankment 1 Left	m3		27		78			EM-1-L
Right	m3		27		78			EM-1-R
Popont	m3		21		57			EM-1-P
Embankment 2 Left	m3		40		124			EM-2-L
Right	m3		40		124			EM-2-R
(3) Conc. Dike	m		13,011		11,875			AG-R-12
(4) Sodding	m2		15					SO
(5) Revetment & B. Protection	Type A-1 m		6,974		4,967			AG-R-1
Type A-2 m			11,096		7,850			AG-R-2
Type B-1 m	800		5,809	4,647	2,692	2,153	6,800	AG-R-3
Type B-2 m	200		9,702	1,940	4,528	906	2,846	AG-R-4
Type C m			7,757		3,935			AG-R-5
Type D m			11,626		8,241			AG-R-6
Type I m	6,700		3,383	22,668	1,886	12,636	35,304	AG-R-7
Type II m	1,450		7,672	11,124	5,089	7,379	18,503	AG-R-8
Type III m			6,569		4,257			AG-R-9
Spurdike m	1,900		1,331	2,530	765	1,454	3,984	AG-R-10
Type IV m			10,821		7,974			AG-R-11
PopontR-1m			2,827		2,230			AG-R-13
PopontR-2m			14,941		10,092			AG-R-14
(6) Groin L=30m	28		114,906	3,217	110,883	3,105	6,322	GR-2
(7) Sluice-Way Type A-1 pc.			332,056		317,284			AG-S-1-1
Type A-2 pc.			385,655		411,705			AG-S-1-2
Type B pc.			962,703		1,524,088			AG-S-2
Type C-1 pc.			1,093,281		1,974,788			AG-S-3-1
Type C-2 pc.			1,600,524		3,286,159			AG-S-3-2
Type D pc.			1,872,648		4,364,433			AG-S-4
Type E pc.			743,459		919,532			AG-S-5
(8) Box-Culvert Popont pc.			447,824		580,695			BXC
(9) Diversion C. & Closing Dike m			5,239,017		5,875,940			PDS
(10) Demolishment Concrete m3			25,166		58,383			AG-R-15
Metal ton			617		1,000			DC
(11) Bridge Newly m2			806		1,485			DM
(12) Drainage Ditch m2			6,239		8,611			BC
(13) Well D=8m pc.			265		195			DT
(14) Pavement Concrete m2			12,000		8,000			WL
Asphalt m2			101		151			PC
Gravel m2			64		572			PA
			36		31			PG
Total of Main Works				62,511		79,861	142,372	
3. Miscellaneous Works				10,314		13,177	23,491	
II. Compensation								COM-F
III. Administration				9,005			9,005	
IV. Physical Contingency				13,212		15,154	28,366	
Total of I, II, III and IV				101,294		116,177	217,471	
V. Engineering Services				2,882		25,934	28,816	
Grand Total				104,175		142,112	246,287	

Table 3-23 (4/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-3

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				78,853		113,280	192,133	
1. Preparatory Works				6,233		8,955	15,188	
2. Main Works								
(1) Excavation	1 Common	m3	1,185,050	16	18,961	51	60,438	79,398 EX-1
	2 Gravel	m3		20		61		EX-2
(2) Embankment	1 Left	m3		27		78		EM-1-L
	Right	m3		27		78		EM-1-R
	Popont	m3		21		57		EM-1-P
Embankment	2 Left	m3		40		124		EM-2-L
	Right	m3		40		124		EM-2-R
(3) Conc.Dike		m		13,011		11,875		AG.R-12
(4) Sodding		m2		15				SO
(5) Revetment & B.Protection	Type A-1	m	880	6,974	6,137	4,967	4,371	10,508 AG.R-1
	Type A-2	m	220	11,096	2,441	7,850	1,727	4,168 AG.R-2
	Type B-1	m	1,920	5,809	11,152	2,692	5,168	16,320 AG.R-3
	Type B-2	m	480	9,702	4,657	4,528	2,173	6,830 AG.R-4
	Type C	m		7,757		3,935		AG.R-5
	Type D	m		11,626		8,241		AG.R-6
	Type I	m		3,383		1,886		AG.R-7
	Type II	m		7,672		5,089		AG.R-8
	Type III	m	2,000	6,569	13,138	4,257	8,515	21,653 AG.R-9
	Spurdike	m		1,331		765		AG.R-10
	Type IV	m		10,821		7,974		AG.R-11
	PopontR-1m			2,827		2,230		AG.R-13
	PopontR-2m			14,941		10,092		AG.R-14
(6) Groin	L=30m		33	114,906	3,792	110,883	3,659	7,451 GR-2
(7) Sluice-Way	Type A-1	pc.		332,056		317,284		AG.S-1-1
	Type A-2	pc.		385,655		411,705		AG.S-1-2
	Type B	pc.	1	962,703	963	1,524,088	1,524	2,487 AG.S-2
	Type C-1	pc.	1	1,093,281	1,093	1,974,788	1,975	3,068 AG.S-3-1
	Type C-2	pc.		1,609,524		3,286,159		AG.S-3-2
	Type D	pc.		1,872,648		4,364,433		AG.S-4
	Type E	pc.		743,459		919,532		AG.S-5
(8) Box-Culvert	Popont	pc.		447,824		580,695		BXC
(9) Diversion C. & Closing Dike		pc.		5,239,017		5,875,940		PDS
		m		25,166		58,383		AG.R-15
(10) Demolishment	Concrete	m3		617		1,000		DC
	Metal	ton		806		1,485		DM
(11) Bridge	Newly	m2		6,239		8,611		BC
(12) Drainage Ditch		m2		265		195		DT
(13) Well	D=8m	pc.		12,000		8,000		WL
(14) Pavement	Concrete	m2		101		151		PC
	Asphalt	m2		64		572		PA
	Gravel	m2		36		31		PG
Total of Main Works				62,335		89,549	151,884	
3. Miscellaneous Works				10,285		14,776	25,061	
II. Compensation								COM-F
III. Administration				9,607			9,607	
IV. Physical Contingency				13,269		16,992	30,261	
Total of I,II,III and IV				101,729		130,272	232,001	
V. Engineering Services				3,074		27,667	30,741	
Grand Total				104,803		157,939	262,742	

Table 3-23 (5/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd Stage;FINANCIAL COST)

River :Agno River

Stretch : AG-4

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			33,836		21,611	55,447	
1. Preparatory Works			2,675		1,708	4,383	
2. Main Works							
(1) Excavation 1 Common	m3	16		51			EX-1
2 Gravel	m3	20		61			EX-2
(2) Embankment 1 Left	m3	27		78			EM-1-L
Right	m3	27		78			EM-1-R
Popont	m3	21		57			EM-1-P
Embankment 2 Left	m3	40		124			EM-2-L
Right	m3	40		124			EM-2-R
(3) Conc.Dike	m	13,011		11,875			AG.R-12
(4) Sodding	m2	15					SO
(5) Revetment & B.Protection Type A-1	m	6,974		4,967			AG.R-1
Type A-2	m	11,096		7,850			AG.R-2
Type B-1	m	5,809		2,692			AG.R-3
Type B-2	m	9,702		4,528			AG.R-4
Type C	m	1,200	7,757	3,935	4,722	14,030	AG.R-5
Type D	m	1,500	11,626	17,439	8,241	29,802	AG.R-6
Type I	m		3,383	1,886			AG.R-7
Type II	m		7,672	5,089			AG.R-8
Type III	m		6,569	4,257			AG.R-9
Spurdike	m		1,331	765			AG.R-10
Type IV	m		10,821	7,974			AG.R-11
PopontR-1m			2,827	2,230			AG.R-13
PopontR-2m			14,941	10,092			AG.R-14
(6) Groin L=30m			114,906	110,883			GR-2
(7) Sluice-Way Type A-1	pc.		332,056	317,284			AG.S-1-1
Type A-2	pc.		385,655	411,705			AG.S-1-2
Type B	pc.		962,703	1,524,088			AG.S-2
Type C-1	pc.		1,093,281	1,974,788			AG.S-3-1
Type C-2	pc.		1,600,524	3,286,159			AG.S-3-2
Type D	pc.		1,872,648	4,364,433			AG.S-4
Type E	pc.		743,459	919,532			AG.S-5
(8) Box-Culvert Popont	pc.		447,824	580,695			BXC
(9) Diversion C. & Closing Dike	pc.		5,239,017	5,875,940			PDS
m			25,166	58,383			AG.R-15
(10)Demolishment Concrete	m3		617	1,000			DC
Metal	ton		806	1,485			DM
(11)Bridge Newly	m2		6,239	8,611			BC
(12)Drainage Ditch	m2		265	195			DT
(13)Well D=8m	pc.		12,000	8,000			HL
(14)Pavement Concrete	m2		101	151			PC
Asphalt	m2		64	572			PA
Gravel	m2		36	31			PG
Total of Main Works			26,748		17,084	43,832	
3. Miscellaneous Works			4,413		2,819	7,232	
II. Compensation							COM-F
III. Administration			2,772			2,772	
IV. Physical Contingency			5,491		3,242	8,733	
Total of I,II,III and IV			42,100		24,853	66,953	
V. Engineering Services			887		7,984	8,872	
Grand Total			42,987		32,837	75,824	

Table 3-23 (6/6) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd Stage; FINANCIAL COST)

River : Agno River

Stretch : POPO

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			44,072		94,923	138,995	
1. Preparatory Works			3,484		7,504	10,988	
2. Main Works							
(1) Excavation 1 Common	m3 4,800	16	77	51	245	322	EX-1
2 Gravel	m3	20		61			EX-2
(2) Embankment 1 Left	m3	27		78			EM-1-L
Right	m3	27		78			EM-1-R
Popont	m3 446,446	21	9,375	57	25,447	34,823	EM-1-P
Embankment 2 Left	m3	40		124			EM-2-L
Right	m3	40		124			EM-2-R
(3) Conc.Dike	m	13,011		11,875			AG.R-12
(4) Sodding	m2 125,179	15	1,878			1,878	SO
(5) Revetment & Type A-1	m	6,974		4,967			AG.R-1
B.Protection Type A-2	m	11,096		7,850			AG.R-2
Type B-1	m	5,809		2,692			AG.R-3
Type B-2	m	9,702		4,528			AG.R-4
Type C	m	7,757		3,935			AG.R-5
Type D	m	11,626		8,241			AG.R-6
Type I	m	3,383		1,886			AG.R-7
Type II	m	7,672		5,089			AG.R-8
Type III	m	6,569		4,257			AG.R-9
Spurdike	m	1,331		765			AG.R-10
Type IV	m	10,821		7,974			AG.R-11
PopontR-1m	600	2,827	1,696	2,230	1,338	3,034	AG.R-13
PopontR-2m		14,941		10,092			AG.R-14
(6) Groin L=30m		114,906		110,883			GR-2
(7) Sluice-Way Type A-1	pc. 1	332,056	199	317,284	190	390	AG.S-1-1
Type A-2	pc. 2	385,655	926	411,705	988	1,914	AG.S-1-2
Type B	pc.	962,703		1,524,088			AG.S-2
Type C-1	pc. 0	1,093,281	328	1,974,788	592	920	AG.S-3-1
Type C-2	pc. 0	1,600,524	480	3,286,159	986	1,466	AG.S-3-2
Type D	pc.	1,872,648		4,364,433			AG.S-4
Type E	pc.	743,459		919,532			AG.S-5
(8) Box-Culvert Popont	pc. 18	447,824	8,061	580,695	10,453	18,513	BXC
(9) Diversion C. & Closing Dike	pc. m	5,239,017		5,875,940			PDS
	m	25,166		58,383			AG.R-15
(10) Demolishment Concrete	m3 380	617	234	1,000	380	614	DC
Metal	ton	806		1,485			DM
(11) Bridge Newly	m2 875	6,239	5,459	8,611	7,535	12,994	BC
(12) Drainage Ditch	m2	265		195			DT
(13) Well D=8m	pc. 78	12,000	936	8,000	624	1,560	WL
(14) Pavement Concrete	m2 26,780	101	2,705	151	4,044	6,749	PC
Asphalt	m2 38,840	64	2,486	572	22,216	24,702	PA
Gravel	m2	36		31			PG
Total of Main Works			34,840		75,038	109,878	
3. Miscellaneous Works			5,749		12,381	18,130	
II. Compensation			14,000			14,000	COM-F
III. Administration			7,650			7,650	
IV. Physical Contingency			9,858		14,238	24,097	
Total of I, II, III and IV			75,580		109,162	184,742	
V. Engineering Services			2,224		20,015	22,239	
Grand Total			77,804		129,177	206,981	

Table 3-24 COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1/10 YEAR; ECONOMIC COST)

River : Agno River

Stretch : AG-ALL

Work Items	Unit	Quantity	L.C. Portion		F.C. Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				791,424		1,533,121	2,324,545	
1. Preparatory Works				62,563		121,195	183,758	
2. Main Works								
(1) Excavation 1 Common	m3	6,815,804	11	74,974	55	376,232	451,206	EX-1
2 Gravel	m3		14		66			EX-2
(2) Embankment 1 Left	m3	1,097,283	20	21,946	83	90,855	112,801	EM-1-L
Right	m3	1,551,226	20	31,025	83	128,442	159,466	EM-1-R
Popont	m3	1,851,810	16	29,629	60	111,109	140,738	EM-1-P
Embankment 2 Left	m3		29		132			EM-2-L
Right	m3	479,081	29	13,893	132	63,239	77,132	EM-2-R
(3) Conc. Dike	m	2,500	10,908	27,271	11,269	28,172	55,443	AG.R-12
(4) Sodding	m2	2,773,499	11	30,508			30,508	SO
(5) Revetment & B. Protection	Type A-1 m	3,560	5,932	21,117	4,556	16,221	37,338	AG.R-1
Type A-2 m	890	9,425	8,389	7,199	6,407	14,796	AG.R-2	
Type B-1 m	7,080	4,816	34,096	2,318	16,411	50,507	AG.R-3	
Type B-2 m	1,770	8,041	14,232	3,903	6,908	21,141	AG.R-4	
Type C m	2,500	6,411	16,028	3,424	8,561	24,589	AG.R-5	
Type D m	2,000	9,743	19,485	7,550	15,099	34,585	AG.R-6	
Type I m	14,700	2,675	39,318	1,683	24,739	64,057	AG.R-7	
Type II m	7,850	6,334	49,722	4,646	36,469	86,191	AG.R-8	
Type III m	7,194	5,551	39,931	3,853	27,720	67,652	AG.R-9	
Spurdike m	1,900	1,054	2,002	687	1,305	3,307	AG.R-10	
Type IV m	2,100	9,099	19,108	7,337	15,407	34,515	AG.R-11	
PopontR-1m	600	2,407	1,444	2,068	1,241	2,685	AG.R-13	
PopontR-2m	119	12,668	1,507	9,210	1,096	2,603	AG.R-14	
(6) Groin L=30m		115	96,393	11,085	105,582	12,142	23,227	GR-2
(7) Sluice-Way	Type A-1 pc.	9	281,523	2,590	300,345	2,763	5,353	AG.S-1-1
Type A-2 pc.	5	326,712	1,699	393,281	2,045	3,744	AG.S-1-2	
Type B pc.	7	818,319	5,728	1,491,145	10,438	16,166	AG.S-2	
Type C-1 pc.	3	930,534	2,605	1,942,564	5,439	8,045	AG.S-3-1	
Type C-2 pc.	8	1,364,220	11,323	3,247,819	26,957	38,280	AG.S-3-2	
Type D pc.	1	1,597,561	1,598	4,331,036	4,331	5,929	AG.S-4	
Type E pc.		629,640		889,134			AG.S-5	
(8) Box-Culvert	Popont pc.	20	390,923	7,818	558,427	11,169	18,987	BXC
(9) Diversion C. & Closing Dike	pc.	1	4,523,502	4,524	5,605,443	5,605	10,129	PDS
m	120	20,798	2,496	57,676	6,921	9,417	AG.R-15	
(10) Demolishment	Concrete m3	7,900	441	3,484	956	7,556	11,039	DC
Metal ton			627		1,612			DM
(11) Bridge Newly	m2	10,570	5,162	54,562	8,395	88,737	143,300	BC
(12) Drainage Ditch	m2		227		184			DT
(13) Well D=8m	pc.	793	9,600	7,613	9,216	7,308	14,921	WL
(14) Pavement	Concrete m2	38,030	88	3,347	146	5,568	8,914	PC
Asphalt m2	53,482	57	3,048	619	33,116	36,165	PA	
Gravel m2	216,147	30	6,484	29	6,225	12,709	PG	
Total of Main Works				625,632		1,211,953	1,837,585	
3. Miscellaneous Works				103,229		199,972	303,201	
II. Compensation				246,000			246,000	COM-E
III. Administration				128,527			128,527	
IV. Physical Contingency				174,893		229,968	404,861	
Total of I, II, III and IV				1,340,844		1,763,089	3,103,933	
V. Engineering Services				37,193		334,734	371,927	
Grand Total				1,378,037		2,097,823	3,475,860	

Table 3-25 COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st Stage;ECONOMIC COST)

River :Agno River

Stretch : AG-ALL

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			574,148		1,084,062	1,658,210	
1. Preparatory Works			45,387		85,697	131,084	
2. Main Works							
(1) Excavation 1 Common	m3 3,181,979	11	35,002	55	175,645	210,647	EX-1
2 Gravel	m3	14		66			EX-2
(2) Embankment 1 Left	m3 1,097,283	20	21,946	83	90,855	112,801	EM-1-L
Right	m3 1,551,226	20	31,025	83	128,442	159,466	EM-1-R
Popont	m3 1,405,364	16	22,486	60	84,322	106,808	EM-1-P
Embankment 2 Left	m3	29		132			EM-2-L
Right	m3 479,081	29	13,893	132	63,239	77,132	EM-2-R
(3) Conc.Dike	m 2,500	10,908	27,271	11,269	28,172	55,443	AG-R-12
(4) Sodding	m2 2,648,320	11	29,132			29,132	SO
(5) Revetment & B.Protection Type A-1	m 2,680	5,932	15,897	4,556	12,211	28,109	AG-R-1
Type A-2	m 670	9,425	6,315	7,199	4,823	11,138	AG-R-2
Type B-1	m 4,200	4,816	20,227	2,318	9,735	29,962	AG-R-3
Type B-2	m 1,050	8,041	8,443	3,903	4,098	12,541	AG-R-4
Type C	m 1,300	6,411	8,335	3,424	4,452	12,786	AG-R-5
Type D	m 500	9,743	4,871	7,550	3,775	8,646	AG-R-6
Type I	m 8,000	2,675	21,398	1,683	13,463	34,861	AG-R-7
Type II	m 6,400	6,334	40,538	4,646	29,733	70,271	AG-R-8
Type III	m 5,194	5,551	28,830	3,853	20,014	48,844	AG-R-9
Spurdike	m	1,054		687			AG-R-10
Type IV	m 2,100	9,099	19,108	7,337	15,407	34,515	AG-R-11
PopontR-1m		2,407		2,068			AG-R-13
PopontR-2m	119	12,668	1,507	9,210	1,096	2,603	AG-R-14
(6) Groin L=30m	54	96,393	5,205	105,582	5,701	10,907	GR-2
(7) Sluice-Way Type A-1	pc. 9	281,523	2,421	300,345	2,583	5,004	AG-S-1-1
Type A-2	pc. 3	326,712	915	393,281	1,101	2,016	AG-S-1-2
Type B	pc. 6	818,319	4,910	1,491,145	8,947	13,857	AG-S-2
Type C-1	pc. 2	930,534	1,396	1,942,564	2,914	4,310	AG-S-3-1
Type C-2	pc. 8	1,364,220	10,914	3,247,819	25,983	36,896	AG-S-3-2
Type D	pc. 1	1,597,561	1,598	4,331,036	4,331	5,929	AG-S-4
Type E	pc. 1	629,640		889,134			AG-S-5
(8) Box-Culvert Popont	pc. 2	390,923	782	558,427	1,117	1,899	BXC
(9) Diversion C. & Closing Dike	pc. 1	4,523,502	4,524	5,605,443	5,605	10,129	PDS
m	120	20,798	2,496	57,676	6,921	9,417	AG-R-15
(10) Demolishment Concrete	m3 7,520	441	3,316	956	7,192	10,508	DC
Metal	ton 627			1,612			DM
(11) Bridge Newly	m2 8,524	5,162	44,001	8,395	71,561	115,562	BC
(12) Drainage Ditch	m2	227		184			DT
(13) Well D=8m	pc. 715	9,600	6,864	9,216	6,589	13,453	WL
(14) Pavement Concrete	m2 11,250	88	990	146	1,647	2,637	PC
Asphalt	m2 14,642	57	835	619	9,066	9,901	PA
Gravel	m2 216,147	30	6,484	29	6,225	12,709	PG
Total of Main Works			453,872		856,966	1,310,838	
3. Miscellaneous Works			74,889		141,399	216,288	
II. Compensation			236,000			236,000	COM-E
III. Administration			94,711			94,711	
IV. Physical Contingency			135,729		162,609	298,338	
Total of I,II,III and IV			1,040,587		1,246,671	2,287,259	
V. Engineering Services			26,531		238,782	265,314	
Grand Total			1,067,119		1,485,454	2,552,572	

Table 3-26 COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd Stage;ECONOMIC COST)

River :Agno River

Stretch : AG-ALL

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			217,276		449,059	666,335	
1. Preparatory Works			17,176		35,499	52,675	
2. Main Works							
(1) Excavation 1 Common	m3 3,633,825	11	39,972	55	200,587	240,559	EX-1
2 Gravel	m3	14		66			EX-2
(2) Embankment 1 Left	m3	20		83			EM-1-L
Right	m3	20		83			EM-1-R
Popont	m3 446,446	16	7,143	60	26,787	33,930	EM-1-P
Embankment 2 Left	m3	29		132			EM-2-L
Right	m3	29		132			EM-2-R
(3) Conc.Dike	m	10,908		11,269			AG-R-12
(4) Sodding	m2 125,179	11	1,377			1,377	SO
(5) Revetment & B.Protection Type A-1	m 880	5,932	5,220	4,556	4,010	9,230	AG-R-1
Type A-2	m 220	9,425	2,074	7,199	1,584	3,657	AG-R-2
Type B-1	m 2,880	4,816	13,870	2,318	6,676	20,545	AG-R-3
Type B-2	m 720	8,041	5,789	3,903	2,810	8,600	AG-R-4
Type C	m 1,200	6,411	7,694	3,424	4,109	11,803	AG-R-5
Type D	m 1,500	9,743	14,614	7,550	11,325	25,939	AG-R-6
Type I	m 6,700	2,675	17,920	1,683	11,276	29,196	AG-R-7
Type II	m 1,450	6,334	9,184	4,646	6,736	15,921	AG-R-8
Type III	m 2,000	5,551	11,101	3,853	7,707	18,808	AG-R-9
Spurdike	m 1,900	1,054	2,002	687	1,305	3,307	AG-R-10
Type IV	m	9,099		7,337			AG-R-11
PopontR-1m	600	2,407	1,444	2,068	1,241	2,685	AG-R-13
PopontR-2m		12,668		9,210			AG-R-14
(6) Groin L=30m	61	96,393	5,880	105,582	6,441	12,320	GR-2
(7) Sluice-Way Type A-1	pc. 1	281,523	169	300,345	180	349	AG-S-1-1
Type A-2	pc. 2	326,712	784	393,281	944	1,728	AG-S-1-2
Type B	pc. 1	818,319	818	1,491,145	1,491	2,309	AG-S-2
Type C-1	pc. 1	930,534	1,210	1,942,564	2,525	3,735	AG-S-3-1
Type C-2	pc. 0	1,364,220	409	3,247,819	974	1,384	AG-S-3-2
Type D	pc.	1,597,561		4,331,036			AG-S-4
Type E	pc.	629,640		889,134			AG-S-5
(8) Box-Culvert Popont	pc. 18	390,923	7,037	558,427	10,052	17,088	BXC
(9) Diversion C. & Closing Dike	pc. m	4,523,502		5,605,443			PDS
		20,798		57,676			AG-R-15
(10)Demolishment Concrete	m3 380	441	168	956	363	531	DC
Metal	ton	627		1,612			DM
(11)Bridge Newly	m2 2,046	5,162	10,561	8,395	17,177	27,738	BC
(12)Drainage Ditch	m2	227		184			DT
(13)Well D=8m	pc. 78	9,600	749	9,216	719	1,468	HL
(14)Pavement Concrete	m2 26,780	88	2,357	146	3,921	6,277	PC
Asphalt	m2 38,840	57	2,214	619	24,050	26,264	PA
Gravel	m2	30		29			PG
Total of Main Works			171,760		354,987	526,747	
3. Miscellaneous Works			28,340		58,573	86,913	
II. Compensation			10,000			10,000	COM-E
III. Administration			33,817			33,817	
IV. Physical Contingency			39,164		67,359	106,523	
Total of I,II,III and IV			300,257		516,417	816,674	
V. Engineering Services			10,661		95,952	106,614	
Grand Total			310,918		612,370	923,288	

Table 3-27 (1/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1/10 YEAR; FINANCIAL COST)

River : Pantal-Sinocalan River

Stretch : PS-ALL

Work Items	Unit	Quantity	L.C. Portion		F.C. Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				760,480		1,611,476	2,371,956	
1. Preparatory Works				60,117		127,389	187,506	
2. Main Works								
(1) Excavation 1 Common	m3	1,756,010	16	28,096	51	89,557	117,653	EX-1
(2) Dredging	m3	179,800	17	3,057	18	3,236	6,293	DW
(3) Embankment 1 Left	m3	2,236,425	27	60,383	78	174,441	234,825	EM-1-L
Right	m3	2,051,325	27	55,386	78	160,003	215,389	EM-1-R
(4) Sodding	m2	1,651,740	15	24,776			24,776	SO
(5) Revetment & R.M	m	850	23,058	19,599	22,030	18,726	38,325	PS.R-1
B. Protection C1.D'L	m	300	27,798	8,339	99,512	29,854	38,193	PS.R-2
C1.D'H	m	700	14,935	10,454	39,227	27,459	37,913	PS.R-3
D.O.R-Bedm		300	7,722	2,317	5,737	1,721	4,038	PS.R-4
C1.D.	m	1,840	20,743	38,167	18,825	34,639	72,805	PS.R-5
H.W.R	m	11,470	4,564	52,347	3,342	38,335	90,683	PS.R-6
L.W.R-B	m	8,010	2,049	16,415	1,053	8,436	24,850	PS.R-7
L.W.R-A	m	450	6,974	3,138	4,967	2,235	5,374	AG.R-1
(6) Groin L=16.5m	pc.	39	67,581	2,636	64,673	2,522	5,158	GR-1
(7) Sluice Way Type-A	pc.	22	887,989	19,536	1,429,156	31,441	50,977	PS.S-1
Type-B-1	pc.	8	979,351	7,835	1,824,615	14,597	22,432	PS.S-2-1
Type-B-2	pc.	6	1,378,624	8,272	2,992,857	17,957	26,229	PS.S-2-2
Type-B-3	pc.	2	1,798,280	3,597	4,187,530	8,375	11,972	PS.S-2-3
Type-C	pc.	6	647,787	3,887	786,114	4,717	8,603	PS.S-3
(8) Water Gate 10*5m	pc.	2	10,524,615	21,049	48,931,313	97,863	118,912	WG-1
20*5m	pc.	1	19,606,433	19,606	95,703,497	95,703	115,310	WG-2
15*4m	pc.	2	15,508,204	31,016	72,998,578	145,997	177,014	WG-3
5*3m	pc.	4	4,304,857	17,219	18,854,733	75,419	92,638	WG-4-2
(9) Demolishment Concrete	m3	6,000	617	3,702	1,000	6,000	9,702	DC
(*) Concrete Dike	m3							
(10) Bridge Newly	m2	19,657	6,239	122,640	8,611	169,266	291,906	BC
(11) Road Pavement Concrete	m2	13,500	101	1,364	151	2,039	3,402	PC
Gravel	m2	347,340	36	12,504	31	10,768	23,272	PG
(12) Graund-Sill	pc.	1	3,832,745	3,833	2,587,883	2,588	6,421	PS.GS
Total of Main Works				601,170		1,273,894	1,875,064	
3. Miscellaneous Works				99,193		210,193	309,386	
II. Compensation				540,000			540,000	COM-F
III. Administration				145,598			145,598	
IV. Physical Contingency				216,912		241,721	458,633	
Total of I,II,III and IV				1,662,989		1,853,197	3,516,186	
V. Engineering Services				37,951		341,562	379,513	
Grand Total				1,700,941		2,194,759	3,895,699	

Table 3-27 (2/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1/10 YEAR; FINANCIAL COST)

River : Pantal-Sinocalan River

Stretch : PS

Work Items	Unit Quantity	L.C. Portion		F.C. Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			437,489		955,530	1,393,019	
1. Preparatory Works			34,584		75,536	110,120	
2. Main Works							
(1) Excavation 1 Common	m3 608,450	16	9,735	51	31,031	40,766	EX-1
(2) Dredging	m3 159,800	17	2,717	18	2,876	5,593	DW
(3) Embankment 1 Left	m3 1,235,025	27	33,346	78	96,332	129,678	EM-1-L
Right	m3 1,079,475	27	29,146	78	84,199	113,345	EM-1-R
(4) Sodding	m2 727,350	15	10,910			10,910	SO
(5) Revetment & R.M	m 850	23,058	19,599	22,030	18,726	38,325	PS.R-1
B. Protection Cl.D'L	m 300	27,798	8,339	99,512	29,854	38,193	PS.R-2
Cl.D'H	m 700	14,935	10,454	39,227	27,459	37,913	PS.R-3
D.O.R-Bed	m 300	7,722	2,317	5,737	1,721	4,038	PS.R-4
Cl.D.	m 880	20,743	18,254	18,825	16,566	34,820	PS.R-5
H.W.R	m 7,310	4,564	33,362	3,342	24,432	57,794	PS.R-6
L.W.R-B	m 5,050	2,049	10,349	1,053	5,319	15,667	PS.R-7
L.W.R-A	m 250	6,974	1,744	4,967	1,242	2,985	AG.R-1
(6) Groin L=16.5m	pc. 7	67,581	6,216	64,673			GR-1
(7) Sluice Way Type-A	pc. 4	887,989	6,216	1,429,156	10,004	16,220	PS.S-1
Type-B-1	pc. 1	979,351	3,917	1,824,615	7,298	11,216	PS.S-2-1
Type-B-2	pc. 1	1,378,624	1,379	2,992,857	2,993	4,371	PS.S-2-2
Type-B-3	pc. 1	1,798,280		4,187,530			PS.S-2-3
Type-C	pc. 5	647,787	3,239	786,114	3,931	7,170	PS.S-3
(8) Water Gate 10*5m	pc. 2	10,524,615	21,049	48,931,313	97,863	118,912	WG-1
20*5m	pc. 1	19,606,433	19,606	95,703,497	95,703	115,310	WG-2
15*4m	pc. 1	15,508,204	15,508	72,998,578	72,999	88,507	WG-3
5*3m	pc. 1	4,304,857	4,305	18,854,733	18,855	23,160	WG-4-2
(9) Demolishment Concrete	m3 2,500	617	1,543	1,000	2,500	4,043	DC
(*) Concrete Dike	m3						
(10) Bridge Newly	m2 11,048	6,239	68,928	8,611	95,134	164,063	BC
(11) Road Pavement Concrete	m2 8,250	101	833	151	1,246	2,079	PC
Gravel	m2 144,840	36	5,214	31	4,490	9,704	PG
(12) Ground-Sill	pc. 1	3,832,745	3,833	2,587,883	2,588	6,421	PS.GS
Total of Main Works			345,841		755,359	1,101,201	
3. Miscellaneous Works			57,064		124,634	181,698	
II. Compensation			396,000			396,000	COM-F
III. Administration			89,451			89,451	
IV. Physical Contingency			138,441		143,329	281,770	
Total of I, II, III and IV			1,061,381		1,098,859	2,160,240	
V. Engineering Services			22,288		200,595	222,883	
Grand Total			1,083,670		1,299,454	2,383,123	

Table 3-27 (3/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1/10 YEAR; FINANCIAL COST)

River : Pantal-Sinocalan River		Stretch : D		L.C. Portion		F.C. Portion		Total (P. 1000)	Remarks
Work Items	Unit Quantity	Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)				
I Main Construction			227,451		469,846	697,297			
1. Preparatory Works			17,980		37,142	55,122			
2. Main Works									
(1) Excavation 1 Common	m3 199,110	16	3,186	51	10,155	13,340	EX-1		
(2) Dredging	m3	17		18			DW		
(3) Embankment 1 Left	m3 848,450	27	22,908	78	66,179	89,087	EM-1-L		
(3) Embankment 1 Right	m3 831,650	27	22,455	78	64,869	87,323	EM-1-R		
(4) Sodding	m2 799,000	15	11,985			11,985	SO		
(5) Revetment & B. Protection	R.M m	23,058		22,030			PS.R-1		
	Cl.D'L m	27,798		99,512			PS.R-2		
	Cl.D'H m	14,935		39,227			PS.R-3		
	D.O.R-Bed m	7,722		5,737			PS.R-4		
	Cl.D. m	20,743	12,446	18,825	11,295	23,741	PS.R-5		
	H.W.R m	3,000	4,564	3,342	10,027	23,718	PS.R-6		
	L.W.R-B m	1,960	2,049	1,053	2,064	6,081	PS.R-7		
	L.W.R-A m	200	6,974	4,967	993	2,388	AG.R-1		
(6) Groin	L=16.5m pc. 39	67,581	2,636	64,673	2,522	5,158	GR-1		
(7) Sluice Way	Type-A pc. 15	887,989	13,320	1,429,156	21,437	34,757	PS.S-1		
	Type-B-1 pc. 3	979,351	2,938	1,824,615	5,474	8,412	PS.S-2-1		
	Type-B-2 pc. 4	1,378,624	5,514	2,992,857	11,971	17,486	PS.S-2-2		
	Type-B-3 pc. 1	1,798,280	1,798	4,187,530	4,188	5,986	PS.S-2-3		
	Type-C pc. 1	647,787	648	786,114	786	1,434	PS.S-3		
(8) Water Gate	10*5m pc. 1	10,524,615		48,931,313			WG-1		
	20*5m pc. 1	19,606,433		95,703,497			WG-2		
	15*4m pc. 1	15,508,204	15,508	72,998,578	72,999	88,507	WG-3		
	5*3m pc. 2	4,304,857	8,610	18,854,733	37,709	46,319	WG-4-2		
(9) Demolishment Concrete	m3 2,000	617	1,234	1,000	2,000	3,234	DC		
(*) Concrete Dike	m3								
(10) Bridge	Newly m2 4,889	6,239	30,502	8,611	42,099	72,602	BC		
(11) Road Pavement Concrete	m2 5,250	101	530	151	793	1,323	PC		
	Gravel m2 124,500	36	4,482	31	3,860	8,342	PG		
(12) Ground-Sill	pc.	3,832,745		2,587,883			PS.GS		
Total of Main Works			179,803		371,420	551,223			
3. Miscellaneous Works			29,667		61,284	90,952			
II. Compensation			64,000			64,000	COM-F		
III. Administration			38,065			38,065			
IV. Physical Contingency			49,427		70,477	119,904			
Total of I, II, III and IV			378,943		540,323	919,266			
V. Engineering Services			11,157		100,411	111,568			
Grand Total			390,099		640,734	1,030,833			

Table 3-27 (4/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1/10 YEAR;FINANCIAL COST)

River :Pantal-Sinocalan River

Stretch : I

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			95,540		186,100	281,640	
1. Preparatory Works			7,553		14,711	22,264	
2. Main Works							
(1) Excavation 1 Common	m3 948,450	16	15,175	51	48,371	63,546	EX-1
(2) Dredging	m3 20,000	17	340	18	360	700	DW
(3) Embankment 1 Left	m3 152,950	27	4,130	78	11,930	16,060	EM-1-L
(3) Embankment 1 Right	m3 140,200	27	3,785	78	10,936	14,721	EM-1-R
(4) Sodding	m2 125,390	15	1,881			1,881	SO
(5) Revetment & R.M	m	23,058		22,030			PS.R-1
B.Protection C1.D'L	m	27,798		99,512			PS.R-2
C1.D'H	m	14,935		39,227			PS.R-3
D.O.R-Bedm		7,722		5,737			PS.R-4
C1.D.	m 360	20,743	7,467	18,825	6,777	14,245	PS.R-5
H.W.R	m 1,160	4,564	5,294	3,342	3,877	9,171	PS.R-6
L.W.R-B	m 1,000	2,049	2,049	1,053	1,053	3,102	PS.R-7
L.W.R-A	m	6,974		4,967			AG.R-1
(6) Groin L=16.5m	pc.	67,581		64,673			GR-1
(7) Sluice Way Type-A	pc.	887,989		1,429,156			PS.S-1
Type-B-1	pc. 1	979,351	979	1,824,615	1,825	2,804	PS.S-2-1
Type-B-2	pc. 1	1,378,624	1,379	2,992,857	2,993	4,371	PS.S-2-2
Type-B-3	pc. 1	1,798,280	1,798	4,187,530	4,188	5,986	PS.S-2-3
Type-C	pc.	647,787		786,114			PS.S-3
(8) Water Gate 10*5m	pc.	10,524,615		48,931,313			WG-1
20*5m	pc.	19,606,433		95,703,497			WG-2
15*4m	pc.	15,508,204		72,998,578			WG-3
5*3m	pc. 1	4,304,857	4,305	18,854,733	18,855	23,160	WG-4-2
(9) Demolishment Concrete	m3 1,500	617	926	1,000	1,500	2,426	DC
(*) Concrete Dike	m3						
(10) Bridge Newly	m2 3,720	6,239	23,209	8,611	32,033	55,242	BC
(11) Road Pavement Concrete	m2	101		151			PC
Gravel	m2 78,000	36	2,808	31	2,418	5,226	PG
(12) Graund-Sill	pc.	3,832,745		2,587,883			PS.GS
Total of Main Works			75,526		147,115	222,640	
3. Miscellaneous Works			12,462		24,274	36,736	
II. Compensation			80,000			80,000	COM-F
III. Administration			18,082			18,082	
IV. Physical Contingency			29,043		27,915	56,958	
Total of I,II,III and IV			222,665		214,015	436,680	
V. Enginering Services			4,506		40,556	45,062	
Grand Total			227,171		254,571	481,742	

Table 3-28 (1/3) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st STAGE;FINANCIAL COST)

River :Pantal-Sinocalan River

Stretch : PS-ALL

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			367,077		784,834	1,151,910	
1. Preparatory Works			29,018		62,042	91,060	
2. Main Works							
(1) Excavation 1 Common	m3 529,700	16	8,475	51	27,015	35,490	EX-1
(2) Dredging	m3 159,800	17	2,717	18	2,876	5,593	DW
(3) Embankment 1 Left	m3 688,085	27	18,578	78	53,671	72,249	EM-1-L
Right	m3 1,117,425	27	30,170	78	87,159	117,330	EM-1-R
(4) Sodding	m2 527,500	15	7,913			7,913	SO
(5) Revetment & R.M	m 850	23,058	19,599	22,030	18,726	38,325	PS.R-1
B.Protection Cl.D'L	m 300	27,798	8,339	99,512	29,854	38,193	PS.R-2
Cl.D'H	m	14,935		39,227			PS.R-3
D.O.R-Beddm	300	7,722	2,317	5,737	1,721	4,038	PS.R-4
Cl.D.	m 750	20,743	15,557	18,825	14,119	29,676	PS.R-5
H.W.R	m 5,970	4,564	27,246	3,342	19,953	47,199	PS.R-6
L.W.R-B	m 3,600	2,049	7,377	1,053	3,791	11,169	PS.R-7
L.W.R-A	m 200	6,974	1,395	4,967	993	2,388	AG.R-1
(6) Groin L=16.5m	pc.	67,581		64,673			GR-1
(7) Sluice Way Type-A	pc. 6	887,989	5,328	1,429,156	8,575	13,903	PS.S-1
Type-B-1	pc. 3	979,351	2,938	1,824,615	5,474	8,412	PS.S-2-1
Type-B-2	pc. 1	1,378,624	1,379	2,992,857	2,993	4,371	PS.S-2-2
Type-B-3	pc. 1	1,798,280		4,187,530			PS.S-2-3
Type-C	pc. 4	647,787	2,591	786,114	3,144	5,736	PS.S-3
(8) Water Gate 10*5m	pc. 1	10,524,615	10,525	48,931,313	48,931	59,456	WG-1
20*5m	pc. 1	19,606,433	19,606	95,703,497	95,703	115,310	WG-2
15*4m	pc. 1	15,508,204	15,508	72,998,578	72,999	88,507	WG-3
5*3m	pc. 1	4,304,857	4,305	18,854,733	18,855	23,160	WG-4-2
(9) Demolishment Concrete	m3 2,500	617	1,543	1,000	2,500	4,043	DC
(*) Concrete Dike	m3						
(10)Bridge Newly	m2 11,048	6,239	68,928	8,611	95,134	164,063	BC
(11)Road PavementConcrete	m2 3,000	101	303	151	453	756	PC
Gravel	m2 103,030	36	3,709	31	3,194	6,903	PG
(12)Graund-Sill	pc. 1	3,832,745	3,833	2,587,883	2,588	6,421	PS.GS
Total of Main Works			290,179		620,422	910,601	
3. Miscellaneous Works			47,880		102,370	150,249	
II. Compensation						333,000	COM-F
III. Administration			74,246			74,246	
IV. Physical Contingency			116,148		117,725	233,873	
Total of I,II,III and IV			890,471		902,559	1,793,029	
V. Enginnering Services			18,431		165,875	184,306	
Grand Total			908,901		1,068,434	1,977,335	

Table 3-28 (2/3) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st STAGE;FINANCIAL COST)

River :Pantal-Sinocalan River		Stretch : PS		L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
Work Items	Unit Quantity	Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)				
I Main Construction			363,668		774,986	1,138,654			
1. Preparatory Works			28,748		61,264	90,012			
2. Main Works									
(1) Excavation 1 Common	m3 529,700	16	8,475	51	27,015	35,490		EX-1	
(2) Dredging	m3 159,800	17	2,717	18	2,876	5,593		DW	
(3) Embankment 1 Left	m3 627,785	27	16,950	78	48,967	65,917		EM-1-L	
Right	m3 1,077,925	27	29,104	78	84,078	113,182		EM-1-R	
(4) Sodding	m2 527,500	15	7,913			7,913		SO	
(5) Revetment & B.Protection	R.M m 850	23,058	19,599	22,030	18,726	38,325		PS.R-1	
Cl.D'L	m 300	27,798	8,339	99,512	29,854	38,193		PS.R-2	
Cl.D'H	m	14,935		39,227				PS.R-3	
D.O.R-Bedm	300	7,722	2,317	5,737	1,721	4,038		PS.R-4	
Cl.D.	m 750	20,743	15,557	18,825	14,119	29,676		PS.R-5	
H.W.R	m 5,970	4,564	27,246	3,342	19,953	47,199		PS.R-6	
L.W.R-B	m 3,600	2,049	7,377	1,053	3,791	11,169		PS.R-7	
L.W.R-A	m 200	6,974	1,395	4,967	993	2,388		AG.R-1	
(6) Groin	L=16.5m pc.		67,581		64,673			GR-1	
(7) Sluice Way	Type-A pc.	6	887,989	5,328	1,429,156	8,575		13,903 PS.S-1	
Type-B-1	pc.	3	979,351	2,938	1,824,615	5,474		8,412 PS.S-2-1	
Type-B-2	pc.	1	1,378,624	1,379	2,992,857	2,993		4,371 PS.S-2-2	
Type-B-3	pc.		1,798,280		4,187,530			PS.S-2-3	
Type-C	pc.	4	647,787	2,591	786,114	3,144		5,736 PS.S-3	
(8) Water Gate	10*5m pc.	1	10,524,615	10,525	48,931,313	48,931		59,456 WG-1	
20*5m	pc.	1	19,606,433	19,606	95,703,497	95,703		115,310 WG-2	
15*4m	pc.	1	15,508,204	15,508	72,998,578	72,999		88,507 WG-3	
5*3m	pc.	1	4,304,857	4,305	18,854,733	18,855		23,160 WG-4-2	
(9) Demolishment Concrete	m3 2,500	617	1,543	1,000	2,500	4,043		DC	
(*) Concrete Dike	m3								
(10) Bridge	Newly m2 11,048	6,239	68,928	8,611	95,134	164,063		BC	
(11) Road Pavement	Concrete m2 3,000	101	303	151	453	756		PC	
Gravel	m2 103,030	36	3,709	31	3,194	6,903		PG	
(12) Graund-Sill	pc.	1	3,832,745	3,833	2,587,883	2,588		6,421 PS.GS	
Total of Main Works			287,485		612,637	900,122			
3. Miscellaneous Works			47,435		101,085	148,520			
II. Compensation				332,000		332,000		COM-F	
III. Administration				73,533		73,533			
IV. Physical Contingency				115,380		116,248		231,628	
Total of I,II,III and IV			884,581		891,234	1,775,815			
V. Engineering Services				18,218		163,966		182,185	
Grand Total			902,799		1,055,200	1,958,000			

Table 3-28 (3/3) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st STAGE; FINANCIAL COST)

River : Pantal-Sinocalan River Stretch : D

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			3,409		9,847	13,256	
1. Preparatory Works			269		778	1,048	
2. Main Works							
(1) Excavation 1 Common	m3	16		51			EX-1
(2) Dredging	m3	17		18			DH
(3) Embankment 1 Left	m3 60,300	27	1,628	78	4,703	6,332	EM-1-L
Right	m3 39,500	27	1,067	78	3,081	4,148	EM-1-R
(4) Sodding	m2	15					SO
(5) Revetment & B.Protection	R.M m	23,058		22,030			PS.R-1
	Cl.D'L m	27,798		99,512			PS.R-2
	Cl.D'H m	14,935		39,227			PS.R-3
	D.O.R-Bedm	7,722		5,737			PS.R-4
	Cl.D. m	20,743		18,825			PS.R-5
	H.W.R m	4,564		3,342			PS.R-6
	L.W.R-B m	2,049		1,053			PS.R-7
	L.W.R-A m	6,974		4,967			AG.R-1
(6) Groin	L=16.5m pc.	67,581		64,673			GR-1
(7) Sluice Way	Type-A pc.	887,989		1,429,156			PS.S-1
	Type-B-1 pc.	979,351		1,824,615			PS.S-2-1
	Type-B-2 pc.	1,378,624		2,992,857			PS.S-2-2
	Type-B-3 pc.	1,798,280		4,187,530			PS.S-2-3
	Type-C pc.	647,787		786,114			PS.S-3
(8) Water Gate	10*5m pc.	10,524,615		48,931,313			WG-1
	20*5m pc.	19,606,433		95,703,497			WG-2
	15*4m pc.	15,508,204		72,998,578			WG-3
	5*3m pc.	4,304,857		18,854,733			WG-4-2
(9) Demolishment Concrete	m3	617		1,000			DC
(*) Concrete Dike	m3						
(10) Bridge Newly	m2	6,239		8,611			BC
(11) Road Pavement Concrete	m2	101		151			PC
	Gravel m2	36		31			PG
(12) Graund-Sill	pc.	3,832,745		2,587,883			PS.GS
Total of Main Works			2,695		7,784	10,479	
3. Miscellaneous Works			445		1,284	1,729	
II. Compensation			1,000			1,000	COM-F
III. Administration			713			713	
IV. Physical Contingency			768		1,477	2,245	
Total of I,II,III and IV			5,890		11,324	17,214	
V. Enginnering Services			212		1,909	2,121	
Grand Total:			6,102		13,233	19,335	

Table 3-29 (1/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd STAGE;FINANCIAL COST)

River :Pantal-Sinocalan River

Stretch : PS-ALL

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks	
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)			
I Main Construction				393,403		826,642	1,220,045		
1. Preparatory Works				31,099		65,347	96,446		
2. Main Works									
(1) Excavation 1 Common	m3	1,226,310	16	19,621	51	62,542	82,163	EX-1	
(2) Dredging	m3	20,000	17	340	18	360	700	DW	
(3) Embankment 1 Left	m3	1,548,340	27	41,805	78	120,771	162,576	EM-1-L	
	m3	933,900	27	25,215	78	72,844	98,060	EM-1-R	
(4) Sodding	m2	1,124,240	15	16,864			16,864	SO	
(5) Revetment & B.Protection	R.M		23,058		22,030			PS.R-1	
	C1.D*L		27,798		99,512			PS.R-2	
	C1.D*H	m	700	14,935	10,454	39,227	27,459	37,913	PS.R-3
	D.O.R-Bedm		7,722		5,737			PS.R-4	
	C1.D.	m	1,090	20,743	22,610	18,825	20,520	43,129	PS.R-5
	H.W.R	m	5,500	4,564	25,101	3,342	18,382	43,484	PS.R-6
	L.W.R-B	m	4,410	2,049	9,037	1,053	4,644	13,682	PS.R-7
	L.W.R-A	m	250	6,974	1,744	4,967	1,242	2,985	AG.R-1
(6) Groin	L=16.5m	pc.	39	67,581	2,636	64,673	2,522	5,158	GR-1
(7) Sluice Way	Type-A	pc.	16	887,989	14,208	1,429,156	22,867	37,074	PS.S-1
	Type-B-1	pc.	5	979,351	4,897	1,824,615	9,123	14,020	PS.S-2-1
	Type-B-2	pc.	5	1,378,624	6,893	2,992,857	14,964	21,857	PS.S-2-2
	Type-B-3	pc.	2	1,798,280	3,597	4,187,530	8,375	11,972	PS.S-2-3
	Type-C	pc.	2	647,787	1,296	786,114	1,572	2,868	PS.S-3
(8) Water Gate	10*5m	pc.	1	10,524,615	10,525	48,931,313	48,931	59,456	WG-1
	20*5m	pc.		19,606,433		95,703,497			WG-2
	15*4m	pc.	1	15,508,204	15,508	72,998,578	72,999	88,507	WG-3
	5*3m	pc.	3	4,304,857	12,915	18,854,733	56,564	69,479	WG-4-2
(9) Demolishment Concrete	m3	3,500	617	2,160	1,000	3,500	5,660	DC	
(*) Concrete Dike	m3								
(10) Bridge	Newly	m2	8,609	6,239	53,712	8,611	74,132	127,844	BC
(11) Road Pavement	Concrete	m2	10,500	101	1,061	151	1,586	2,646	PC
	Gravel	m2	244,310	36	8,795	31	7,574	16,369	PG
(12) Graund-Sill	pc.		3,832,745		2,587,883			PS.GS	
Total of Main Works				310,991		653,472	964,463		
3. Miscellaneous Works				51,313		107,823	159,136		
II. Compensation				207,000			207,000	COM-F	
III. Administration				71,352			71,352		
IV. Physical Contingency				100,763		123,996	224,760		
Total of I,II,III and IV				772,519		950,639	1,723,157		
V. Enginnering Services				19,521		175,687	195,207		
Grand Total				792,039		1,126,325	1,918,364		

Table 3-29 (2/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd STAGE; FINANCIAL COST)

River :Pantal-Sinocalan River

Stretch : PS

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				73,821		180,543	254,365	
1. Preparatory Works				5,836		14,272	20,108	
2. Main Works								
(1) Excavation 1 Common	m3	78,750	16	1,260	51	4,016	5,276	EX-1
(2) Dredging	m3		17		18			DW
(3) Embankment 1 Left	m3	607,240	27	16,395	78	47,365	63,760	EM-1-L
	Right	1,550	27	42	78	121	163	EM-1-R
(4) Sodding	m2	199,850	15	2,998			2,998	SO
(5) Revetment & R.M	m		23,058		22,030			PS.R-1
B.Protection Cl.D'L	m		27,798		99,512			PS.R-2
	Cl.D'H	700	14,935	10,454	39,227	27,459	37,913	PS.R-3
	D.O.R-Bedm		7,722		5,737			PS.R-4
	Cl.D.	130	20,743	2,697	18,825	2,447	5,144	PS.R-5
	H.W.R	1,340	4,564	6,116	3,342	4,479	10,594	PS.R-6
	L.W.R-B	1,450	2,049	2,971	1,053	1,527	4,499	PS.R-7
	L.W.R-A	50	6,974	349	4,967	248	597	AG.R-1
(6) Groin L=16.5m	pc.		67,581		64,673			GR-1
(7) Sluice Way Type-A	pc.	1	887,989	888	1,429,156	1,429	2,317	PS.S-1
	Type-B-1	1	979,351	979	1,824,615	1,825	2,804	PS.S-2-1
	Type-B-2		1,378,624		2,992,857			PS.S-2-2
	Type-B-3		1,798,280		4,187,530			PS.S-2-3
	Type-C	1	647,787	648	786,114	786	1,434	PS.S-3
(8) Water Gate 10*5m	pc.	1	10,524,615	10,525	48,931,313	48,931	59,456	WG-1
	20*5m		19,606,433		95,703,497			WG-2
	15*4m		15,508,204		72,998,578			WG-3
	5*3m		4,304,857		18,854,733			WG-4-2
(9) Demolishment Concrete	m3		617		1,000			DC
(*) Concrete Dike	m3							
(10) Bridge Newly	m2		6,239		8,611			BC
(11) Road Pavement Concrete	m2	5,250	101	530	151	793	1,323	PC
	Gravel	41,810	36	1,505	31	1,296	2,801	PG
(12) Graund-Sill	pc.		3,832,745		2,587,883			PS.GS
Total of Main Works				58,357		142,722	201,079	
3. Miscellaneous Works				9,629		23,549	33,178	
II. Compensation					64,000		64,000	COM-F
III. Administration					15,918		15,918	
IV. Physical Contingency					23,061		27,081	50,142
Total of I,II,III and IV				176,800		207,625	384,425	
V. Enginering Services					4,070		36,628	40,698
Grand Total				180,870		244,253	425,124	

Table 3-29 (3/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd STAGE;FINANCIAL COST)

River :Pantal-Sinocalan River

Stretch : D

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks	
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)			
I Main Construction				224,042		459,999	684,041		
1. Preparatory Works				17,711		36,364	54,074		
2. Main Works									
(1) Excavation 1 Common	m3	199,110	16	3,186	51	10,155	13,340	EX-1	
(2) Dredging	m3		17		18			DW	
(3) Embankment 1 Left	m3	788,150	27	21,280	78	61,476	82,756	EM-1-L	
	Right	792,150	27	21,388	78	61,788	83,176	EM-1-R	
(4) Sodding	m2	799,000	15	11,985			11,985	SO	
(5) Revetment & R.M	m		23,058		22,030			PS.R-1	
B.Protection Cl.D'L	m		27,798		99,512			PS.R-2	
	Cl.D'H		14,935		39,227			PS.R-3	
	D.O.R-Bed		7,722		5,737			PS.R-4	
	Cl.D.	600	20,743	12,446	18,825	11,295	23,741	PS.R-5	
	H.W.R	3,000	4,564	13,692	3,342	10,027	23,718	PS.R-6	
	L.W.R-B	1,960	2,049	4,017	1,053	2,064	6,081	PS.R-7	
	L.W.R-A	200	6,974	1,395	4,967	993	2,388	AG.R-1	
(6) Groin L=16.5m	pc.	39	67,581	2,636	64,673	2,522	5,158	GR-1	
(7) Sluice Way Type-A	pc.	15	887,989	13,320	1,429,156	21,437	34,757	PS.S-1	
	Type-B-1	3	979,351	2,938	1,824,615	5,474	8,412	PS.S-2-1	
	Type-B-2	4	1,378,624	5,514	2,992,857	11,971	17,486	PS.S-2-2	
	Type-B-3	1	1,798,280	1,798	4,187,530	4,188	5,986	PS.S-2-3	
	Type-C	1	647,787	648	786,114	786	1,434	PS.S-3	
(8) Water Gate 10*5m	pc.		10,524,615		48,931,313			WG-1	
	20*5m		19,606,433		95,703,497			WG-2	
	15*4m	1	15,508,204	15,508	72,998,578	72,999	88,507	WG-3	
	5*3m	2	4,304,857	8,610	18,854,733	37,709	46,319	WG-4-2	
(9) Demolishment Concrete	m3	2,000	617	1,234	1,000	2,000	3,234	DC	
(*) Concrete Dike	m3								
(10) Bridge Newly	m2	4,889	6,239	30,502	8,611	42,099	72,602	BC	
(11) Road Pavement Concrete	m2	5,250	101	530	151	793	1,323	PC	
	Gravel	m2	124,500	36	4,482	31	3,860	8,342	PG
(12) Graund-Sill	pc.		3,832,745		2,587,883			PS.GS	
Total of Main Works				177,108		363,636	540,744		
3. Miscellaneous Works				29,223		60,000	89,223		
II. Compensation				63,000			63,000	COM-F	
III. Administration				37,352			37,352		
IV. Physical Contingency				48,659		69,000	117,659		
Total of I,II,III and IV				373,053		528,999	902,052		
V. Enginnering Services				10,945		98,502	109,447		
Grand Total				383,998		627,501	1,011,498		

Table 3-29 (4/4) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd STAGE; FINANCIAL COST)

River : Pantal-Sinocalan River

Stretch : I

Work Items	Unit Quantity	L.C. Portion		F.C. Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			95,540		186,100	281,640	
1. Preparatory Works			7,553		14,711	22,264	
2. Main Works							
(1) Excavation 1 Common	m3 948,450	16	15,175	51	48,371	63,546	EX-1
(2) Dredging	m3 20,000	17	340	18	360	700	DH
(3) Embankment 1 Left	m3 152,950	27	4,130	78	11,930	16,060	EM-1-L
(3) Embankment 1 Right	m3 140,200	27	3,785	78	10,936	14,721	EM-1-R
(4) Sodding	m2 125,390	15	1,881			1,881	SO
(5) Revetment & B. Protection	R.M. m	23,058		22,030			PS.R-1
	Cl.D'L m	27,798		99,512			PS.R-2
	Cl.D'H m	14,935		39,227			PS.R-3
	D.O.R-Bedm	7,722		5,737			PS.R-4
	Cl.D. m 360	20,743	7,467	18,825	6,777	14,245	PS.R-5
	H.W.R m 1,160	4,564	5,294	3,342	3,877	9,171	PS.R-6
	L.W.R-B m 1,000	2,049	2,049	1,053	1,053	3,102	PS.R-7
	L.W.R-A m	6,974		4,967			AG.R-1
(6) Groin	L=16.5m pc.	67,581		64,673			GR-1
(7) Sluice Way	Type-A pc.	887,989		1,429,156			PS.S-1
	Type-B-1 pc. 1	979,351	979	1,824,615	1,825	2,804	PS.S-2-1
	Type-B-2 pc. 1	1,378,624	1,379	2,992,857	2,993	4,371	PS.S-2-2
	Type-B-3 pc. 1	1,798,280	1,798	4,187,530	4,188	5,986	PS.S-2-3
	Type-C pc.	647,787		786,114			PS.S-3
(8) Water Gate	10*5m pc.	10,524,615		48,931,313			WG-1
	20*5m pc.	19,606,433		95,703,497			WG-2
	15*4m pc.	15,508,204		72,998,578			WG-3
	5*3m pc. 1	4,304,857	4,305	18,854,733	18,855	23,160	WG-4-2
(9) Demolishment Concrete	m3 1,500	617	926	1,000	1,500	2,426	DC
(*) Concrete Dike	m3						
(10) Bridge Newly	m2 3,720	6,239	23,209	8,611	32,033	55,242	BC
(11) Road Pavement Concrete	m2	101		151			PC
	Gravel m2 78,000	36	2,808	31	2,418	5,226	PG
(12) Grand-Sill	pc.	3,832,745		2,587,883			PS.GS
Total of Main Works			75,526		147,115	222,640	
3. Miscellaneous Works			12,462		24,274	36,736	
II. Compensation			80,000			80,000	COM-F
III. Administration			18,082			18,082	
IV. Physical Contingency			29,043		27,915	56,958	
Total of I, II, III and IV			222,665		214,015	436,680	
V. Engineering Services			4,506		40,556	45,062	
Grand Total			227,171		254,571	481,742	

Table 3-30 COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1/10 YEAR;ECONOMIC COST)

River : Pantal-Sinocalan River

Stretch : PS-ALL

Work Items	Unit Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
		Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction			612,599		1,633,453	2,246,052	
1. Preparatory Works			48,427		129,127	177,554	
2. Main Works							
(1) Excavation 1 Common	m3 1,756,010	11	19,316	55	96,932	116,248	EX-1
(2) Dredging	m3 179,800	14	2,517	18	3,236	5,754	DW
(3) Embankment 1 Left	m3 2,236,425	20	44,729	83	185,176	229,904	EM-1-L
Right	m3 2,051,325	20	41,027	83	169,850	210,876	EM-1-R
(4) Sodding	m2 1,651,740	11	18,169			18,169	S0
(5) Revetment & R.M	m 850	19,038	16,182	20,915	17,778	33,960	PS.R-1
B.Protection Cl.D'L	m 300	22,759	6,828	99,477	29,843	36,671	PS.R-2
Cl.D'H	m 700	12,239	8,567	38,933	27,253	35,820	PS.R-3
D.O.R-Bedm	300	6,546	1,964	5,289	1,587	3,550	PS.R-4
Cl.D.	m 1,840	17,409	32,033	17,812	32,773	64,806	PS.R-5
H.W.R	m 11,470	3,868	44,364	3,078	35,304	79,669	PS.R-6
L.W.R-B	m 8,010	1,616	12,944	925	7,411	20,355	PS.R-7
L.W.R-A	m 450	5,932	2,669	4,556	2,050	4,720	AG.R-1
(6) Groin L=16.5m	pc. 39	56,733	2,213	61,527	2,400	4,612	GR-1
(7) Sluice Way Type-A	pc. 22	754,984	16,610	1,399,208	30,783	47,392	PS.S-1
Type-B-1	pc. 8	833,947	6,672	1,796,722	14,374	21,045	PS.S-2-1
Type-B-2	pc. 6	1,174,707	7,048	2,963,512	17,781	24,829	PS.S-2-2
Type-B-3	pc. 2	1,533,260	3,067	4,155,720	8,311	11,378	PS.S-2-3
Type-C	pc. 6	548,433	3,291	759,056	4,554	7,845	PS.S-3
(8) Water Gate 10*5m	pc. 2	8,897,063	17,794	49,374,864	98,750	116,544	WG-1
20*5m	pc. 1	16,546,536	16,547	96,644,933	96,645	113,191	WG-2
15*4m	pc. 2	13,107,409	26,215	73,673,884	147,348	173,563	WG-3
5*3m	pc. 4	3,647,591	14,590	19,005,673	76,023	90,613	WG-4-2
(9) Demolishment Concrete	m3 6,000	441	2,646	956	5,738	8,384	DC
(*) Concrete Dike	m3						
(10) Bridge Newly	m2 19,657	5,162	101,469	8,395	165,024	266,494	BC
(11) Road Pavement Concrete	m2 13,500	88	1,188	146	1,976	3,164	PC
Gravel	m2 347,340	30	10,420	29	10,003	20,424	PG
(12) Graund-Sill	pc. 1	3,190,852	3,191	2,362,794	2,363	5,554	PS.GS
Total of Main Works			484,268		1,291,267	1,775,535	
3. Miscellaneous Works			79,904		213,059	292,963	
II. Compensation			195,000			195,000	COM-E
III. Administration			122,053			122,053	
IV. Physical Contingency			139,448		245,018	384,466	
Total of I,II,III and IV			1,069,100		1,878,471	2,947,570	
V. Engineering Services			35,937		323,431	359,368	
Grand Total			1,105,036		2,201,902	3,306,939	

Table 3-31 COST ESTIMATE OF RIVER IMPROVEMENT WORKS (1st STAGE;ECONOMIC COST)

River :Pantal-Sinocalan River

Stretch : PS-ALL

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				297,754		792,131	1,089,886	
1. Preparatory Works				23,538		62,619	86,157	
2. Main Works								
(1) Excavation 1 Common	m3	529,700	11	5,827	55	29,239	35,066	EX-1
(2) Dredging	m3	159,800	14	2,237	18	2,876	5,114	DW
(3) Embankment 1 Left	m3	688,085	20	13,762	83	56,973	70,735	EM-1-L
Right	m3	1,117,425	20	22,349	83	92,523	114,871	EM-1-R
(4) Sodding	m2	527,500	11	5,803			5,803	SO
(5) Revetment & R.M	m	850	19,038	16,182	20,915	17,778	33,960	PS.R-1
B.Protection Cl.D'L	m	300	22,759	6,828	99,477	29,843	36,671	PS.R-2
Cl.D'H	m		12,239		38,933			PS.R-3
D.O.R-Bed	m	300	6,546	1,964	5,289	1,587	3,550	PS.R-4
Cl.D.	m	750	17,409	13,057	17,812	13,359	26,416	PS.R-5
H.W.R	m	5,970	3,868	23,091	3,078	18,375	41,467	PS.R-6
L.W.R-B	m	3,600	1,616	5,817	925	3,331	9,148	PS.R-7
L.W.R-A	m	200	5,932	1,186	4,556	911	2,098	AG.R-1
(6) Groin L=16.5m	pc.		56,733		61,527			GR-1
(7) Sluice Way Type-A	pc.	6	754,984	4,530	1,399,208	8,395	12,925	PS.S-1
Type-B-1	pc.	3	833,947	2,502	1,796,722	5,390	7,892	PS.S-2-1
Type-B-2	pc.	1	1,174,707	1,175	2,963,512	2,964	4,138	PS.S-2-2
Type-B-3	pc.		1,533,260		4,155,720			PS.S-2-3
Type-C	pc.	4	548,433	2,194	759,056	3,036	5,230	PS.S-3
(8) Water Gate 10*5m	pc.	1	8,897,063	8,897	49,374,864	49,375	58,272	WG-1
20*5m	pc.	1	16,546,536	16,547	96,644,933	96,645	113,191	WG-2
15*4m	pc.	1	13,107,409	13,107	73,673,884	73,674	86,781	WG-3
5*3m	pc.	1	3,647,591	3,648	19,005,673	19,006	22,653	WG-4-2
(9) Demolishment Concrete	m3	2,500	441	1,103	956	2,391	3,494	DC
(*) Concrete Dike	m3							
(10) Bridge Newly	m2	11,048	5,162	57,030	8,395	92,750	149,780	BC
(11) Road Pavement Concrete	m2	3,000	88	264	146	439	703	PC
Gravel	m2	103,030	30	3,091	29	2,967	6,058	PG
(12) Graund-Sill	pc.	1	3,190,852	3,191	2,362,794	2,363	5,554	PS.GS
Total of Main Works				235,379		626,191	861,570	
3. Miscellaneous Works				38,838		103,321	142,159	
II. Compensation				114,200			114,200	COM-E
III. Administration				60,204			60,204	
IV. Physical Contingency				70,824		118,820	189,644	
Total of I,II,III and IV				542,982		910,951	1,453,934	
V. Enginnering Services				17,438		156,944	174,382	
Grand Total				560,420		1,067,895	1,628,315	

Table 3-32 COST ESTIMATE OF RIVER IMPROVEMENT WORKS (2nd STAGE;ECONOMIC COST)

River :Pantal-Sinocalan River

Stretch : PS-ALL

Work Items	Unit	Quantity	L.C.Portion		F.C.Portion		Total (P.1000)	Remarks
			Unit Cost (peso)	Amount (P.1000)	Unit Cost (peso)	Amount (P.1000)		
I Main Construction				314,845		841,321	1,156,166	
1. Preparatory Works				24,889		66,508	91,397	
2. Main Works								
(1) Excavation 1 Common	m3	1,226,310	11	13,489	55	67,692	81,182	EX-1
(2) Dredging	m3	20,000	14	280	18	360	640	DW
(3) Embankment 1 Left	m3	1,548,340	20	30,967	83	128,203	159,169	EM-1-L
(3) Embankment 1 Right	m3	933,900	20	18,678	83	77,327	96,005	EM-1-R
(4) Sodding	m2	1,124,240	11	12,367			12,367	SO
(5) Revetment & R.M	m		19,038		20,915			PS.R-1
B.Protection Cl.D'L	m		22,759		99,477			PS.R-2
Cl.D'H	m	700	12,239	8,567	38,933	27,253	35,820	PS.R-3
D.O.R-Bedm			6,546		5,289			PS.R-4
Cl.D.	m	1,090	17,409	18,976	17,812	19,415	38,391	PS.R-5
H.W.R	m	5,500	3,868	21,273	3,078	16,929	38,202	PS.R-6
L.W.R-B	m	4,410	1,616	7,126	925	4,080	11,206	PS.R-7
L.W.R-A	m	250	5,932	1,483	4,556	1,139	2,622	AG.R-1
(6) Groin L=16.5m	pc.	39	56,733	2,213	61,527	2,400	4,612	GR-1
(7) Sluice Way Type-A	pc.	16	754,984	12,080	1,399,208	22,387	34,467	PS.S-1
Type-B-1	pc.	5	833,947	4,170	1,796,722	8,984	13,153	PS.S-2-1
Type-B-2	pc.	5	1,174,707	5,874	2,963,512	14,818	20,691	PS.S-2-2
Type-B-3	pc.	2	1,533,260	3,067	4,155,720	8,311	11,378	PS.S-2-3
Type-C	pc.	2	548,433	1,097	759,056	1,518	2,615	PS.S-3
(8) Water Gate 10*5m	pc.	1	8,897,063	8,897	49,374,864	49,375	58,272	WG-1
20*5m	pc.		16,546,536		96,644,933			WG-2
15*4m	pc.	1	13,107,409	13,107	73,673,884	73,674	86,781	WG-3
5*3m	pc.	3	3,647,591	10,943	19,005,673	57,017	67,960	WG-4-2
(9) Demolishment Concrete	m3	3,500	441	1,544	956	3,347	4,891	DC
(*) Concrete Dike	m3							
(10) Bridge Newly	m2	8,609	5,162	44,440	8,395	72,274	116,714	BC
(11) Road Pavement Concrete	m2	10,500	88	924	146	1,537	2,461	PC
Gravel	m2	244,310	30	7,329	29	7,036	14,365	PG
(12) Graund-Sill	pc.		3,190,852		2,362,794			PS.GS
Total of Main Works				248,889		665,076	913,965	
3. Miscellaneous Works				41,067		109,738	150,804	
II. Compensation				80,800			80,800	COM-E
III. Administration				61,848			61,848	
IV. Physical Contingency				68,624		126,198	194,822	
Total of I,II,III and IV				526,117		967,519	1,493,637	
V. Enginnering Services				18,499		166,488	184,987	
Grand Total				544,616		1,134,007	1,678,623	

FIGURES

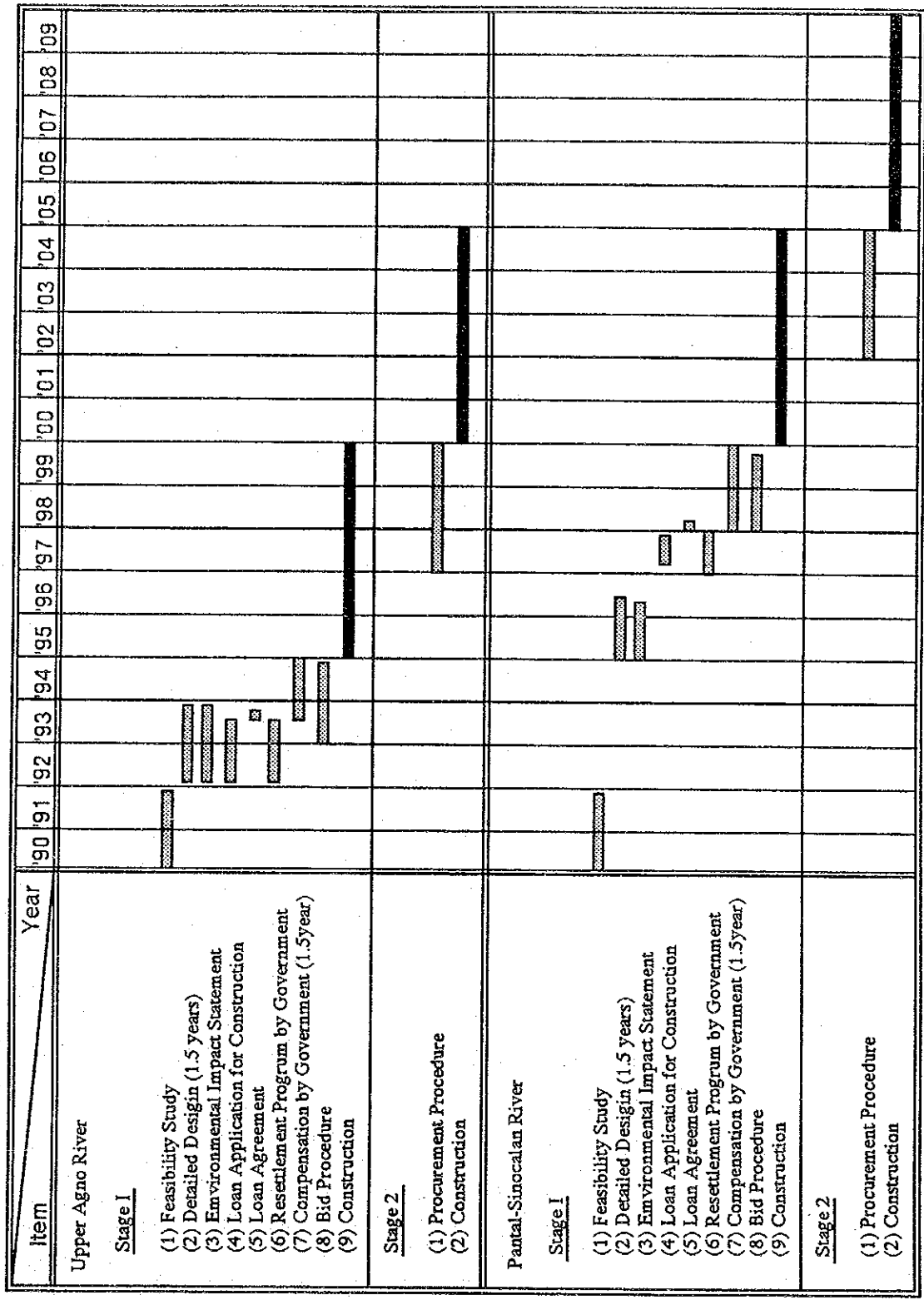


Fig. 2.1 IMPLEMENTATION SCHEDULE OF THE PRIORITY PROJECT

Buedo River (B-4)

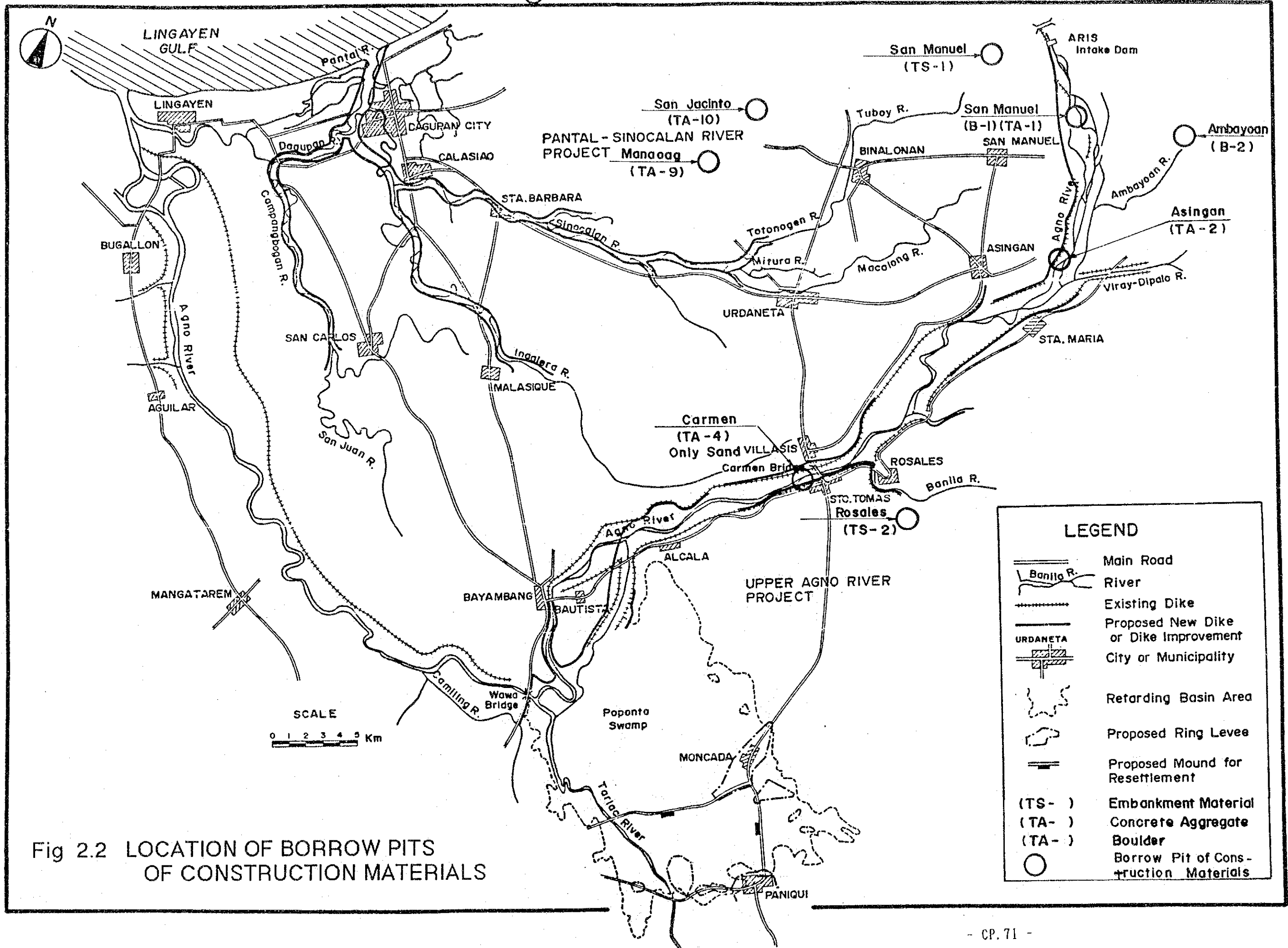


Fig 2.2 LOCATION OF BORROW PITS OF CONSTRUCTION MATERIALS

LEGEND	
	Main Road
	River
	Existing Dike
	Proposed New Dike or Dike Improvement
	City or Municipality
	Retarding Basin Area
	Proposed Ring Levee
	Proposed Mound for Resettlement
(TS-)	Embankment Material
(TA-)	Concrete Aggregate
(TA-)	Boulder
○	Borrow Pit of Construction Materials

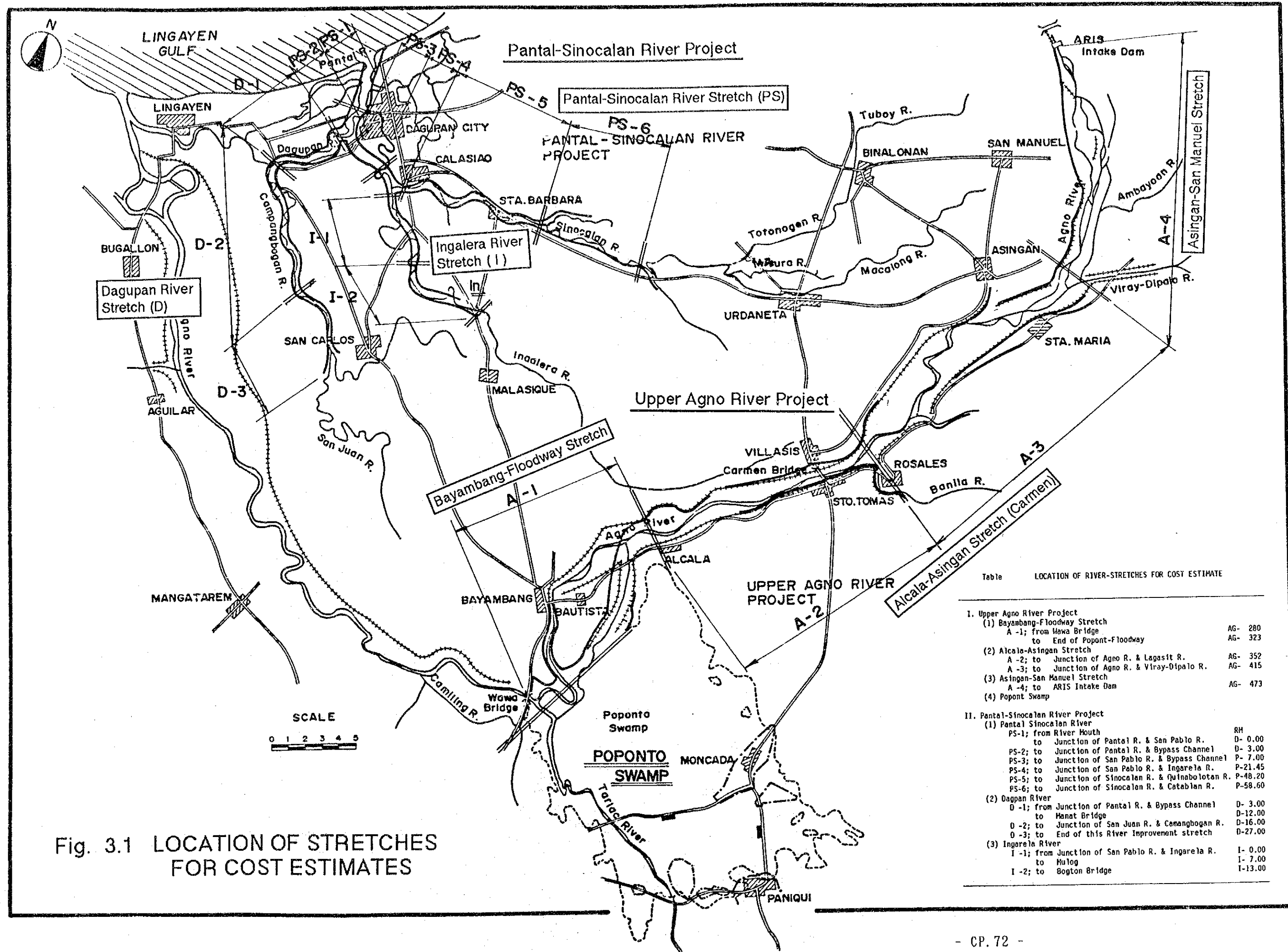
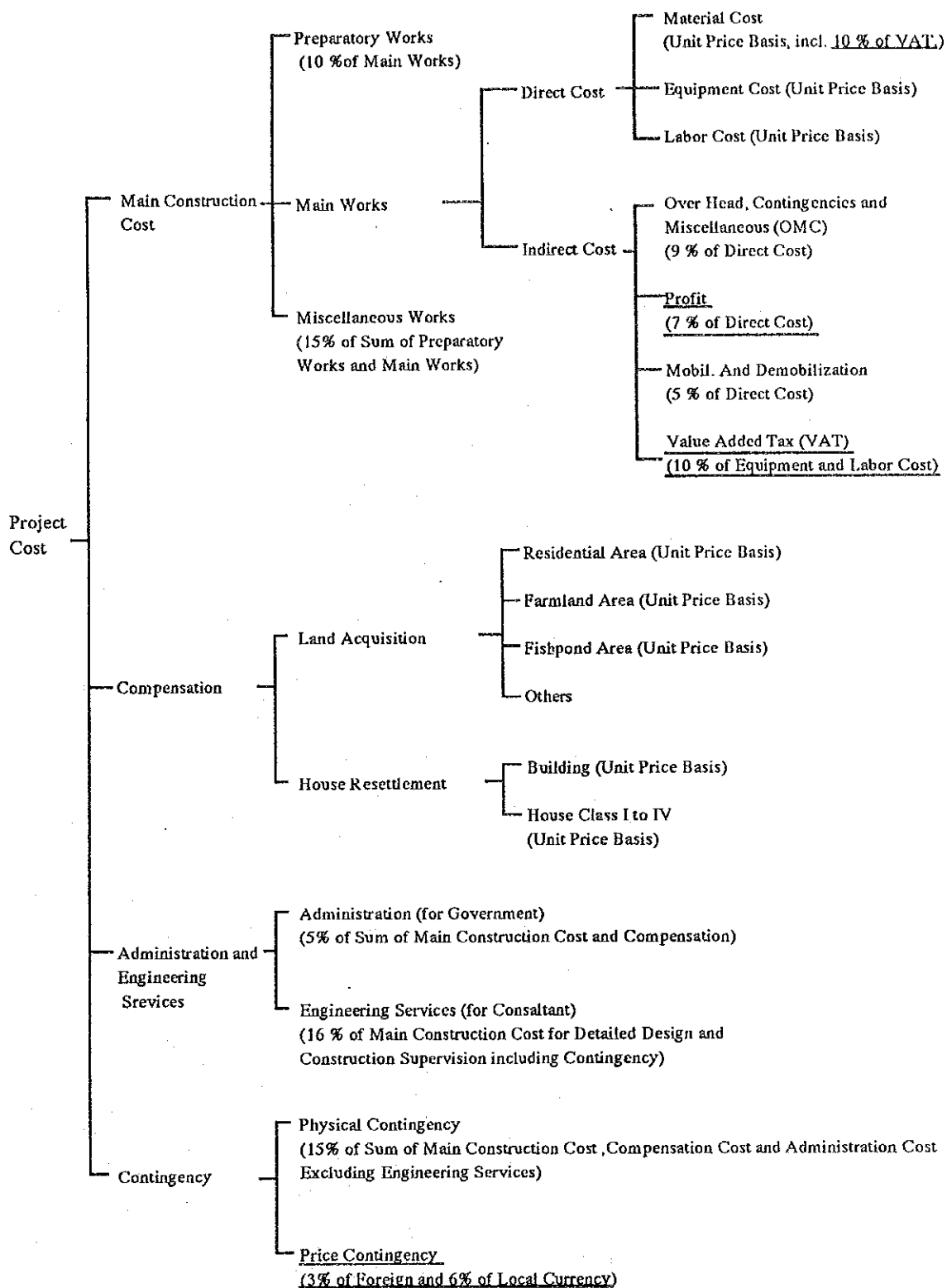


Table LOCATION OF RIVER-STRETCHES FOR COST ESTIMATE

I. Upper Agno River Project		
(1) Bayambang-Floodway Stretch		
A-1; from Hwa Bridge		AG- 280
to End of Popont-Floodway		AG- 323
(2) Alcala-Asingan Stretch		
A-2; to Junction of Agno R. & Lagasit R.		AG- 352
A-3; to Junction of Agno R. & Viray-Dipalo R.		AG- 415
(3) Asingan-San Manuel Stretch		
A-4; to ARIS Intake Dam		AG- 473
(4) Popont Swamp		
II. Pantal-Sinocalan River Project		
(1) Pantal Sinocalan River		
PS-1; from River Mouth		RH
to Junction of Pantal R. & San Pablo R.		D- 0.00
PS-2; to Junction of Pantal R. & Bypass Channel		D- 3.00
PS-3; to Junction of San Pablo R. & Bypass Channel		P- 7.00
PS-4; to Junction of San Pablo R. & Ingarela R.		P-21.45
PS-5; to Junction of Sinocalan R. & Quinabolotan R.		P-48.20
PS-6; to Junction of Sinocalan R. & Catablan R.		P-58.60
(2) Dagupan River		
D-1; from Junction of Pantal R. & Bypass Channel		D- 3.00
to Manat Bridge		D-12.00
D-2; to Junction of San Juan R. & Cemangbogan R.		D-16.00
D-3; to End of this River Improvement stretch		D-27.00
(3) Ingarela River		
I-1; from Junction of San Pablo R. & Ingarela R.		I- 0.00
to Huloog		I- 7.00
I-2; to Bogton Bridge		I-13.00

Fig. 3.1 LOCATION OF STRETCHES FOR COST ESTIMATES



Note: For Financial Project Cost, all items Are included.
For Economic Project Cost, under lined items are excluded.

Fig. 3.2 CONSTITUTION OF PROJECT COST (CONTRACT SYSTEM)

14. EI
ENVIRONMENTAL
IMPACT ASSESSMENT

EI : ENVIRONMENTAL IMPACT ASSESSMENT

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1. INTRODUCTION

The objectives of the Environmental Study in this Feasibility Study are as follows;

- 1) To identify impacts which are expected to cause effects on the environment concerned by the proposed Priority Projects,
- 2) To evaluate magnitude and its significance of the impacts,
- 3) To judge whether the proposed Priority Projects need further environmental study, and if so, to point out the effects to be studied in the next stage,

This supporting Report covers both natural and social environment of which major study items are enumerated below :

- 1) Additional data collection
 - Water quality requirement for operating fish ponds
 - Record of diseases and epidemics affected by past floods
 - Information on navigation in/around the river mouth of Pantal-Sinocalan River
- 2) Review and assessment of existing environmental condition in the Priority Project areas by use of existing data
- 3) Field survey for water quality tests (pH, Dissolved Oxygen, Turbidity, Electrical Conductivity, etc.)
- 4) Interview survey on diseases in Dagupan city and Poponto swamp
- 5) Evaluation on water quality in urban stretch of Pantal-Sinocalan River
- 6) Assessment of environmental impact on expected impact items in Priority Project areas
- 7) Recommendation on the environmental mitigation measures
- 8) Recommendation for further environmental study

2. EXISTING ENVIRONMENTAL CONDITIONS IN THE PRIORITY PROJECTS AREA

2.1 Physical Environment

The existing physical environment in the Priority Project areas is assessed as summarized in Table 2.1. This assessment identified that physical environment variables on sedimentation and soil erosion are predominant factors affecting the area. Following is a brief description of the current conditions of sedimentation and soil erosion from the physical environmental aspects.

(1) Sedimentation

The Priority Projects area is underlain by sediments, sedimentary rocks and volcanic rocks. The sediments which make up most of the area are composed of alluvial deposits of sand, gravel, silt and clay. Sediments therein come from both natural (erosion, landslide, river channel erosion), and artificial (agriculture, deforestation, road construction, mining) sources.

Natural sediment production is mainly originated from the southern Cordillera mountains. Thus large quantity of sediment is deposited in the upper reaches of the Agno River together with the Poponto swamp area which additionally receives sediment inflow in the Tarlac River from the Zambales mountains.

In the area of the Pantal-Sinocalan River, there exists the Agno River Irrigation System (ARIS) canals conveying irrigation water from the Agno River. The ARIS has been suffering from sedimentation in canals, which causes decrease of flow capacity because the canals became shallow. Moreover, fine sediment materials as silt readily flow into paddy fields through lateral canals together with irrigation water. The annual sedimentation volume is estimated about 480,000m³ based on the data of desilting volume in the canals which is yearly conducted.

(2) Soil Erosion

Figure 2.1 shows the soil erosion susceptibility map in the Pangasinan area and spatial distribution thereof is summarized in Table 2.2. San Nicolas, Bayambang and San Manuel located in the upper Agno River basin show high susceptibility, although the area of the Pantal-Sinocalan River is almost free from accelerated soil erosion.

Figure 2.2 also shows the soil pollution and degradation map in the Pangasinan area.

2.2 Land Resource

The existing environmental condition in the Priority Projects area is assessed from the viewpoint of the land resource as summarized in Table 2.3. Table 2.4 shows the estimated land use conditions in the Pangasinan area. Both areas are widely used for cultivated area and residential/institutional area because of their geographical locations lying on the Luzon Plain what is called "Rice Granary". A large percentage of the cultivated area is used for production of rice, corn and vegetables. The more densely populated municipalities are located in the residential area of the Pantal-Sinocalan River compared with ones in the upper Agno River.

2.3 Water Resource

The existing environmental condition in the Priority Projects area is assessed from the viewpoint of water resources as shown in Table 2.5. The water resources in the area consist of surface and marine water and groundwater. Surface water is mainly used for irrigation and fish culture, while marine water is used for navigation and fish culture (as blackish water). Groundwater is mainly used for domestic water and partly fish culture.

2.3.1 Water Quality

(1) Classification of Water Quality

The National Pollution Control Commission (NPCC) classified fresh surface water in terms of water quality criteria for maintaining water quality and preservation of present and future water use in 1978.

Table 2.6 shows the NPCC guideline on water usage and classification while Table 2.7 lists the water quality criteria specified by NPCC for surface water and groundwater.

At present, the following designation are set for rivers in the Priority Projects area.

Upper Agno River : Class A

Pantal-Sinocalan River

- Dagupan River : Class C

- Sinocalan River : Class D

- Ingalera River : not specified

(2) Water Quality Tests in June 1991

Water sampling and simplified water quality tests were conducted by the Study Team on June 24-29, 1991 to assess the present water quality condition in the upper Agno River and the Pantal-Sinocalan River. The water sampled location is shown in Figure 2.3. The test results are summarized in Table 2.8. In addition, the data related to water quality analysis are collected as given in Tables 2.9 to 2.12.

Although test quantities and reliability is not sufficient, the present river water quality in the Study Area is roughly assessed based on the test results together with collected data as summarized below:

a) Upper Agno River

- Potential of hydrogen (pH) of river water tends to be alkalinity except in the junction of the Tarlac River which might be affected by the volcanic ash from Mt. Pinatubo.
- Dissolved oxygen (DO) and Biochemical oxygen demand (BOD) fulfill the Class A standard.
- The turbidity and suspended solids (SS) and heavy metals (Fe, Cu, Mn, Pb) exceed the standard of Class A.

- Electric conductivity (E.C.) shows low value (average 0.58 ms/cm), which implies that the organic content in this level is not so significant.

b) Pantal-Sinocalan River

- The pH tends to be higher alkalinity in the upper reaches.
- The DO fulfills the Class D standard while the E.C. is high (average 14.7 ms/cm) due to sea water intrusion in the lower reaches.
- In the urban stretch (the Marusay River), effluent load of domestic solid waste and sewerage seems to be not remarkable and no water quality deterioration issue is observed at present.

c) Dagupan River

- The pH tends to be higher alkalinity in the upper reaches.
- The DO fulfills the Class C standard except in the downstream of San Carlos in the Campangbogan River.
- The E.C. is high due to sea water intrusion in the lower reaches.

d) Ingalera River

- The pH tends to be neutrality in the whole stretches.
- The DO fulfills the Class D standard although no standard has been yet established.

(3) Seawater Intrusion

The extent of seawater intrusion of the Pantal-Sinocalan River is assessed by use of the E.C. values measured. The Figure 2.4 illustrates the presumed front of the seawater wedge in the Pantal-Sinocalan River, the upstream of the Dagupan River and the Agno River. Although these are all rough estimates it can be said that the seawater of the Sinocalan reaches at least up to the downstream of Calasiao town during dry season.

2.3.2 Water Use

The existing water use in the following two river stretches are identified as the areas to be investigated in depth through initial screening.

- Bayambang stretch in the upper Agno River
- Urban stretch of Dagupan city in the Pantal-Sinocalan River

The existing water use in the above stretches is briefly assessed below.

(1) Bayambang Stretch

There exists private water use for irrigation in the Bayambang stretch between the inlet of floodway to the Wawa bridge along the Agno River, where river water is withdrawn by movable pumps from the both banks downstream of the Calvo bridge. Through the field survey there are presently about 100 pumps with a capacity of 0.01 - 0.02 m²/sec. The total water use is estimated around 2 m³/sec at the upper limit. Furthermore, there expected to be no future increase of irrigation water use.

(2) Urban Stretch of Pantal-Sinocalan River

There is no water use for irrigation and domestic water supply in the downstream of the Pantal-Sinocalan River because of seawater intrusion in this stretch. The piped domestic water supply sources of Dagupan city and Calasiao town are deep wells (deeper than 100m).

2.3.3 Groundwater

The alluvial plain in the Agno River has moderate to extensive, highly productive groundwater. Thus groundwater in the Priority Projects area is widely used for public and private water supply, industrial use and irrigation. However, there are no available data on groundwater withdrawal for these water uses.

In a separate study conducted by the Bureau of Soils and the National Hydraulic Research Center, the results of the analysis of well waters were generally satisfactory for domestic and agricultural uses, except for the following: Urdaneta wells where the pH was 3.7; Binmaley wells where color, turbidity and chloride were high, and the San Carlos wells where calcium and chloride levels failed drinking water standards. Coastal waters in Dagupan city, Bolinao, Agno and Alaminos showed high salinity as well as in Malasiqui which is subject to tidal fluctuations. Overpumping and close proximity to the sea could bring the reasons for the high salinity in these areas' groundwater. Generally however groundwater in the Priority Projects area have good physics-chemical and bacteriological quality, and are suitable for domestic and other purposes.

Figure 2.5 shows the distribution of groundwater wells in Pangasinan. There exists deep wells more than 100m in depth in the coastal area in the plain due to high salinity. Table 2.12 shows the percentage population served by type of water sources in health districts in Pangasinan. As given in this table, all health districts mainly depend on deep/shallow wells for water source. Figure 2.6 shows the domestic water supply system in Dagupan city and Calasiao town.

2.4 Ecological Environment

The existing ecological environment in the Priority Project areas is assessed as summarized in Table 2.13. There are no endangered/protected species, forests and wildlife species in the Study Area, while mangroves are partly observed in the Pantal-Sinocalan River and the Dagupan River.

2.4.1 Aquatic Life

Figure 2.7 shows the map of fish spawning/breeding grounds and fishpond areas in Pangasinan. Fish species caught in Pangasinan are listed in Table 2.14.

In the upper Agno River, there live freshwater fish such as mudfish, freshwater shrimps, catfish, milkfish (bangus), carp, tilapia, freshwater terapon, eel, climbing perch, etc. among which freshwater terapon, eel, climbing perch and freshwater goby are decreasing in number. There exist freshwater fishponds near Bayambang and Rosales towns. Moreover, the Poponto swamp area is traditionally productive one for freshwater fish and crustaceans, mollusks and water fowl. The Culisaw creek located at the northwest of swamp is well known as spawning and breeding ground for migratory fish species. However, the creek is heavily damaged by volcanic debris and mudflow due to the eruption of Mt. Pinatubo.

There are same species of freshwater fish in the Pantal-Sinocalan River as ones in the upper Agno River. Decreasing species of fish caught has not yet been recorded at present. Milkfish (bangus) fishponds are intensively developed in the downstream reaches of the Pantal-Sinocalan River by use of marine water intrusion thereto.

2.5 Economic Activities

Major economic activities in Pangasinan is primary industries of agriculture, forestry and fisheries as listed in Table 2.15. Agriculture is predominant among them and the cultivated area is covered by economic crops and cultivated-type vegetation. Table 2.16 shows the existing condition of economic activities in the Priority Projects areas. Socio-economic levels of income, standard of living, housing and social services are relatively stable because the industrial basis mainly on agriculture is well developed.

2.5.1 Fisheries

Table 2.17 lists the area and production of fisheries in Pangasinan where there exist coastline and rich fishery resources. Aside from its natural marine, brackish and freshwater fisheries, it engages in extensive

brackish water aquaculture (milkfish and prawn), oyster culture, seaweed culture, and freshwater inland fishponds (tilapia) and rice-fish culture.

Table 2.18 shows other fishery statistics in Pangasinan including the number of fishpond operators and fishermen, marine fishermen, bancas and motor boats. About 70% of marine fishermen is fulltime one and 80% of fishpond operators and fishermen is engaged in brackishwater fishponds culture.

Fisheries in the upper Agno River are mainly natural fisheries, freshwater inland fishponds (tilapia) and rice-fish culture as shown in Table 2.19, where flood inundation areas are mainly utilized for fisheries. Natural fisheries and rice-fish culture are usually supplied for private consumption, while tilapia fishculture is on commercial basis. Marine fisheries together with brackish fishpond culture are significant in the downstream reaches of the Pantal-Sinocalan River. Table 2.20 shows the brackish fishpond area in Pangasinan.

Fishpond areas are habitually damaged by floods caused by typhoons. Table 2.21 shows the damage of fisheries by typhoon "Openg", in 1989.

2.5.2 Industries

Major industry in Pangasinan is agriculture and there exist ricemill/cornmill firms in each municipality therein. Table 2.22 shows the distribution of firms by industry in Pangasinan. Several kinds of industry firms are developed in/around Dagupan city and Calasiao town in the downstream reaches of the Pantal-Sinocalan River, some of which become water contamination source by waste water disposal into allied rivers.

2.5.3 Navigation

Navigation is one of major water use in the downstream reaches of the Pantal-Sinocalan River. The purpose of navigation are classified as follows:

- a) community traffic by small boats
- b) fishing boats

- c) naval guard ships
- d) dredgers for river maintenance

Community traffic and fishing by small boats are majority of the navigation and amounts about 5,000 person trips of daily maximum capacity in the urban stretch in Dagupan city as shown in Table 2.23. The size of ships is summarized in Table 2.24.

2.6 Public Health

As listed in Table 2.25, there observed water-related diseases, insect vectors and other public health hazards in the Priority Projects area. The historical morbidity and mortality rates per 100,000 population for the period of 1975 to 1988 in Pangasinan are tabulated in Tables 2.26 and 2.27. The leading causes of morbidity and mortality are mainly upper respiratory tract and other infections that are curable given the appropriate medical attention or even preventable.

Table 2.28 shows the causative agent and mode of transmission concerning diseases that may be affected by floods. During/after the year that large floods occurred, there observed on increase of the morbidity rate. Especially, the cases of respiratory organs, water-related and water-borne parasitic diseases tends to increase. Mortality rate however did not rise significantly, although more people are getting sick, about the same number as in the previous year's die from the disease (diarrheas, gastroenteritis, dysentery, etc.).

2.6.1 Water-borne Parasitic Diseases

Major water-borne parasitic disease is malaria, although its rate in terms of leading causes of morbidity and mortality indicates a small number. Figure 2.9 shows the areas in Pangasinan that are endemic for malaria, and the malaria incidence distribution map in terms of Annual Parasite Incidence (API) in Pangasinan. Malaria incidence is 2 or more times during dry season; anopheles mosquitoes (medium of transmission) are adversely affected by rains/floods and they can't breed in contaminated or dirty water.

According to the interview survey to medical doctors, the malaria incidence during/after floods has not yet reported in the Priority Project area. However, it is noted that flies, mosquitoes, cockroaches etc. are enumerated as a media of transmission in contagions in view of causality of diseases/epidemics.

2.6.2 Water-related Disease

There are diarrhea, food poisoning, dysentery, anforms, gastroenteritis, typhoid fever and so on in water-related diseases. Among them the incidence of diarrhea is significant. Figure 2.10 shows the distribution of diarrhea cases by health district in Pangasinan in 1988.

The number of diarrhea cases are almost uniformly distributed in the Priority Projects area, while higher cases are reported in/around coastal area. According to the interview survey, diarrhea occupies in most of cases of diseases/epidemics which occurred during/after large floods.

3. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF PRIORITY PROJECTS

3.1 Methodology of EIA for Priority Projects

To attain the objectives of this environmental study in the Feasibility Study, Initial Environmental Examination (IEE) was conducted at first. Environmental Impact Assessment (EIA) is preliminarily conducted only for the parameter items which were scoped by the IEE. IEE is essentially an initial examination of the environmental effect potentials of the proposed projects based mostly on the preliminary information which can be readily obtained. The IEE is thus a first approach of EIA by screening and scooping, which needs to be carried out at a depth only as determined whether an EIA will be required in the next stage through the IEE.

A checklist method is applied as a basic tool of EIA and preliminary EIA in this environmental study, because it is one of the useful initial tools for identification of impacts and its evaluation of significance. The checklist is prepared by using major items of environmental effect as rows and major project components as columns. The expected effects are evaluated by significance ranging from A to C for each project component with classifying whether positive or negative. The checklist items are selected by the Study Team taking into consideration the features of the Projects and the guidelines prepared by Government of Philippines (GOP) and the Asian Development Bank (ADB).

3.2 Result of EIA for Priority Projects

The results of EIA for the Priority Projects are summarized in Table 3.1. The parameter items of which impact is assessed to be significant are scoped and described hereunder.

3.2.1 Problems due to the Location

(1) Resettlement

Not only the people inhabiting inside the planned river area to be confined by new disks and bypass floodways but the people living in the designated inundation area of the Poponto retarding basin have to be

evacuated and resettled. Impact on these people is assessed at high level of significance.

The number of buildings/houses and affected population are summarized below.

River	No. of Building /Houses	Affected Population
(1) Upper Agno River		
- Upper Agno River	920	5,520
- Poponto retarding basin	3,960	23,760
Total	4,880	29,280
(2) Pantal-Sinocalan River		
- Main Pantal-Sinocalan River	1,790	10,740
- Ingarela River	504	3,024
- Dagupan River	481	2,886
- Bypass channel	103	618
Total	2,878	17,268

Under the upper Agno River project, the Poponto retarding basin will have a wider inundation area. This will affect an estimated 11,490 households on roughly 68,340 residents, largely from the towns of Moncada, Paniqui and Bautista. As protection measures, ring levees will be introduced for 44,580 of the affected inhabitants. Thus a resettlement program is to be provided for some 23,760 residents who cannot be protected.

Since the residents to be resettled for flood-prone area will live in flood-free areas with the implementation of flood control projects, they can receive positive effects such as increase of safeguard against floods, improvement of living standard and increase of economic efficiency. In addition, the inundation area in the Poponto retarding basin is usable for cultivation because of intermittent flooding thereof. In this respect, this resettlement problem is essentially different from problems in reservoir areas of dam projects.

In view of the above, the resettlement program should be carefully managed through sincere discussions with the residents regarding their new place of residence and administrative measures.

(2) Land Value Change

Flood-prone area is threatened by flooding. This is generally reflected in a lower market land value for these area compared with those in flood-free area. With the implementation of the Priority Projects, the protected land could be put to its best use.

Flood-prone area, for example, in the urban cores could be used for commercial/residential purposes as a result of increase safeguard against floods. Croplands could be cultivated more intensively or transformed into other land uses. This leads to appreciation of land values which in turn results in increase of income and significant improvement in living standards.

On the other hand, the land value in the Poponto retarding basin might be unchanged because wider area and longer duration of inundation therein might induce incidence of diarrhea and water-borne diseases.

(3) Encroachment of Agricultural and Aquacultural Lands

In the Upper Agno River project, realignment of dikes and construction of new levees will encroach on some agricultural and residential areas in the municipalities of San Manuel, Asingan and Villasis. Meanwhile, the expansion of the Poponto floodway into the swamp area will occupy agricultural land and the proposed project will induce wider inundation area in the swamp.

In the Pantal-Sinocalan River project, the proposed bypass channel in Dagupan city will occupy across residential area as well as cropland. Likewise, construction of levees along river course will encroach on agricultural, fishpond and residential land in and around Dagupan city, San Carlos, Calasiao and Santa Barbara towns.

The land subject to acquisition are summarized below.

River	Area (ha)
(1) Upper Agno River	
- Upper Agno River	1,041
- Poponto retarding basin	166
Total	1,207
(2) Pantal-Sinocalan River	
- Main Pantal-Sinocalan River	467
- Ingarela River	121
- Dagupan River	146
- Bypass channel	65
Total	799

As shown above, a total of 2,006 ha is required to be acquired for the right-of-way. Once croplands and fishponds have been transformed to other land uses, it would be hard to return to original uses. In this respect, encroachment of lands will lead to loss of jobs and output, which is assessed to significant negative impact.

(4) Effects on Groundwater Hydrology

The proposed bypass channel in Dagupan city will allow sea water to intrude in its river channel. Existing shallow wells along the channel will be affected by permeation of the sea water to some extent.

However, water from shallow wells in this area is used mainly for cleaning, washing and fishpond water supply. The domestic water in the area depends mainly on deep wells. Impact of sea water intrusion is therefore assessed to be low level of significant.

(5) Impairment of Navigation

As described in preceding Chapter, navigation is one of major water use in the downstream reaches of the Pantal-Sinocalan River.

By construction of the bypass channel in Dagupan city, inlet and outlet in the urban stretch of Dagupan city will be equipped with gates to avoid flood inflow thereto. This will affect the inland navigation in the urban stretch.

The gate width at the outlet is determined taking into account sizes of navigation ships to minimize impairment of navigation. In addition, landing place and anchorage are proposed downstream of the gate for larger navigation ships. In view of the above, the impact of impairment of navigation is assessed to the low level of significance.

(6) Loss of Community and Recreation Area

The communities in the area subject to resettlement will be significantly influenced in view of social conflicts. In order to minimize the loss of community, the following appropriate measures will be taken into account for provision of resettlement program:

- due selection of resettlement area as near the present resident area as possible
- construction/replacement of bridges/roads

3.2.2 Problems in Construction Stage

(1) Hazards to Workers and nearby Residents

The environmental problems which might take place in the construction stage are air pollution, traffic accidents, noise and vibration to residents. Air might be contaminated by dust from earthworks of river channels, floodways, dike embankment.

In order to reduce those impacts, it is necessary to water and clean the streets especially residential area, and to limit the speed of the vehicles. The noise from the construction works will have to be controlled by the regulations concerned. Of course, the safety control and management should be placed as a first priority to prevent accidents to workers and nearby residents.

(2) Deterioration of Water Quality

Deterioration of water quality will be turbidity of water caused by suspended soil particles from dredging and excavation of river channel, and land cleaning of embankment. As for the proposed bypass channel, it is necessary to secure appropriate spoil bank areas for the excavated materials in order to avoid water pollution to the downstream fishpond areas.

3.2.3 Problems in Operation Stage

(1) Deterioration of Water Quality

Environmental impact which might take place in operation stage is considered to be deterioration of water quality in the Bayambang stretch of the upper Agno River and the urban stretch in Dagupan city. This impact might be caused due to reduction of low flow discharge by construction of a new floodway to Poponto swamp, and construction of a new bypass channel in Dagupan city.

Bayambang Stretch

At present water quality in this stretch fulfils the Class A standard of NPCC regarding DO and BOD due to decomposition of organic matter.

This fact of clean water is explained by a reason that there are no significant amount of effluents from commercial and industrial establishments which are the major sources of organic matters. In this sense, no deterioration of water quality is expected although low flow discharge is reduced to about 15% of the existing quantity.

Urban Stretch in Dagupan City

The average nutrient level of the Dagupan River is shown in Table 3.2. The reducing function in nitrogen is assessed to be high because the concentration of nitrogen ($\text{NO}_2\text{-N} + \text{NO}_3\text{-N}$) is smaller than that of phosphate ($\text{PO}_4\text{-3}$) in the upstream reaches of the Dagupan River.

In addition, the concentration value at the river mouth is smaller than that of the upstream. This might be due to contribution of purification by tidal effect of sea water.

The urban stretch will be under a burden of a heavy pollutant in the future, as a result that its surrounding area will be populated owing to growth of economic development. In view of the above, the water quality analysis was herein carried out to estimate river discharge to minimize deterioration of water quality in the target year of 2000. Projected conditions are as follows:

a) Phosphate is assumed to be completely mixed with fresh water.
(complete dilution model)

b) Purification by tidal effect of sea water is not taken into account.

c) Water quality (concentration of phosphate) is set at 38.59 g/lit. in average. No discharge data is available at the time of observation of water quality. Thus, the river discharge given for item g) is tentatively used for the simulation.

d) Sanitary sewage water volume is assumed as:

- gray water	30 lit./day·person
- feces and urine	1.4 lit./day·person

e) Projected population in the drainage area of the urban stretch are assumed as:

- 1990	37,000 persons
- 1995	42,000 persons
- 2000	47,000 persons

f) Pollutant load of phosphate is assumed as:

- gray water	0.083 g/day·person
- feces and urine	0.057 g/day·person

g) River Discharge is assumed as:

- 7.1 m³/sec of low flow discharge at the Sinocalan gauging station in 1990, which is used for estimation of present pollution load in the upstream of the urban stretch.
- 3.9 m³/sec of drought discharge at the Sinocalan gauging station in 1990, which is used for estimation of the future concentration in the urban stretch.

h) The maximum phosphate content of 0.2 mg/liter, which is commonly used as a standard of eutrophication in a coastal area, is adopted as the water quality requirement in the Project area.

As a result of the above projection and analysis, it is estimated that about 0.6 m³/sec of low flow should be maintained at least in the urban stretch to fulfill the water quality requirement of 0.2 mg/liter of phosphate in the year 2000.

A water gate is provided for flood control of the urban stretch at the junction of the proposed bypass channel. This gate will be opened during low flow discharge, and it will be closed during flood. In this connection, some 20% of river flow from the upstream basin will be diverted to the urban stretch. Even in the case of the recorded minimum discharge of 3.7 m³/sec in 1990, 0.74 m³/sec (20% of 3.7 m³/sec) of low flow discharge will be maintained in the urban stretch. The environmental impact on deterioration of water quality in the urban stretch consequently assessed to be low level of significance.

Water quality is evaluated in terms of phosphate in this section because BOD records are not available. Monitoring of BOD in the Project areas is recommended to be executed.

(2) Intrusion of Saline Water

Seawater intrusion analysis was performed to determine an impact of seawater on the Pantan-Sinocalan project. Under the design conditions, the extent of sea water intrusion is estimated at about 1 km further upstream of

the present conditions. This additional 1 km extension seems to exert little impact. Moreover, the Sinocalan irrigation dam for the existing water intake facility is located about 4 km upstream of the estimated front wedge of sea water, which is sufficiently outside the river stretch affected by sea water. The impact of saline water is therefore assessed to be low level of significance.

(3) Vector Diseases and Public Health Hazards

The flood-prone area will be turned into the flood-free areas with the realization of the Priority Projects. In this respect, the incidence of diseases such as diarrhea, gastro-enteritis and influenza will be readily reduced, which might be originated in vectors (flies, mosquitoes, cockroaches, etc.) caused during/after floods.

As mentioned earlier, broader inundation in the Poponto swamp might lead to increase of incidence in the above mentioned diseases. Healthcare including provision/improvement of water supply system in the surrounding area should be intensified to minimize public health hazards.

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

(1) Environmental Parameters Identified

The results of preliminary Environmental Impact Assessment (EIA) are discussed in preceding Chapter. The parameter items of which impact is assessed to be significant are:

Parameter Item	Upper Agno River	Pantal-Sinocalan River
A) Problems due to the location		
. Resettlement	-/A	-/A to -/C
. Land value changes	= to +/A	+/A
. Encroachment of agricultural and aquacultural lands	-/A to -/B	-/A to -/C
. Effects on groundwater hydrology	0	-/C to 0
. Impairment of Navigation	0	-/C to 0
. Loss of community and recreation areas	-/B to -/C	-/C
B) Problems in Construction Stage		
. Hazards to workers and nearby residents	-/C	-/C
. Deterioration of water quality	-/C to 0	-/C to 0
C) Problems in Operation Stage		
. Deterioration of water quality	0	-/C to 0
. Intrusion of saline water	0	-/C to 0
. Vector disease hazards	-/C to +/C	0 to +/C
. Public health hazards	-/C to +/C	0 to +/C

Note: (1) + : Positive effect, - : Negative effect, 0 : No effect,
= : Neutral effect

(2) A : High level of significance, B : Medium level of significance,
C : Low level of significance

Among the environmental parameter items identified as significant, social environments are loaded higher negative impact than natural environment in both the upper Agno River and Pantal-Sinocalan River projects.

	Upper Agno River	Pantal- Sinocalan River
<u>Natural Environment</u>		
. Effects on groundwater	no effect	low
. Hazards to workers and nearby residents	low	low
. Deterioration of water quality	low	low
. Intrusion of saline water	no effect	low
<u>Social Environment</u>		
. Resettlement	high	high
. Encroachment of lands	high to medium	high to low
. Impair of navigation	no effect	low
. Loss of community	medium to low	low
. Vector disease hazards	low	no effect
. Public health hazards	low	no effect

Expected positive impacts are:

	Upper Agno River	Pantal- Sinocalan River
<u>Social Environment</u>		
. Land value change	high	high
. Vector disease hazards	low	low
. Public health hazards	low	low

(2) Principal Conclusions

Upper Agno River Project

The project components of flood control in the upper Agno River are river improvement works along the main stream; mainly construction of diking systems, excavation of low water channels, construction of Poponto floodway, and expansion of Poponto retarding basin. Among them, construction of new dikes, and Poponto floodway, and expansion of Poponto retarding basin are expected to impose significant impact on the social environment in terms of resettlement and encroachment of agricultural and residential lands. Loss of community is also an adverse effect due to the resettlement.

The identified municipalities to be affected are:

- a) Poponto floodway and retarding basin; Bayambang, Bautista, Alcala, San Manuel, Moncada, Paniqui and Ramos
- b) Carmen stretch; Vilasis and Rosales
- c) Asingan-San Manuel stretch; Santa Maria, Asingan, San Manuel and Tayug.

The impacts due to problems during construction and the impacts on vector disease and public health are all low level of significance and are expected to be mitigated to satisfactory level.

Pantal-Sinocalan River

The project components of flood control in the Pantal-Sinocalan River are construction of the Dagupan bypass and river improvement works along the main stream and its tributaries, the Dagupan and the Ingalera; mainly, construction of diking systems, excavation of low water channels. Among them, construction of new dikes in the areas of Dagupan city and towns of Calasiao and Santa Barbara are expected to impose significant impact on the social environment in terms of resettlement and encroachment of agricultural and residential lands. Loss of community is also an adverse effect due to the resettlement.

The identified cities and municipalities to be affected are:

- a) Pantal-Sinocalan River stretches; Dagupan, Binmaley, Calasiao, Santa Barbara, Urdaneta, San Carlos, and Malasiqui
- b) Dagupan bypass; Dagupan and Calasiao

The impact due to problems during construction and intrusion of saline water, and the impact on navigation, vector disease and public health are all low level of significance. Although the expected impact on water quality in the urban stretch of the Sinocalan River and fishponds along the Dagupan River is assessed to be low level, further detailed study will be required in order to clarify some unknowns involved due to insufficient information and recorded data.

Particular description of the identified parameter items and their level of significance is presented hereunder.

4.2 Recommendation

4.2.1 Natural Environment

At the present, the monitored data of river water quality in the Priority Project areas are not available except a few.

Further detailed water quality analyses will be required for preparation of Environmental Impact Statement (EIS). For successful EIS, following surveys are recommended to be executed:

(1) Survey on water quality

- test items pH, BOD, DO, SS, COD Coliform, total nitrogen, total phosphorus
- sampling sites Bayambang stretch of the Agno River, urban stretch of the Pantal-Sinocalan River, and fishpond areas along the Dagupan and the Ingalera Rivers

(2) Survey on water pollutant sources (at water quality survey sites)

- population in watershed of both rivers
- sanitary condition (toilet, sewage system)
- water supply system
- volume of daily water use

(3) Survey on the materials deposited on Riverbeds

- test items COD, SS, toxic substance
- sampling sites the same as water quality survey

4.2.2 Social Environment

For the smooth preparation and execution of the resettlement program, the following surveys and measures are recommended to be executed:

- quantitative survey to identify landowners and residents to be resettled
- detail survey on land use, and valuation of houses and lands involved
- public hearing and discussions with residents regarding the matter concerned

TABLES

Table 2.2 SPATIAL DISTRIBUTION OF SOIL EROSION SUSCEPTIBILITY, PANGASINAN

Municipality	SOIL EROSION SUSCEPTIBILITY (Area approximation in has.)					Total Mapped Area
	Extreme	High	Moderate	Slight	None	
1. Agno	-	2,400	6,800	2,400	2,000	13,600
2. Aguilar	-	3,200	-	5,200	6,800	15,200
3. Alaminos	-	1,600	400	3,000	10,800	15,800
4. Alacala	-	-	-	1,200	1,600	2,800
5. Anda	-	-	-	1,120	4,800	5,920
6. Asingan	-	-	-	-	5,600	5,600
7. Balungao	-	200	-	1,600	5,600	7,400
8. Bani	-	400	1,600	2,800	6,800	11,600
9. Basista	-	-	-	-	1,520	1,520
10. Bautista	-	-	-	-	8,800	8,800
11. Bayambang	800	-	-	200	4,400	5,400
12. Binalonan	ND	ND	ND	ND	ND	ND
13. Binmaley	-	-	-	-	4,800	4,800
14. Bolinao	-	-	2,400	3,800	15,600	21,800
15. Bugallon	-	3,200	-	2,400	7,800	13,400
16. Burgos	-	1,600	3,200	4,000	2,000	10,800
17. Calasiao	-	-	-	400	1,600	2,000
18. Dasol	-	4,400	1,200	12,000	3,600	21,200
19. Infanta	-	7,600	2,400	8,400	1,200	19,600
20. Lacaoc	-	-	-	2,400	800	3,200
21. Labrador	-	2,000	-	2,000	3,200	7,200
22. Lingayen	-	-	-	-	4,400	4,400
23. Mabini	-	9,000	2,000	8,000	3,200	22,200
24. Malasiqui	-	-	-	6,000	6,400	12,400
25. Manaoag	-	-	-	720	2,000	2,720
26. Mangaldan	-	-	-	2,000	2,000	4,000
27. Mangatarem	2,800	2,000	2,000	5,600	17,200	29,600
28. Mapandan	-	-	-	1,200	800	2,000
29. Natividad	600	1,600	3,000	800	600	6,600
30. Pozorrubio	2,000	2,400	400	1,200	5,200	11,200
31. Rosales	400	600	-	2,000	2,800	5,800
32. San Fabian	-	2,600	200	800	2,000	5,600
33. San Jacinto	-	1,200	-	600	800	2,600
34. San Manuel	1,200	1,000	1,000	1,400	2,000	6,600
35. San Nicolas	11,000	2,400	3,400	2,000	2,000	20,800
36. San Quintin	2,000	400	3,200	1,600	3,200	10,400
37. Sta. Barbara	-	-	-	1,800	5,600	7,400
38. Sta. Maria	-	-	-	-	4,000	4,000
39. Stc. Tomas	-	-	-	400	400	800
40. Sison	600	1,600	800	400	2,400	5,800
41. Sual	-	8,600	-	2,000	1,200	11,800
42. Tayug	-	-	-	600	4,000	4,600
43. Umingan	1,200	2,800	2,000	3,600	12,600	22,200
44. Urbixtondo	-	-	-	-	5,200	5,200
45. Urdaneta	-	-	-	-	11,000	11,000
46. Villasis	-	-	-	400	6,400	6,800
47. Dagupan City	-	-	-	-	3,200	3,200
48. San Carlos City	-	-	-	-	15,600	15,600
Total	22,600	62,800	36,000	96,040	225,520	442,960
% of Total Area	5.10	14.18	8.13	21.68	50.91	100.00

Source: Ecological Profile of Pangasinan,
MHS/NEPC, NACIAD, 1982

Table 2.3 DESCRIPTION OF EXISTING LAND RESOURCES
IN THE PRIORITY PROJECTS AREA

River System		Agno River		Pantal-Sinocalan River		Remarks
(Priority Study Area)						
Environmental	Wawa -	Poponto	Sinocalan	Ingalera	Dagupan	
Variables (Land Resources)	San Roque	Swamp	River	River	River	
	Stretch					
		0	0	0	0	0
	: Agricultural	0	0	0	0	0
	: Residential/Institutional	0	0	0	0	0
	: Industrial	0	x	0	0	0
	: Commercial	0	0	0	0	0
Land Use	: Forest Area	x	x	x	x	x
	: Grasslands	0	0	0	0	0
	: Wetlands	0	0	0	x	0
	: Major Structures	0	0	0	0	x
Infra-	: Utility Networks	0	0	0	0	0
structure:	: Transportation Networks	0	0	0	0	0
						Irrigation/Flood Control P/L, Waterline, Telephone etc. Roads, Bridge, Navigation etc.

LEGEND : 0 - Existing
X - Not Existing
H - High
N - Normal
L - Low
* - Evaluated based on data

Table 2.4 ESTIMATED AREA AND PERCENT OF LAND USES AND VEGETATION TYPES
IN PANGASINAN, 1985

CLASSIFICATION	A R E A (ha)	PERCENT OF TOTAL
I. Alienable and Disposable	405915	75.62
A. Agricultural	289588	53.95
1. Grains (Palay)	206944	38.55
2. Cereals (Corn)	16156	3.01
3. Rootcrops	3262	0.61
4. Vegetables	12322	2.30
5. Legumes	10008	1.86
6. Non-Food/Cash Crops	7138	1.33
7. Fruit Trees	10254	1.91
8. Other Crops	4826	0.90
9. Others * a	18678	3.48
B. Pasture Areas	10555	1.97
C. Fishponds	7398	1.38
D. Stewardship Areas	7246	1.35
E. Others * b	91128	16.97
II. Forest	130903	24.38
A. Forest Lands	51081	9.51
1. Forest Reserve	22875	4.26
2. Timberland	27477	5.12
3. National Parks	92	0.02
4. Military Reservation	288	0.05
5. Fishpond Development	349	0.06
B. Unclassified	79822	14.87
Total	536818	100.00

Legend: * a : includes open grasslands
* b : includes other built-up areas

Sources: MAF, Region I
NIA, Region I
BED, Region I

Table 2.5 DESCRIPTION OF EXISTING WATER RESOURCE
IN THE PRIORITY PROJECTS STUDY AREA

River System (Priority Study Area)	Agno River	Pantal-Sinocalan River	Remarks
Environmental Variable (Water Resource)	Wawa - San Roque Swamp Stretch	Sinocalan River	Ingalera River
	Poponto	Dagupan River	
: Water Quantity	H	N	L
: Flood Potential	H	H	H
: Stream Blockage	H	L	H
: Bedload	H	H	H
: Water Quality (BOD)	L *	L	L
Hydrology: Suspended Solids (SS)	H *	N	N
: Coliform Organisms	H *	H	H
: Chemical Content (Cu, Heavy Metal, etc.)	H *	N	L
: Clarity (Turbidity)	H *	N	N
: Need for Ground Water Protection (Salinity/Quantity)	L	L	L
			N
			Damming Debris
			H > 10, N 5-10, L < 5 mg/l.
			H > 1000, N 500-1000, L < 500 mg/l
			H > 5000, N 1000- 5000, L < 1000 MNP/100ml
			H > 0.2, N 0.02-0.2, L < 0.02 mg/l
			H > 300, N 100-300, L < 100

LEGEND : 0 - Existing
X - Not Existing
H - High
N - Normal
L - Low
* - Evaluated based on data

Table 2.6 NPCC GUIDE ON WATER USAGE & CLASSIFICATION

(a) Fresh Surface Water

Classification	Best Usage
Class AA	For source of public water supply. This class is intended primarily for waters having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the National Standards for Drinking Water (NSDW) of the Philippines.
Class A	For source of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the NSDW.
Class B	For primary contact recreation.
Class C	For the propagation and growth of fish and other aquatic resources.
Class D	For agriculture, irrigation, livestock watering, and industrial cooling and processing.
Class E	For navigational use.

(b) Ground Water

Classification	Best Usage
Class GA	For source of domestic water supply.
Class GB	For source of irrigation and industrial water supply.

(c) Marine and Estuarine Water

Classification	Best Usage
Class SB	For primary contact recreation.
Class SC	For propagation and growth of fish and other aquatic resources.
Class SD	For industrial cooling and processing.
Class SE	For navigation.

Source: Rules & Regulations of the National Pollution Control Commission (1978)
Section 69, NPCC Water Quality Criteria (1978)

Table 2.7 AMBIENT WATER QUALITY CRITERIA BY NPCC

Quality Parameter	Surface Water										Ground Water		
	Fresh					Marine and Estuarine					GA	GB	
	AA	A	B	C	D	E	SB	SC	SD	SE			
Color, Units		75	50	50			50						50
Temperature, °C		30	30	3(e)	3(e)			3(a)	3(e)				
Transparency			(c)	(c)	(c)		(c)	(c)					
Dissolved Oxygen		5	5	5		2	5	5	3	2			
5-day BOD at 20 °C		10	15	20			15	20					
Total Dissolved Solids				1,000	1,000		1,000	1,000					1,000
Total Solids	(a)	(a)		2,000	2,000		2,000	2,000				(a)	
pH	(a)	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	5.0-9.0	6.5-8.5	6.5-8.5	6.5-8.5	5.0-9.0		(a)	6.0-8.5
Coliform, MPN/100ml	50	5,000	1,000	5,000			1,000	5,000				50	
Phenolic Substances	(a)	(a)	0.002	0.02			0.002	0.02				(a)	
Radioactive substances													
Ra - 226, uCi/L	(a)	(a)										(a)	
Sr - 90, uCi/L	(a)	(a)										(a)	
Beta Emitter, uCi/L	(a)	(a)										(a)	
Trace Elements													
Aluminum					5								5
Arsenic	0.05	0.05	0.05	0.05	0.1		0.05	0.05				0.05	0.1
Barium	(a)	(a)		0.05				0.05				(a)	
Beryllium					0.1								0.1
Boron					0.75								0.75
Cadmium	(a)	(a)	0.01	0.01	0.01		0.01	0.01				(a)	0.01
Cobalt					0.05								0.05
Chromium	(a)	(a)	0.05	0.05	0.10		0.05	0.05				(a)	0.10
Copper	(a)	(a)		0.02	0.20			0.02				(a)	0.20
Cyanide	0.05	0.05	0.05	0.05			0.05	0.05				0.05	
Flouride	(a)	(a)			1							(a)	
Iron	(a)	(a)			5							(a)	5
Lead	0.05	0.05	0.05	0.05	5		0.05	0.05				0.05	5
Lithium					2.5(d)								2.5(d)
Manganese	(a)	(a)			0.2							(a)	0.2
Mercury	0.002	0.002	0.002	0.002			0.002	0.002				0.002	
Molybdenum					0.01								0.01
Nickel					0.2								0.2
Selenium	0.05	0.05	0.05	0.05	0.02		0.05	0.05				0.05	
Silver	0.05	0.05	0.05	0.05			0.05	0.05				0.05	
Vanadium					0.1								0.1
Zinc	(a)	(a)		2	2							(a)	2
Sodium Adsorption Ratio (SAR)					8-18								8-18
Organic Chemicals													
Synthetic Detergents (MBAS)	nil	0.05	0.05	0.05			0.5	0.5	5	10		nil	
Oil and Grease	nil	2	2	5	5	10	2	5	5	10		nil	
Persistent Pesticides													
Aldrin	0.001	0.001	0.001	0.01	ug/L		0.001	0.01	ug/L			0.001	
DDT	0.05	0.05	0.05	0.02	ug/L		0.05	0.02	ug/L			0.05	
Dieldrin	0.001	0.001	0.001	0.005	ug/L		0.001	0.005	ug/L			0.001	
Chlordane	0.003	0.003	0.003	0.04	ug/L		0.003	0.04	ug/L			0.003	
Endrin	0.0002	0.0002	0.002	0.002	ug/L		0.0002	0.002	ug/L			0.0002	
Heptachlor	0.0001	0.0001	0.0001	0.01	ug/L		0.0001	0.01	ug/L			0.0001	
Lindane	0.004	0.004	0.004	0.02	ug/L		0.004	0.02	ug/L			0.004	
Toxaphene	0.005	0.005	0.005	0.01	ug/L		0.005	0.01	ug/L			0.005	
Methoxychlor	0.1	0.1	0.1	0.005	ug/L		0.1	0.005	ug/L			0.1	
2, 4-D	0.1	0.1	0.1	4.0	ug/L		0.1	2.0	ug/L			0.1	
2, 4,5-TP	0.01	0.01	0.01				0.01					0.01	
P C B s	nil	0.001	0.001				0.001					nil	
Other Chemicals													
Ammonia		0.01											
Calcium	(a)	(a)										(a)	
Chloride	(a)	(a)										(a)	
Magnesium	(a)	(a)										(a)	
Nitrate	(a)	(a)										(a)	
Sulfate	(a)	(a)										(a)	
Nutrients		(b)	(b)	(b)	(b)		(b)	(b)	(b)				

- Remarks: 1. (a) National Standards for Drinking Water in the Philippines
 (b) Shall not be present in conc. to cause deleterious or abnormal biotic growth
 (c) Secchi Disk shall be visible at a minimum depth of one (1) meter
 (e) Rise in temperature
 2. All values are max, permissible except for Dissolved Oxygen which is min, permissible.
 3. All units in mg/L (milligrams/liter) except those indicated
 4. uCi/L - micro micro Curie per liter
 5. ug/L - micro micro gram per liter
 6. MPN - most probable number

Source: Rules & Regulations of the National Pollution Control Commission (1978)
 Section 69. Table 1 - NPCC Water Quality Criteria (1978)

Table 2.8 RESULT OF WATER QUALITY TESTS

Point No.	Date	Time	Air Temp (°C)	Water Temp (°C)	pH	DO (mg/l)	Turb (mg/l)	E.C. (ms/cm)	Remarks
1	6/28	11:30	36.0	31.7	7.1	5.2	1,320	0.658	Agno River Wawa Bridge
2	6/28	11:55	38.0	33.4	7.7	6.9	450	0.535	Agno River Wawa
3	6/28	13:00	37.0	33.7	7.6	6.1	300	0.558	Agno River Calbo Bridge
4	6/28	13:45	40.0	33.8	7.5	6.1	420	0.560	Agno River Alcala
5	6/28	14:15	39.0	33.6	8.4	6.8	310	0.558	Agno River Sto. Tomas
6	6/28	14:35	37.0	33.3	8.8	6.5	300	0.580	Agno River Plareda Bridge
7	6/28	15:20	38.0	35.3	8.7	8.0	150	0.396	Agno River Sta. Maria
8	6/28	16:45	30.0	31.5	7.9	5.9	75	0.683	Agno River San Vicente
9	6/28	17:25	32.0	30.0	8.8	6.5	200	0.655	Agno River ARIS intake
10	6/29	11:20	37.0	31.9	7.2	5.9	480	2.57	Tarlac River Culisaw Creek
11	6/25	13:20	32.0	30.8	7.5	4.7	25	48.1	Pantal River Pugaro
12	6/25	13:50	31.0	30.6	7.6	5.7	20	44.0	Pantal River Salapingao
13	6/25	14:05	31.0	31.0	8.0	6.3	20	36.3	Pantal River confluence with Sinocalan River
14	6/26	11:35	34.0	32.2	7.8	4.5	25	30.5	Sinocalan River Quintos Bridge
15	6/26	11:55	36.0	33.2	7.5	3.9	10	18.11	Sinocalan River Lasip Grande
16	6/26	12:30	36.0	32.7	7.5	4.2	5	6.51	Sinocalan River Nalsian
17	6/26	12:55	35.0	31.9	7.5	4.0	15	0.760	Sinocalan River San Vicente
18	6/27	13:00	40.0	31.9	7.4	5.6	80	0.615	Sinocalan River Calasiao Bridge
19	6/24	18:10	30.0	31.8	7.9	7.1	30	0.657	Sinocalan River Quesban
20	6/24	17:35	33.5	33.2	7.9	6.9	10	0.674	Sinocalan River Maramba Bridge
21	6/24	17:20	34.0	33.4	7.6	6.2	10	0.681	Sinocalan River Irrigation Intak
22	6/24	17:00	33.0	33.7	8.8	6.1	5	0.696	Sinocalan River Banaoang Bridge
23	6/24	16:40	33.0	33.8	8.9	6.6	10	0.677	Sinocalan River Maricmatic
24	6/24	16:05	34.0	33.6	8.7	6.0	20	0.689	Sinocalan River Calegu Bridge
25	6/24	15:20	37.0	35.9	9.4	8.6	<1	0.447	Sinocalan River Tulong Bridge
26	6/25	13:40	31.0	31.1	7.6	6.0	25	45.9	Bayaoas River Taytay Dawel Bridg
27	6/27	12:45	40.0	31.5	7.2	4.2	45	0.934	Ingalera River San Pablo Bridge
28	6/27	13:20	40.0	32.1	7.2	5.2	50	0.639	Ingalera River Longos Bridge
29	6/27	13:45	38.0	30.8	6.8	4.6	100	0.316	Ingalera River Doyong Bridge
30	6/27	14:10	35.0	31.7	8.7	6.5	50	0.302	Ingalera River Matagden
31	6/27	14:48	36.0	31.7	7.8	9.1	140	0.553	Ingalera River And Macabito Brid
32	6/27	15:05	37.0	30.6	6.9	6.0	100	0.604	Ingalera River Bogton Bridge
33	6/27	15:30	35.0	30.8	6.9	7.1	50	0.566	Ingalera River Embarca Dero Brid
34	6/27	15:55	34.0	30.8	7.2	6.0	50	0.653	Ingalera River Talospatang
35	6/25	14:25	31.5	31.7	7.9	6.0	15	39.6	Dagupan River Lucao
36	6/26	11:05	34.0	32.1	7.8	5.6	<1	42.6	Dagupan River Lucao
37	6/25	14:45	32.0	31.4	7.5	5.6	20	40.2	Dagupan River Gayaman
38	6/25	15:00	32.0	31.5	7.3	5.0	15	41.1	Dagupan River Manat Bridge
39	6/25	15:20	32.0	31.6	7.3	4.7	15	40.0	Dagupan River Balogo
40	6/26	15:50	34.0	33.1	8.4	8.3	100	41.0	Dagupan River Quintong Bridge
41	6/26	16:30	35.0	31.9	7.7	3.4	25	33.4	Dagupan River Pangpang Bridge
42	6/26	17:10	33.0	32.7	8.8	7.6	20	27.6	Dagupan River Palaris Bridge
43	6/26	17:30	33.0	34.3	8.5	7.3	50	29.1	Dagupan River Abanoon Bridge

E.C. : Electric Conductivity under controlled Temperature of 25° C

TABLE 2.9 RESULTS OF WATER QUALITY ANALYSIS IN THE UPPER AGNO RIVER

Parameters	San Manuel		Bayambang		Limahong Channel	
	Wet	Dry	Wet	Dry	Wet	Dry
Temperature, °C	29.43	26.50	30.30	26.00	27.00	31.46
pH	7.52	7.90	7.62	8.00	7.53	7.75
Odor, Threshold Odor Number	37.00	50.00	37.00	50.00	37.00	50.00
Color, Color Units	10.83	5.00	53.67	5.00	19.50	5.00
Turbidity, Silica Scale	402.50	53.33	287.50	45.66	347.50	12.00
Alkalinity, in mg/l	89.66	115.00	97.66	125.00	110.00	122.50
Dissolved Oxygen mg/l	8.33	8.40	7.46	8.50	7.30	7.95
B.O.D. (5 - day), mg/l	0.44	0.14	0.53	0.21	0.34	0.29
Chlorides, mg/l	9.66	11.75	11.68	11.00	3508.30	12520.00
Sulfates, mg/l	36.60	58.66	33.26	49.96	153.26	287.66
Total Solids, mg/l	916.66	504.00	689.00	365.00	5967.30	24451.00
Suspended Solids, mg/l	573.00	255.00	513.66	140.50	35.66	84.00
Phosphates, mg/l	0.58	0.10	0.69	0.34	0.32	0.18
Total Hardness, mg/l	136.30	192.00	137.30	190.50	1263.30	4150.00
Coliform, MPN/100 ml x 10 ²	18.50	165.65	4.00	175.00	792.00	1.25

NOTES : Sampling date: Aug. 19, 1975 to Nov. 25, 1976

Source: BUREAN OF SOILS

TABLE 2.10 RESULTS OF NPCC ANALYSIS IN WATER QUALITY OF UPPER AGNO RIVER

Parameters	San Manuel	Bayambang	Padilla Bridge Lingayen
pH	8.2	8.2	8.3
Color (units)	250	100	20
Tu (JTU)	630	100	30
DO (mg/l)	11.4	8.4	9.7
BOD (mg/l)	4.0	0.6	0.8
Sm a (mg/l)	4.5	0.1	nil
Tds (mg/l)	400	200	1500
Ts (mg/l)	4100	500	1500
COD (mg/l)	37.1	18.5	11.1
Fe (mg/l)	83.70	3.60	0.70
Cu (mg/l)	1.96	0.16	0.02
Zn (mg/l)	0.12	0.11	0.07
Mn (mg/l)	1.70	0.22	0.13
Ni (mg/l)	0.07	0.04	0.04
Hg (ppb)	bdc	0.10	bdc

Note: 1. Sampling date: Nov. 9, 1982

2. bdc - Below Detectable Concentration

3. at Settleable matter

Table 2.11 AGNO RIVER WATER QUALITY PARAMETER MEASUREMENTS THAT EXCEEDED NPCC STANDARDS

Sampling Location	Philippine Water Classification			
	Class C		Class D	
	Wet	Dry	Wet	Dry
1. San Roque	Cu (1.8) Fe (46.1) Pb (0.08)	Cu (1.9) Fe (62)	Cu (1.8) Fe (46.1)	Cu (1.9) Fe (62)
2. Carmen	Cu (0.75) Fe (27.4) TS (2060)	Cu (1.10) Fe (40.375)	Cu (0.75) Fe (27.4) TS (2060)	Cu (1.10) Fe (40.375)
3. Bayambang	Cu (0.7) Fe (29.1)	Cu (0.25) Fe (6.775)	Cu (0.7) Fe (29.1)	Cu (0.25) Fe (6.775)
4. Limahong	Cu (0.038) DS (6210) TS (6510)	Cu (0.05) DS (31450) TS (31570)	DS (6210) TS (6510) B (0.78)	DS (31450) TS (31570)
5. Labrador	Cu (0.56) Fe (5.5) DS (9810) TS (9910)	Cu (0.036) DS (27600) TS (29520)	Fe (5.5) DS (9810) TS (9910) B (1.87)	DS (27600) TS (29520)

Source: TGI, Aug. 83 to Feb. 1984, EIS of the San Roque Multi-purpose Project

Note: Values are in mg/l ppm.

TABLE 2.12 PERCENTAGE POPULATION SERVED BY TYPE OF WATER SOURCES IN HEALTH DISTRICT, PROVINCE OF PANGASINAN 1988

District	Level I	Level II	Level III	Doubtful
PPH	86.02	0.20	9.38	4.40
BDH	88.37	0.05	8.20	3.38
EPDH	91.13	2.40	1.21	5.26
MDH	95.19	0.60	0.25	3.96
SCDH	92.95	0.45	1.95	4.65
UDH	89.03	0.93	6.17	3.97
WPDH	61.89	2.19	9.58	26.34
PROVINCE	87.11	1.18	5.65	6.06

NOTE: Level I - Deep/Shallow wells, Open dug wells, Unimproved Springs.
Level II - Waterworks System with public faucets
Level III - Waterworks System connected to individual households.

PPH : Pongasinan Provincial Hospital
WPDH: Western Pangasinan District Hospital
EPDH: Eastern Pangasinan District Hospital
UDH : Urdaneta District Hospital
MDH : Mangatarem District Hospital
BDH : Bayambang District Hospital
SCDH: San Carlos District Hospital

REMARKS: Designation of Health districts is shown in Fig.2.10

Table 2.13 DESCRIPTION OF EXISTING ECOLOGICAL ENVIRONMENTAL CONDITION
IN THE PRIORITY PROJECTS AREA

River System (Priority Study Area)		Agno River	Pantal-Sinocalan River	Remarks	
Environmental Variable (Ecological Environment)	Wawa - San Roque Stretch	Poponto Swamp	Sinocalan River	Ingalara River	Dagupan River
: Presence of Endangered or Protected Species	X	X	X	X	X
: Presence of Endangered or Protected Forests	X	X	X	X	X
: Presence of Endangered or Mangroves/Wetlands	X	X	O	X	O
Vegetation: Species Diversity - Terrestrial	N	N	L	L	L
: Species Density - Terrestrial	L	L	N	N	N
: Species Diversity - Aquatic	N	N	L	L	N
: Species Density - Aquatic	L	L	L	L	N
: Presence of Endangered or Protected Wildlife	X	X	X	X	X
: Species Diversity - Terrestrial	L	L	L	L	L
Wildlife : Species Diversity - Terrestrial	L	L	L	L	L
: Species Diversity - Aquatic	N	H	L	L	N
: Species Density - Aquatic	L	H	N	N	N

LEGEND : O - Existing
X - Not Existing
H - High
N - Normal
L - Low
* - Evaluated based on data

Table 2.14 FISH SPECIES IN PANGASINAN

Item	Name
1. Species of Freshwater Fish Caught/ Raised*	mudfish freshwater-shrimp catfish milkfish (bangus)* carp prawn* tilapia freshwater terapon eel climbing perch
2. Species of Marine Fishes Caught/ Raised* and Other Marine Species	tuna siganids mackerel crabs lizzard fish seacatfish mullet snow morral others: carfish anchovies oyster* squids parrotfish corals snappers nemipterids mollusks hairtail moonfish crustaceans caranx slipmouth sea cucumber shrimps flying fish shells goatfish baracuda shark groupers gizaed shad cavalla mojarra octopus etc.
3. Endangered Fish Species	freshwater terapon (ayungin) climbing perch eel freshwater goby

Sources: BFAR, Dagupan City

Table 2.15 NUMBER OF ESTABLISHMENTS AND EMPLOYMENT BY INDUSTRY GROUP AND TYPES OF MANUFACTURING ACTIVITIES IN PANGASINAN

A. Industry Group	No. of Establishments	Employment Rate %
	1983	4thQ 1988
1. Agriculture, Forestry and Fisheries	NDA	50.88
2. Mining and Quarrying	73	0.88
3. Manufacturing	3882	9.14
4. Electricity, Gas and Water	13	0.15
5. Construction	13	4.13
6. Commerce	9241	11.21
7. Transportation, Communications and Storage	366	5.61
8. Services	3286	17.85
9. Industry not Adequately Defined	NDA	0.15
T o t a l	16879	100 %
B. Major Manufacturing Activities		
	Shell Craft	
	Rattan Craft	
	Bamboo Craft	
	Handicraft	
	Metal Craft	
	Furniture	
	Ceramics	
	Food Processing	
	Garments	
	Salt-Making	
	Leather-Tanning	
	Rice Milling	

Sources:

1. On No. of Establishments:
1983 Census on Establishments, NCSSO and UP - ISSI
2. On Employment Rate:
Agri-Business Group, Dept. of Agriculture

3. On Manufacturing Activities:
NACIDA, Lingayen, Pangasinan

Table 2.16 DESCRIPTION OF EXISTING ECONOMIC ACTIVITIES
IN THE PRIORITY PROJECTS AREA

River System (Priority Study Area)		Agno River	Pantal-Sinocalan River	Remarks	
Environmental Variable (Economic Activities)	Wawa - San Roque Stretch	Poponto Swamp	Sinocalan River	Ingalera River	Dagupan River
Cultural/	N	N	N	N	N
: Income					H > 50,000 N 30,000-50,000 L < 30,000 (/year)
Socio-economic:	N	N	N	N	N
Standard of Living					
status	N	N	N	N	N
: Housing, Social Service					
: Population Density *	N	N	H	N	H
: Food/Crop Production	H	H	N	N	H
: Peace and Order Problems	N	N	N	N	N
: Presence of Natural Fisheries	O	O	O	O	O
: Presence of Fish Culture - milkfish *	X	X	O	X	O
: Presence of Fish Culture - prawn *	X	X	O	X	O
: Presence of Fish Culture - tilapia *	O	O	O	X	O
: Presence of Fish Culture - oyster	X	X	O	X	O
: Presence of Fish Culture - others	O	O	O	X	O
Transportation: Navigation	X	X	O	X	O
					Fishing boat, motor boat, banca

LEGEND : O - Existing
X - Not Existing
H - High
N - Normal
L - Low
* - Evaluated based on data

Table 2.17 AREA AND PRODUCTION OF FISHERIES BY SOURCES IN PANGASINAN, 1987

Sources	Area (ha)	Production (mt)
1. Inland Fisheries		
1.1 Freshwater fishpond	958.69	1435.80 (tilapia)
1.2 Brackishwater fishpond	15450.70	23176.00 (milkfish, prawn)
1.3 Communal fishing grounds (lakes, rivers, creeks, reservoirs, swamps)	7303.84	759.49
1.4 Oyster farms	38.06	1758.52
1.5 Rice-fish Culture	10.63	4.46
T o t a l	23761.92	27134.27
2. Marine Fisheries		
2.1 Municipal Fisheries	NDA	13668.80
2.2 Commercial Fisheries (more than 7 fathous deep)	x	987.00
T o t a l	NDA	14655.30

Source: BFAR, Dagupan City

Note: NDA - No Data Available

x Fishing Grounds:

Lingayen Gulf	Olanen Bay	Dasol Bay	Lucap Bay
China Sea	Caquiputan Channel	Tamoac Bay	Sual Cove

Table 2.18 OTHER FISHERY STATISTICS IN PANGASINAN

Item	Number
1. Fishpond Operators and Fishermen	
1.1 Freshwater Fishponds	645
1.2 Brackishwater Fishponds	5289
1.3 Communal Fishing Grounds	NDA
1.4 Oyster Farms	602
1.5 Rice-Fish Culture	48
T o t a l	6584
2. Marine Fisheries	
2.1 Fishermen : fulltime	18983
part-time	8008
T o t a l	26991
2.2 Bancas	
2.2.1 Motorized	5059
2.2.2 Non-motorized	2793
2.3 Fishing Vessels	14
2.4 Aggregate Tonnage of Vessels	282.15 mt
3. Hatcheries	
3.1 Milkfish	NDA
3.2 Prawn	21
3.3 Lapu-Lapu (Nursery)	1
3.4 Tilapia	11
T o t a l	33
4. Other Marine Products	9.0 ha., 4 operators, 6.732 mt annual production (arosep)
4.1 Seaweeds Culture	

Sources: BFAR, Dagupan City

NA - not applicable mt - metric tons
NDA - no data available

Table 2.19 INUNDATION FISHERIES DATA OF THE AGNO RIVER

Location	Flood Plain Fisheries Area (ha)	Fish Species Caught	Quantity Caught (mt/year)
Aguilar	4	mudfish	343 total
Alcala	15	catfish	
Bautista	200	carp	
Bayambang	2000	tilapia	
Binmaley	20	climbing perch	
Buballon	40	plasalid	
Lingayen	100	eel	
Mangatarem	200	goby	
Malasiqui	30	harf-beak	
rosales	50	freshwater shrimp	
San carlos	10	freshwater mullusks	
San Nicolas	7		
Urbiztondo	8		
Total	2684		

Source: Department of Agriculture, 1989 (Privente Communication)
Region I. San Fernando, La Union

Table 2.20 BRACKISH FISHPONDS AREA, IN PANGASINAN, 1989

Unit: ha

Municipality/City	Total	Milkfish	Prawn
Binmaley	2,983	2,884	99
Bugallon	401	391	10
Calasiao	30	30	0
Labrador	230	162	68
Lingayen	1,422	1,357	65
Mangaldan	261	261	0
San Fabian	318	264	54
Dagupan City	1,164	1,125	39
San Carlos City	164	164	0
Sub-total	6,973	6,638	335

Source: Bureau of Fisheries and Aquatic Resources, BPAR,
Dagupan Provincial Office, 1989 (Private Communication)

Table: 2.21 DAMAGE OF FISHERY BY TYPHOON "OPENG" ON SEPTEMBER 20, 1989

Municipality	Area (ha)	Stocks				Value				Remarks
		Fry	Fing.	Mark.	Fry.	Fing.	Mark.	Fry.	Fing.	
Brackishwater Fishpond:										
1. Dagupan City (Bangus) (Malaga)	1,086.52	383,350	1,117,300	338,650	P115,005	P1,675,950	P2,709,200	Tilapia	Fing. = P0.25/pc Mark'l. = P35.00/kg. @ 10 pcs.	
2. San Fabian (Bangus)	52.35	-	239,500	19,000	-	359,250	152,000	Gouramy	Fing. = P0.25/ pc. Mark'l. = P35.00/kg. @ 10 pcs.	
3. San Carlos City (Bangus)	44.15	-	52,850	14,100	-	79,275	112,800	Bangus	Fry = P0.30/ pc. Fing. = P1.50/pc	
4. Mangaldan (Bangus)	149.6	70,000	74,000	12,000	21,000	111,000	40,000	Malaga	Mark'l. = P8.00/pc. Fry = P1.00/pc.	
5. Labrador (Bangus)	16.6	-	27,000	5,000	-	40,500	160,000	Prawn	Mark'l. = P12.00/pc. Fry = P1.50/pc.	
6. Bugallon (Bangus)	20.0	-	75,000	20,000	-	112,500	80,000			
7. Binalayan (Malaga) (Bangus)	23.35	28,000	26,000	2,500	28,000	39,000	30,000			
8. Calasiao (Bangus) (Prawan)	22.5	-	7,500	10,000	-	11,250	12,000			
9. Lingayen (Bangus)	61.0	-	5,000	29,000	-	7,500	232,000			
Sub - Total	1,475.47	481,350	1,775,150	478,450	P164,005	P2,622,225	P3,843,600		Sub-Total (value) P6,629,830	
Freshwater Fishpond										
1. Mangaldan (Tilapia)	1.0	-	-	4,000	-	-	P14,000			
2. Sta. Barbara (Tilapia)	5.802	-	41,000	-	-	P10,250	-			
3. Natividad (Tilapia)	15.0	-	-	3,000	-	-	10,500			
4. Bautista (Tilapia) (Gouramy)	73.0	-	100,000	77,500	-	25,000	271,250			
5. Tayug (Tilapia)	2.2	-	-	15,000	-	-	52,500			
6. Calasiao (Tilapia)	4.402	-	3,900	1,900	-	975	6,650			
7. San Carlos City (Tilapia)	0.0775	-	2,000	-	-	500	-			
8. Asingan (Tilapia)	0.655	-	12,900	-	-	3,225	-			
9. Binalonan (Tirapia)	0.63	-	13,000	-	-	3,250	-			
10. San Manuel (Tirapia)	0.415	-	8,500	-	-	2,125	-			
Sub - Total	103.1815	-	281,300	178,900	-	70,325	626,150		Sub-Total (value) P696,475	
Total	1578.6515	481,350	2,029,450	657,350	P164,005	P2,692,550	P4,469,750	Grand Total	(value) P7,326,305	

TABLE 2.22 DISTRIBUTION OF FIRMS BY INDUSTRY IN PANGASINAN

Municipality	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Municipal Total
Agno											1			1						2
Aguilar														2						2
Alaminos														4						4
Alcala												1								1
Anda																	1			1
Asingan													2	5						7
Balungao														1						1
Bani				1										1						2
Basista														1						1
Bautista																				0
Bayambang														1						1
Binalonan					1									3						4
Binmaley														1						1
Bolinao														1	1					2
Bugallon														2			1			3
Burgos														1						1
Calasiao	1					4	1	1	2			1	2	4					1	17
Dagupan City						2	1	1	2	1		1	2	1	4	1			1	17
Dasol														1						1
Infanta																				0
Labrador																				0
Laoac																				0
Lingayen														6						6
Mabini								2		1										3
Malasiqui														11						11
Manaoag																	1			1
Mangaldan					2	2								7	3		2			16
Mangatarem										1		1		8						10
Mapandan				1					1			1								3
Natividad														2						2
Pozorrubio														2						2
Rosales														3	1					4
San Carlos City						1						1	4							6
San Fabian	1							1				2	4					1		9
San Jacinto													1							1
San Manuel													1					1		2
San Nicolas		1											1					1		3
San Quintin													1							1
Sta. Barbara													4							4
Sta. Maria													1							1
Sto. Tomas																				0
Sison			1																	1
Sual														4						4
Tayug						3	1						1	2				1		8
Umingan																				0
Urbistondo																				0
Urdaneta														9	1					10
Villasis								3					2	2						7
Total	2	1	1	1	4	12	3	6	6	2	3	2	15	103	10	2	4	-	6	183

Note: Classification of industries

- A. Agricultural Products
- B. Beverages/Carbonated Drinks
- C. Cement Industries
- D. Cottage Industries and Handicrafts
- E. Distilleries/Blending Spirits Ind.
- F. Food Products
- G. Hotels/Clinics/Commercial Bldgs./School
- H. Ice Plants
- I. Industrial Products
- J. Iron and Steel Mills
- K. Mineral Products/ Sand and Gravel/Mining Industries
- L. Petroleum/Gas Industries/Products
- M. Piggery/Livestock/Poultry
- N. Ricemills/Cornmills
- O. Saw/Re-saw Mills
- P. Slaughterhouses
- Q. Sugar and other Refineries
- R. Tobacco Redrying Plants
- S. Other unclassified Industries

Table 2.23 DAILY NAVIGATION IN DAGUPAN CITY

Items	1	2	3	4	5	6
Route No.						
Destination	Near DPWH office to Calmay-Carael	Magsaysay Market to Pantal	Magsaysay Market to Calmay	Magsaysay Market to Pugaro	Magsaysay Market to Salapingao	Magsaysay Market to Calmay-Carael
Type of ship	Small boat without engine (banca)	Small boat without engine (banca)	Small boat with engine	Small boat with engine	Small boat with engine	Small boat with engine
Number of passengers (person/ship)	5	5-6	25 (average)	25 (average)	25 (average)	11 (average)
Number of trips (trip/ship/day)	5	15	3-4	2-4	1	5
Number of ships	40-45	16	5	6	20	13
Daily total trips (person trip)	1,125	1,440	500	600	500	715

Remarks ; Route No. is to be refered in Fig.2.8.

Table 2.24 SIZE AND PURPOSE OF THE SHIP IN
PANTAL-SINOCALAN AND DAGUPAN RIVER

Purpose	Length (m)	Width (m)	Height (m)	Draft (m)	Number of ships	Remarks
Large size ship						
Dredging	32.0	8.6	5.53 (to Pilot house) 13.0 (to frame)	1.0	1	DPWH Dredger
Navy	19.8	6.1	9.1	1.8	1	Phil. Naval Guard ship
Fishing	21.5* 13.7	12.2*	4.6*	3.0*	2* 15	Not in operatio in operation
Middle size ship						
Maintenance	10.4	3.9	2.5	0.8	1	DPWH Tug boat
Fishing	10.5	1.5	1.5	N.D.	50	
Small size ship						
Transport	11.0	1.3			44	W/E
Transport	3.7	0.5			61	WO/E

Height : from water level

W/E : with engine

WO/E : without engine

Table 2.25 DESCRIPTION OF PUBLIC HEALTH IN THE
PRIORITY PROJECTS AREA

Environmental Variable (Public Health)	River System (Priority Study Area)			Remarks	
	Agno River	Pantal-Sinocalan River			
	Wawa - San Roque Stretch	Poponto Swamp	Sinocalan River	Ingalera River	Dagupan River
: Presence of Water-Related Disease	0	0	0	0	0
: Insect Vectors	0	0	0	0	0
: Other Public Health Hazards	0	0	0	0	0

LEGEND : 0 - Existing
X - Not Existing
H - High
N - Normal
L - Low

Table 2.26 LEADING CAUSES OF MORBIDITY IN PANGASINAN

Unit : Rate/100,000 population

CAUSES	1975	1976*	1977	1978	1979	1980	1981	1982	1983	1984*	1985*	1986*	1987	1988
1 Pneumonia	146.5	123.7	109.3	137.1	152.1	112.0	128.7	137.4	134.7	250.7	199.0	182.1	197.7	253
2 Heart Diseases	-	-	-	-	-	-	-	-	-	74.0	91.7	94.0	108.6	-
3 Tuberculosis	368.4	337.6	193.0	182.2	125.8	190.9	140.0	85.8	66.9	219.0	204.4	268.8	321.6	580
4 Cerebro-Vascular Acc.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Malignant Neoplasms	29.1	29.9	40.4	37.1	38.1	35.6	36.1	36.0	39.0	36.4	39.9	48.2	70.0	29
6 Diarrheas *	172.3	161.8	133.3	91.0	75.2	115.7	92.1	64.9	30.0	373.7	636.1	627.6	567.8	-
7 Accidents	-	-	-	-	-	-	-	-	-	28.8	50.1	36.6	45.0	-
8 Measles	23.9	21.7	17.3	20.7	14.6	20.8	21.2	13.9	19.3	43.2	56.0	48.4	70.4	85
9 Malnutrition	-	-	-	-	-	-	-	-	-	-	-	-	-	96
10 Nephritis, Nephritic Syndrome/Nephrosis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Bronchitis	-	548.7	358.9	317.1	318.8	405.1	284.7	215.9	170.9	342.6	796.9	566.3	764.4	1030
12 Peptic Ulcer	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13 Malaria	10.7	11.2	6.8	5.2	5.2	12.0	6.6	3.2	3.1	6.7	20.2	12.8	23.1	-
14 Dysentery	-	-	-	-	-	-	-	-	-	-	-	-	-	4
15 Whooping Cough	22.1	24.2	9.6	4.5	19.0	24.7	24.1	25.4	3.7	47.3	29.4	21.2	8.2	6
16 Influenza	470.4	218.9	379.9	203.2	170.5	244.9	166.1	123.5	73.8	335.8	474.1	405.7	64.4	810
17 Tetanus	9.2	6.2	10.9	11.0	2.4	2.2	2.3	1.4	2.2	3.6	3.1	3.4	3.4	-
18 Viral Encephalitis	0.6	1.8	0.3	0.5	-	0.4	1.2	0.2	0.2	-	-	-	-	-
19 Rabies	0.8	0.1	0.6	0.1	0.3	0.8	0.5	0.1	0.3	-	-	-	-	-

Remarks :

(1) DIARRHEAS include food poisoning, dysentery, anforms, gastro-enteritis

(2) Number of 1988 is 10 leading causes

(3) * ; large flood occurred year

Table 2.27 LEADING CAUSES OF MORTALITY IN PANGASINAN

Unit: Rate/100,000 population

CAUSES	1975	1976*	1977	1978	1979	1980	1981	1982	1983	1984*	1985*	1986*	1987	1988
1 Pneumonia	127.4	113.2	96.8	106.5	131.5	120.7	114.0	123.8	128.3	138.2	161.3	137.7	143.7	169
2 Heart Diseases	-	-	-	-	-	-	-	-	-	56.3	67.6	62.2	62.4	10
3 Tuberculosis	76.8	76.4	70.5	70.9	66.9	67.7	65.2	67.4	61.8	63.2	65.6	62.4	54.0	39
4 Cerebro-Vascular Acc.	-	-	-	-	-	-	-	-	-	-	-	-	-	40
5 Malignant Neoplasms	29.1	29.9	34.5	31.1	31.2	33.3	32.9	32.6	37.6	35.8	39.3	35.0	35.8	28
6 Diarrheas *	27.2	22.5	35.0	22.3	26.8	23.9	30.7	22.9	27.0	26.1	20.8	21.4	12.9	34
7 Accidents	-	-	-	-	-	-	-	-	-	20.9	22.6	17.3	16.1	34
8 Measles	10.9	7.7	10.9	12.2	10.9	8.9	12.9	6.9	13.4	15.5	14.4	13.1	27.2	6
9 Malnutrition	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10 Nephritis, Nephritic Syndrome/Nephrosis	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Bronchitis	-	26.6	25.3	21.2	5.6	6.5	6.5	6.7	5.1	4.7	5.4	3.6	2.6	7
12 Peptic Ulcer	-	-	-	-	-	-	-	-	-	-	-	-	-	9
13 Malaria	0.2	0.3	0.5	0.6	0.5	1.0	0.5	0.4	0.3	0.1	0.7	0.3	0.4	-
14 Dysentery	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15 Whooping Cough	0.1	0.2	0.2	0.1	0.3	0.1	0.1	0.2	0.2	-	0.3	0.1	0.1	-
16 Influenza	15.4	17.1	18.6	12.8	14.9	10.9	12.0	9.6	9.4	8.8	9.8	10.8	11.3	-
17 Tetanus	9.2	6.2	7.6	7.7	1.9	1.9	1.4	0.6	1.8	1.7	1.2	1.7	1.5	-
18 Viral Encephalitis	0.6	0.7	0.3	0.4	-	-	-	-	-	-	-	-	-	-
19 Rabies	0.8	0.1	0.6	0.1	0.3	0.8	0.5	0.1	0.3	-	-	-	-	-

Remarks :

(1) DIARRHEAS include food poisoning, dysentery, auforms, Gastro-enteritis

(2) Number of 1988 is 10 leading causes

(3) * ; large flood occurred year

Table 2.28 CAUSATIVE AGENT AND MODE OF TRANSMISSION CONCERNING
DISEASES THAT MAY BE AFFECTED BY FLOODS

Disease	Causative Agent	Mode of Transmission
1. Diarrhea	Faecal bacteria or virus	contaminated food or water; flies
2. Gastroenteritis	bacteria or virus; toxins	-do-
3. Influenza	viruses	from infected persons
4. Bronchitis	virus	-do-
5. Pneumonia	bacteria (pneumococcus bacteria)	-do-
6. Tuberculosis	bacteria (Mycovacterium tuberculosis)	-do-; flies shigella flexneri
7. Dysentery	faecal/bacteria; protozoa (Entamoena histolytica)	contaminated food and/or water; flies
8. Skin Diseases	fungi, bacteria or virus, chemical agents	from infected persons; flies
9. Typhoid Fever	faecal bacteria (Salmonella typhi or parathyphi)	from infected persons; flies
10. Malaria	protozoa (Plasmodium flavirostris or vivax)	from infected persons by mosquito bite
11. Cholera	faecal bacteria (Vibrio cholerae)	contaminated food or water; flies
12. Food poisoning	bacteria (staphylococcus)	contaminated or spoiled food
13. Hepatitis	virus (for infectious hepatitis), alcohol and other drugs, toxic substances	from infected persons (in case of viral hepatitis)
14. Whooping Cough	bacteria Bordetella pertussis, bacteria parapertussis; occasionally infections with certain viruses look like this disease	from infected persons
15. Arthritis	degeneration of joints due to aging; highuric acid level	not contagious
16. Nephritis	previous streptococcal infection	not contagious

Table 3.1 PRELIMINARY RESULT OF EIA FOR THE PRIORITY PROJECTS

River	Scheme	Upper Agno River		Pantal-Sinocalan River	
		River Improvement	Poponto Reterding Basin	River Improvement	Dagupan bypass
Parameter Item					
A) Problems due to the Location					
1. Resettlement		-/A	-/A	-/A	-/C
2. Encroachment of cultural tribes		o	o	o	o
3. Land value changes		+/A	=	+/A	+/A
4. Encroachment of agricultural and aquacultural lands		-/A	-/B	-/A	-/C
5. Depreciation of forestry		o	o	o	o
6. Inundation of mineral resources		o	o	o	o
7. Encroachment of historical/ cultural values		o	o	o	o
8. Watershed erosion/silt runoff		o	o	o	o
9. Effects on groundwater hydrology		o	o	o	-/C
10. Impairment of navigation		o	o	-/C	o
11. Encroachment of precious ecology		o	o	o	o
12. Migrating valuable fish species		o	o	o	o
13. Road erosion		o	o	o	o
14. Water light conflicts		o	o	o	o
15. Loss of community and recreation areas		-/C	-/B	-/C	-/C
16. Intensification of traffic congestion		o	o	o	o
17. Aesthetic and landscape		o	o	o	o
18. Prevention of accessibility		o	o	o	o
B) Problems in Construction Stage					
1. Soil erosion and silt runoff		o	o	o	o
2. Hazards to workers and nearby residents		-/C	-/C	-/C	-/C
3. Spread to communicable diseases		o	o	o	o
4. Deterioration of water quality		-/C	o	-/C	o
C) Problems in Operation Stage					
1. Downstream erosion/aggradation		o	o	o	o
2. Deterioration of water quality		o	o	o	-/C
3. Intrusion of saline water		o	o	o	-/C
4. Eutrophication		o	o	o	o
5. Encroachment of precious ecology		o	o	o	o
6. Depreciation of fisheries		o	o	o	o
7. Aesthetic and landscape		o	o	o	o
8. Vector disease hazards		+/C	-/C	+/C	o
9. Public health hazards		+/C	-/C	+/C	o

Notes: (1) /: Upper side is the expected effect, and lower side is its significance.

(2) o: No effect expected,

+ : Positive effect expected,

- : Negative effect expected,

= : Neutral effect expected,

i.e there may be a change but such change will be neither beneficial and harmful

(3) A: Effect which has relatively high level of significance,

B: Effect which has relatively medium level of significance,

C: Effect which has relatively low level of significance,

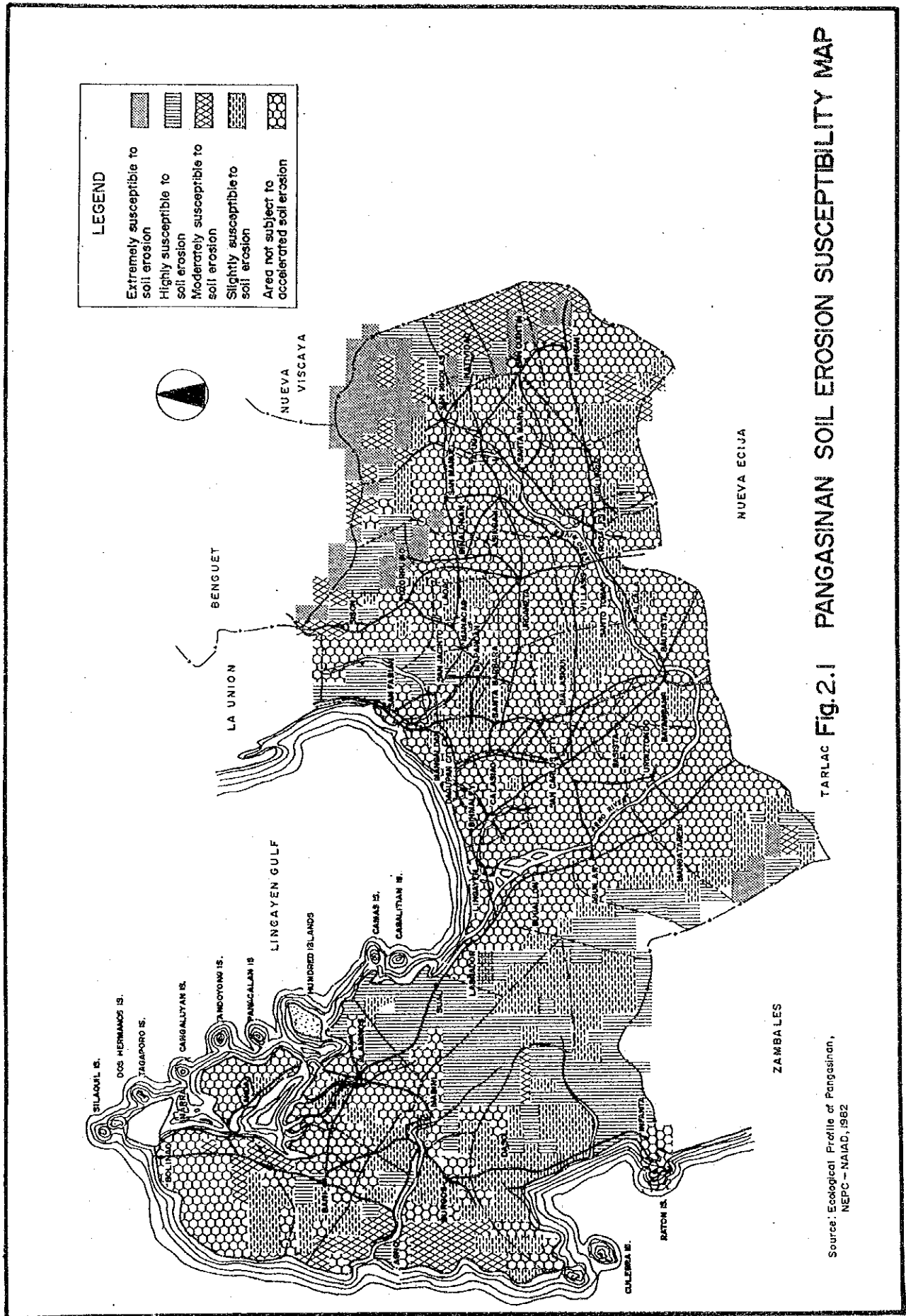
Table 3.2 AVERAGE NUTRIENT LEVEL IN PRIORITY PROJECT AREA

Unit : $\mu\text{g}/\ell$

place	Nitrite ($\text{NO}_2\text{-N}$)			Nitrate ($\text{NO}_3\text{-N}$)			Phosphate($\text{PO}_4\text{-P}$)		
	1987		1988	1987		1988	1987		1988
	3 rd	4 rd	1 st	3 rd	4 th	1 st	3 rd	4 th	1 st
Agno offshore	5.31	2.70	1.59	3.96	0.92	4.29	42.05	10.09	7.98
Agno Mouth	-	11.93	2.94	-	2.70	4.76	-	17.06	23.87
Agno Upstream	-	2.71	1.60	-	0.92	3.28	-	10.81	15.73
Dagupan Offshore	8.74	1.44	1.18	7.34	1.01	5.04	7.93	6.29	9.27
Dagupan Mouth	6.75	4.08	2.36	14.21	5.47	4.09	29.74	9.25	6.84
Dagupan Upstream	15.74	20.02	4.22	16.04	7.29	25.51	63.75	39.43	12.58

Note: Offshore; 1,000~1,500m off the coastline
Mouth; Mouth of rivers
Upstream; 1,000~2,500m upstream from river mouth.

FIGURES



LEGEND

	Extremely susceptible to soil erosion
	Highly susceptible to soil erosion
	Moderately susceptible to soil erosion
	Slightly susceptible to soil erosion
	Area not subject to accelerated soil erosion

TARLAC Fig.2.1 PANGASINAN SOIL EROSION SUSCEPTIBILITY MAP

Source: Ecological Profile of Pangasinan, NEPC - NAAD, 1982

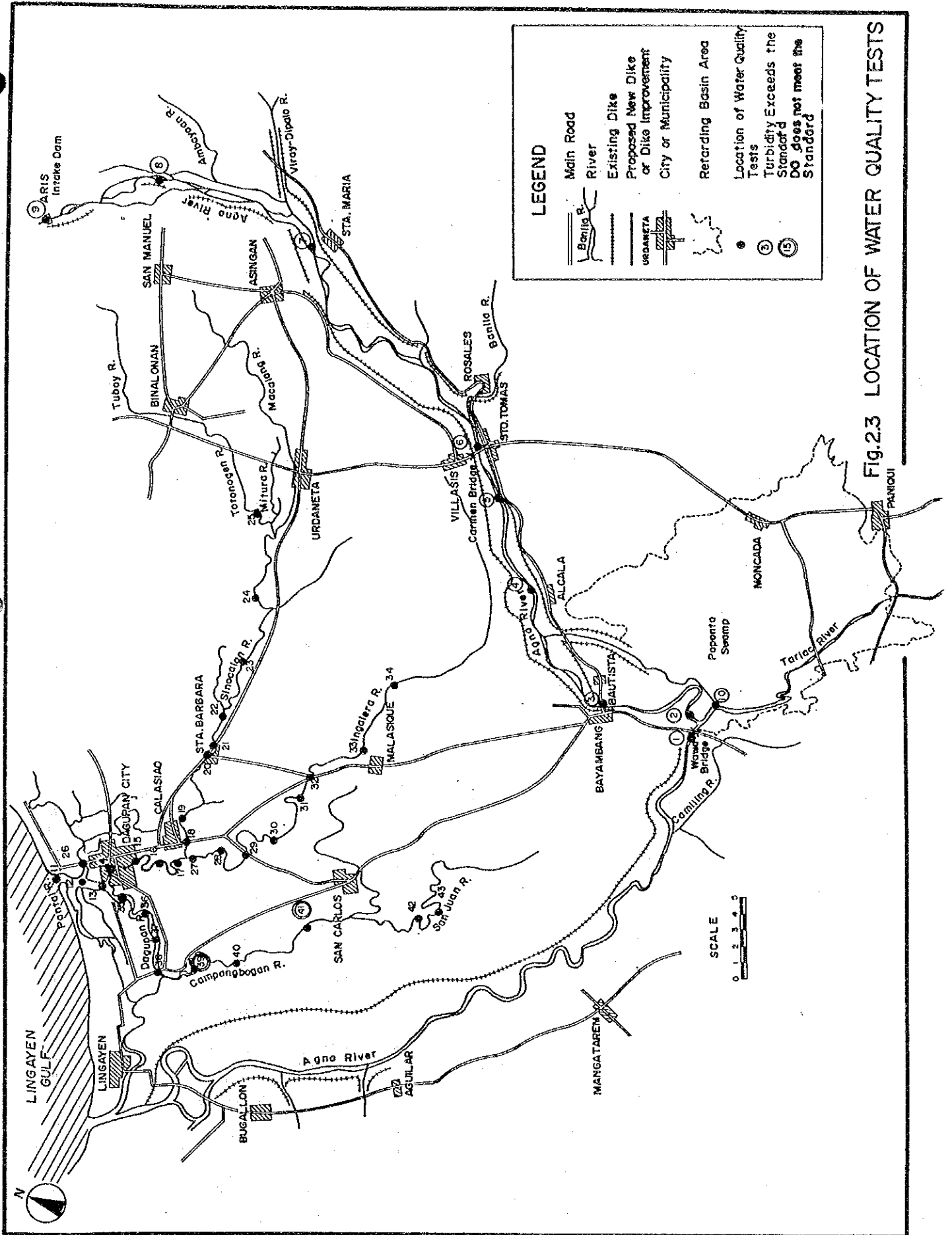
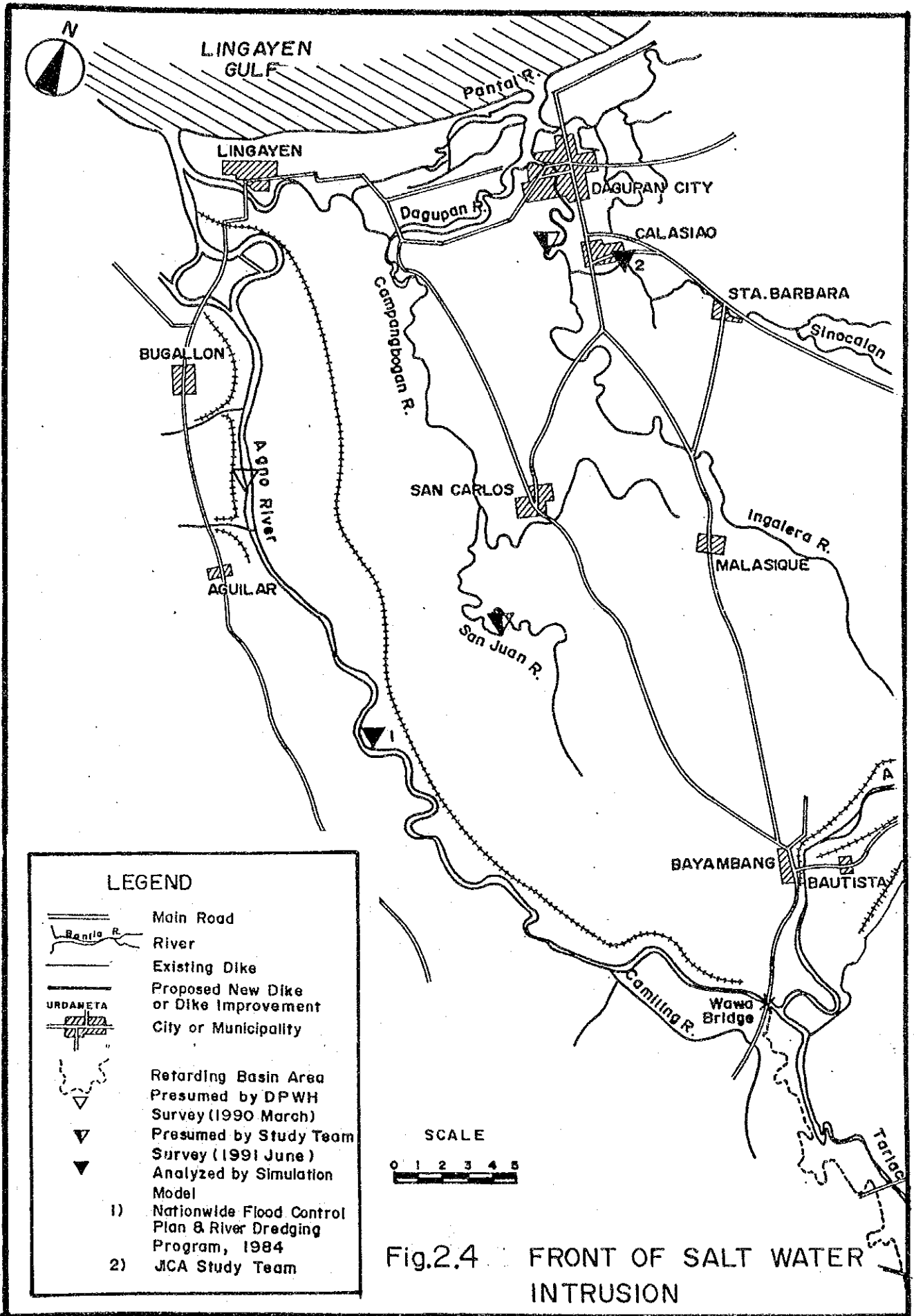


Fig.2.3 LOCATION OF WATER QUALITY TESTS



LEGEND

- Main Road
- River
- Existing Dike
- Proposed New Dike or Dike Improvement
- City or Municipality
- Retarding Basin Area Presumed by DPWH Survey (1990 March)
- Retarding Basin Area Presumed by Study Team Survey (1991 June)
- Retarding Basin Area Analyzed by Simulation Model
- 1) Nationwide Flood Control Plan & River Dredging Program, 1984
- 2) JICA Study Team

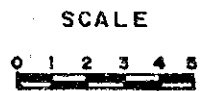


Fig.2.4 FRONT OF SALT WATER INTRUSION

