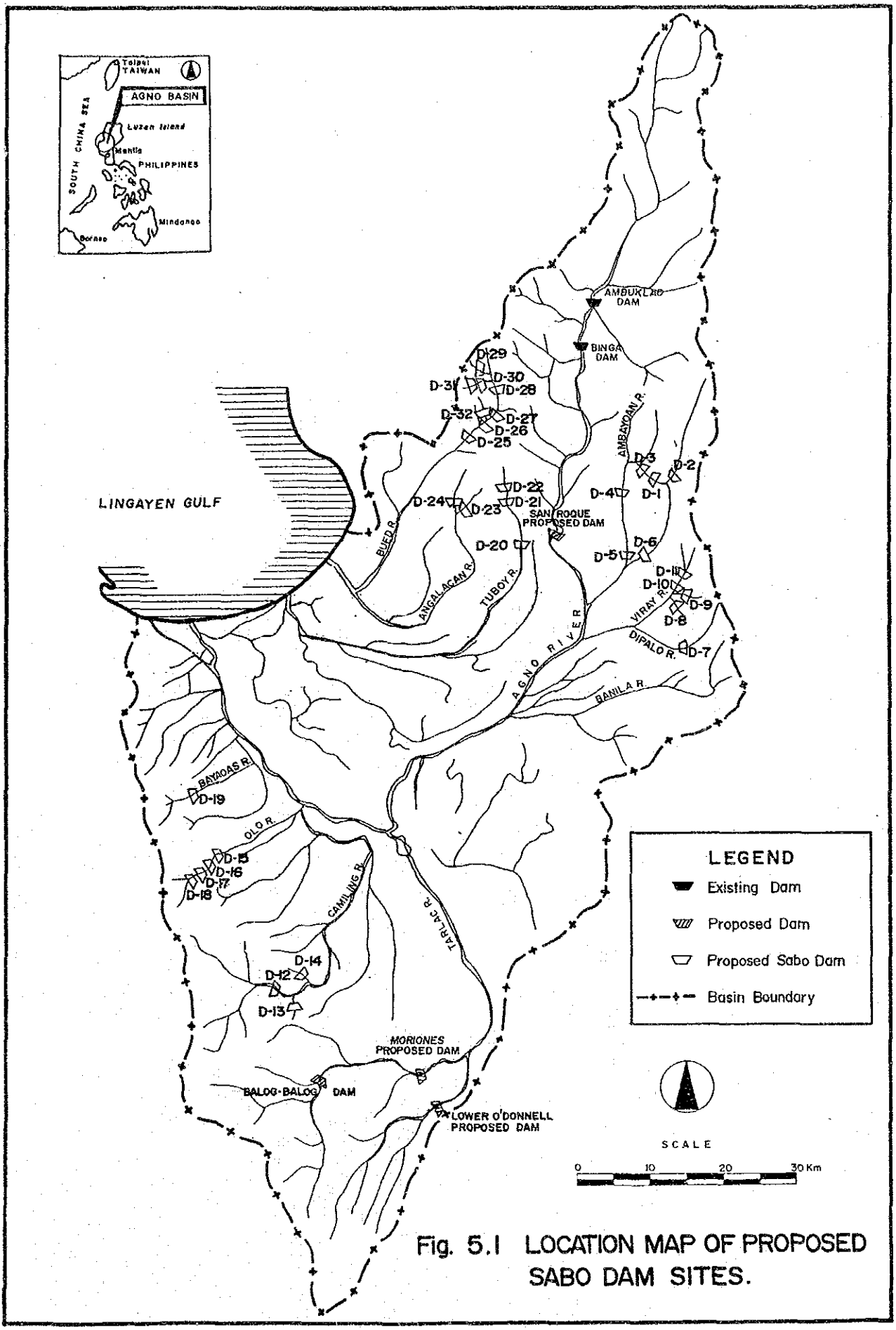

Fig. 5.1 LOCATION MAP OF PROPOSED SABO DAM SITES.

11. CP
CONSTRUCTION PLAN
AND
COST ESTIMATES

CP : CONSTRUCTION PLAN AND COST ESTIMATES

SUMMARY

(1) Basic Condition of Cost Estimate

Project cost was estimated on the basis of the following assumptions:

(a) Construction works are to be executed by the contract system.

(b) Unit cost of each construction work item is estimated on the unit price basis, except for some work items which are estimated on lump sum/percentage basis.

(c) Unit prices are based on the price level as of June, 1989.

(d) Foreign currency conversion rates are US$1.00 = ₱21.30 = ¥132.00.

(2) Project Cost

Project cost is classified into two (2) categories: financial cost and economic cost. Financial cost is the budgetary cost required to implement the project and economic cost is used for the economic evaluation of the project. The financial project cost consists of the main construction cost, compensation cost, administration and engineering cost, and contingencies.

The basic constitution of project cost is as shown in Fig. 2.1, and the unit cost of each work item for river improvement plan is tabulated in Table 2.5.

(3) Construction Cost of Optimum Plan

Flood control plans for 25-year flood and 10-year flood are selected as the optimum development scales for the Agno river and Allied rivers respectively through economic evaluation. These financial costs are as follows;

(Unit: Million Pesos)

River	F.C. Portion	L.C. Portion	Total
I. Agno River (25-yr)			
1. Lower Agno River	3,893	2,161	6,054
2. Poponto Stretch	761	366	1,127
3. Upper Agno River	1,393	811	2,204
Sub-Total	6,047	3,338	9,385
4. Tarlac River	903	518	1,421
5. Tributaries	937	703	1,640
Total of Agno River	7,887	4,559	12,446
II. Allied Rivers (10-yr)			
1. Panto-Sinocalan River	1,311	849	2,160
2. Cayanga-Patalan River	615	511	1,126
Total for Allied Rivers	1,926	1,360	3,286
Grand Total	9,813	5,919	15,732

(4) Work Quantities

Major work quantities for Long Term Plan of the Agno and Allied Rivers are as follows:

Work Items	Unit	Agno River	Tarlac River	Agno River Tributary	Panto River	Cayanga River
Excavation	1,000m^3	24,673	4,300	1,200	4,216	1,842
Dredging	1,000m^3	13,027	0	0	38	260
Embankment	1,000m^3	15,269	1,355	2,581	4,012	718
Revetment	1,000m^2	514	96	190	373	193
Groin	no.	958	244	1,070	952	1,095
Sluiceway	no.	16	2	26	39	16
Water Gate	no.	2	0	0	0	0
Bridge	no.	5	3	14	22	8
Fixed Weir	no.	1	0	0	0	0

CP: CONSTRUCTION PLAN AND COST ESTIMATES

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ABBREVIATIONS

1. NAME OF PHILIPPINE GOVERNMENT AGENCIES

AFCS	Agno Flood Control System
ARIS	Agno River Irrigation System
DENR	Department of Environment and Natural Resources
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
GOP	Government of the Philippines
LATRIS	Lower Agno and Totonogen River Irrigation System
NAPOCOR	National Power Corporation
NAMRIA	National Mapping and Resource Information Authority
NIA	National Irrigation Administration
OCD	Office of Civil Defense
PENRO	Provincial Environment and Natural Resources Office
PM	Project Manager
PMO	Project Management Office
PNR	Philippine National Railways
SMORIS	San Miguel - O'Donnell River Irrigation System

2. NAME OF JAPANESE GOVERNMENT AND OTHER OFFICIAL AGENCIES AND ORGANIZATION

GOJ	Government of Japan
JICA	Japan International Cooperation Agency
MOC	Ministry of Construction, Japan
OECF	Overseas Economic Cooperation Fund, Japan
UN	United Nations

3. MEASUREMENT UNITS

(Length)		(Weight)	
mm	millimeter(s)	gr(grs)	gramme(s)
cm	centimeter(s)	kg(kgs)	kilogramme(s)
m	meter(s)	ton(s)	ton(s),eq'vt to 1,000 kg
km	kilometer(s)		

(Area)

mm^2	square millimeter(s)
cm^2	square centimeter(s)
m^2	square meter(s)
km^2	square kilometer(s)
ha(has)	hectare(s)

(Time)

sec	second(s)
min	minute(s)
hr(hrs)	hour(s)
dy(dys)	day(s)
mth(mths)	month(s)
yr(yrs)	year(s)

(Volume)

cm^3	cubic centimeter(s)
m^3	cubic meter(s)
ltr	liter(s)

1. INTRODUCTION

The main objective of the study on cost estimate is to obtain the cost of construction works for the comparative study on alternative flood control plans in the Master Plan.

The cost estimate consists of both economic and financial costs for the purposes of the economic evaluation and financial requirement of the flood control plans based on the "Agno Flood Control System CY-1989 Regular Infrastructure Program" by the DPWH-PMO.

This report consists of four (4) parts, namely:

1. Cost Estimation Criteria
2. Unit Costs
3. Cost Estimation Results
4. Preliminary Construction Plan

2. COST ESTIMATE

2.1 Cost Estimation Criteria

The cost estimation criteria presented herein were prepared for the comparative study on alternative flood control plans.

2.1.1 Constitution of Project Cost

Basic Conditions

Project cost was estimated on the basis of the following assumptions:

(1) Construction works are to be executed by contract system.

(2) Unit cost of each construction work item is estimated on the unit price basis, except for some work items which are estimated on lump sum/percentage basis.

(3) Unit prices are based on the price level as of June, 1989.

(4) Foreign currency conversion rates are US$1.00 = P21.30 = ¥132.00

Constitution of Project Cost

The basic constitution of the project cost is as shown in Fig. 2.1.

Project cost is classified into two (2) categories: financial cost and economic cost. Financial cost is the budgetary cost required to implement the project and the economic cost is used for the economic evaluation of the project. The financial project cost consists of the main construction cost, compensation cost, administration and engineering cost, and contingencies.

2.1.2 Main Construction Cost

The main construction cost consists of the cost of preparatory works, main works and miscellaneous works.

Preparatory Works

The cost of preparatory works for flood control and river improvement is usually within 5 to 10% of the cost of main construction works for flood control and river improvement depending on the project study status. Therefore, in this estimation, 10% which is in the higher side of the range was applied.

Main Works

The cost for main works was computed by multiplying the unit cost with the work quantity. The unit cost of each item consists of direct cost and indirect cost. The direct cost in unit cost consists of materials cost, equipment expenses and labor cost which were estimated on unit price based on the "Agno Flood Control System CY-1989 Regular Infrastructure Program" by the DPWH-PMO and similar projects in the study area.

Indirect cost consists of (1) overhead, contingencies and miscellaneous expenses (OCM); (2) profit; (3) mobilization and demobilization expenses for contractor; and, (4) Value Added Tax (VAT). Each component of the indirect cost was computed in percent according to the guideline of DPWH as follows:

(1) Overhead, Contingencies and Miscellaneous (OCM)	:	9% of estimated direct cost
(2) Profit	:	7% of estimated direct cost
(3) Mobilization and Demobilization	:	5% of estimated direct cost
(4) Value Added Tax	:	10% of equipment expenses and labor cost in direct cost

Miscellaneous Works

The cost of miscellaneous works is, in general, to be accounted as a certain percentage of the sum of preparatory and main works depending upon the accuracy of the investigation and design. When the project is in detailed engineering stage supported by detailed survey and investigation, miscellaneous works are not required to be considered. Since this Study is in the Master Plan stage, 15% was applied to the miscellaneous works.

2.1.3 Compensation Cost

Compensation cost is divided into land acquisition and house evacuation, and estimated on unit basis as follows:

Land Acquisition	:	Commercial area
		Residential area
		Farmland (irrigated area)
		Non-farmland area
House Evacuation	:	Building 1 (single house)
		Building 2 (duplex house)

The following unit costs, which represent average values in the project area according to the provincial assessors, are employed in the estimation of compensation cost.

Commercial area	:	P400,000/ha
Residential area	:	P150,000/ha
Farmland (irrigated area)	:	P 10,000/ha
Non-Farmland area	:	P 7,000/ha
Building 1	:	P 40,000/unit
Building 2	:	P 80,000/unit

2.1.4 Administration and Engineering Services

The administration cost for the government is computed at 5% of the sum of the main construction cost and compensation cost according to the standard criteria of DPWH.

The engineering of the flood control works is principally divided into master planning of the basin-wide flood control scheme, feasibility study, detailed design and construction supervision. The objective and scope of works of the engineering services differ in each stage of study of each project.

The cost of engineering services herein estimated is to cover the detailed design and construction supervision; therefore, 16% of main construction works is adopted to the rate of the engineering cost.

2.1.5 Project Contingency

Project contingency consists of physical contingency and price escalation contingency.

Physical contingency is usually estimated at 10 to 20% depending on the project study stage; hence, 15% is applied in this study.

The price escalation rates are adopted at 6% for the local currency component and 3% for the foreign currency component which are currently being used in projects financed by OECF loans.

2.1.6 Component of Unit Cost

Foreign financing agencies are expected to extend assistance to the project, therefore, cost estimate consists of the Foreign Currency Portion (F.C) and the Local Currency Portion (L.C). In estimating the project cost, the following basic conditions are assumed.

Foreign Currency Portion

(1) All costs of construction equipment;

(2) Part of construction materials costs;

(3) Part of indirect cost such as OCM, profit and mobilization/demobilization; and

(4) Part of engineering services cost.

Local Currency Portion

(1) All labor costs;

(2) Part of construction material costs;

(3) Part of indirect cost such as OCM, profit and mobilization/demobilization;

(4) Value Added Tax;

(5) All compensation costs for land acquisition and house evacuation;

(6) All cost of administration for the government staff; and

(7) Part of engineering services cost.

The components of unit cost are tabulated as follows:

Particulars	Portion of Unit Cost	
	Foreign Currency (%)	Local Currency (%)
(1) Labor Cost	0	100
(2) Equipment Cost	100	0
(3) Material Cost		
(a) Fuel	50	50
(b) Cement	65	35
(c) Re-bar	65	35
(d) Structural Steel	100	0
(e) Others	0	100
(4) Overhead (Excl. VAT)	(2+3) x 21	(1+3) x 21
(5) Value Added Tax (VAT)	0	(1+3) x 10
(6) Compensation	0	100
(7) Administration	0	100
(8) Engineering Services	90	10

2.2 Unit Cost

2.2.1 Financial Unit Cost

The financial unit cost of each construction work item for river and dam construction works are preliminary prepared based on the foregoing criteria.The financial unit costs are listed in Tables 2.1 and 2.2.

2.2.2 Economic Unit Cost

Economic cost is the financial cost less government tax, contractor's profit and price escalation contingency. The economic unit cost are listed in Tables 2.3 and 2.4.

2.2.3 Standard Unit Construction Cost

The unit cost of each work item for river improvement scheme was estimated according to the foregoing criteria, standard design of riparian structures and preliminary construction plan. The standard unit construction cost is listed in Table 2.5.

2.3 Results of Cost Estimate

2.3.1 Framework

The alternative of the Framework Plans are as follows:

Agno River Main Stream including Tarlac River

Alternative 1	:	River improvement only
Alternative 2	:	Combination of river improvement and natural flood retarding basin
Alternative 3	:	Combination of river improvement, natural flood retarding basin and flood control dam
Alternative 4	:	Combination of river improvement and flood control dam

Agno River Tributaries

Ambayoan	:	River improvement only
Viray-Dipalo	:	River improvement only
Banila	:	River improvement only
Camiling	:	River improvement only

Allied Rivers

Alternative 1	:	River improvement only
Alternative 2	:	River improvement and Binalonan Floodway

The design flood for the Framework Plan are 100-year flood for Main Agno and Tarlac rivers and 50-year flood for Agno river tributaries and Allied rivers.

The economic construction costs of each alternative plan are as follows:

Agno River Main Stream including Tarlac River (Unit: million pesos)

	Agno	Tarlac	Dam	Total
Alternative 1				
Main Construction Cost	7,780	1,098	-	8,878
Total Project Cost	11,472	1,587	-	13,059
Alternative 2				
Main Construction Cost	7,216	879	-	8,095
Total Project Cost	10,700	1,228	-	11,988
Alternative 3				
Main Construction Cost	7,058	713	1,324	9,095
Total Project Cost	10,485	1,061	1,811	13,357
Alternative 4				
Main Construction Cost	7,582	862	1,324	9,768
Total Project Cost	11,202	1,265	1,811	14,278

The details of cost estimate are shown in Table 2.6, and work quantities of river improvement are shown in Table 2.7.

Agno Tributaries (Unit: million pesos)

	Main Const. Cost	Total Project Cost
Ambayoan River	116	173
Viray-Dipalo	187	278
Banila River	687	1,023
Camiling River	303	451
Total	1,293	1,925

The details of cost estimate are shown in Table 2.8, and work quantities are shown in Table 2.9.

Allied Rivers (Unit: million pesos)

	Panto-Sinocalan River	Cayanga-Patalan River	Total
Alternative 1			
Main Const. Cost	1,897	777	2,674
Total Project Cost	2,824	1,158	3,982
Alternative 2			
Main Const. Cost.	1,715	837	2,552
Total Project Cost	2,553	1,246	3,799

The details of cost estimate are shown in Table 2.10, and work quantities are shown in Table 2.11.

2.3.2 Long Term Plan

To find out the optimum development scale of flood control plan, following design floods are studied and estimate the construction costs for the Agno and Allied rivers.

100-year flood

- Agno and Tarlac rivers by river improvement with natural flood retarding basin

50, 25, and 10-year flood

- Agno and Tarlac rivers by river improvement with natural flood retarding basin
- Tributaries of Agno river by river improvement
- All Allied rivers by river improvement with floodway

The estimated economic cost are as follows:

(Unit: million pesos)

	100-Year Flood	50-Year Flood	25-Year Flood	10-Year Flood
Agno Main Stream				
Main Const. Cost	6,952	6,264	5,528	4,811
Total Project Cost	10,340	9,400	8,394	7,413
Tarlac River				
Main Const. Cost	879	792	713	612
Total Project Cost	1,288	1,170	1,061	923
Agno Tributaries				
Main Const. Cost	-	1,293	1,012	893
Total Project Cost	-	1,925	1,506	1,330
Panto-Sinocalan River				
Main Const. Cost	-	1,715	1,546	1,319
Total Project Cost	-	2,553	2,303	1,965
Cayanga-Patalan River				
Main Const. Cost	-	837	777	715
Total Project Cost	-	1,246	1,159	1,066

The details of cost estimate are shown in Tables 2.12 to 2.14.

2.3.3 Optimum Plan

Flood control plans for 25-year flood and 10-year flood are selected as the optimum development scales for the Agno river and Allied rivers respectively through economic evaluation. These financial costs are as follows:

(Unit: Mill.₱)

River	F.C. Portion	L.C. Portion	Total
I. Agno River (25-yr)			
1. Lower Agno River	3,893	2,161	6,054
2. Poponto Stretch	761	366	1,127
3. Upper Agno River	1,393	811	2,204
Sub-Total	6,047	3,338	9,385
4. Tarlac River	903	518	1,421
5. Tributaries	937	703	1,640
Total of Agno River	7,887	4,559	12,446
II. Allied Rivers (10-yr)			
1. Panto-Sinocalan River	1,311	849	2,160
2. Cayanga-Patalan River	615	511	1,126
Total for Allied Rivers	1,926	1,360	3,286
Grand Total	9,813	5,919	15,732

The summary of cost estimate and work quantities are shown in Tables 2.15 to 2.18. The constitution and location of the subject rivers and river stretches are shown in Figs. 2.2 and 2.3, and the details of cost estimate are shown in Table 2.19.

2.3.4 Compensation Work

The compensation work comprising land acquisition and house evacuation will be carried out by the government prior to the commencement of construction. Table 2.20 shows the tentative area of land acquisition and number of house evacuation required for long term plan of river improvement works based on a 1/50,000 map, so that they should be reviewed in more detail at the future stage.

3. CONSTRUCTION PLAN

3.1 Implementation Schedule

From the technical and economic point of view, the implementation program for the Long Term Plan is formulated for the target year 2010 as shown in Fig. 3.1. The total project cost of the Long Term Plan, which is estimated to be 15,732 million pesos at 1989 constant price level, corresponds to about 2.5% of the projected cumulative GRDP of the Study Area in the period 1995-2009 (16.9 billion pesos).

3.2 Outline of Work

Major work quantities for Long Term Plan of the Agno and Allied rivers are as follows:

Work Items	Unit	Agno River	Tarlac River	Agno River Tributary	Panto River	Cayanga River
Excavation	1,000m^3	24,673	4,300	1,200	4,216	1,842
Dredging	1,000m^3	13,027	0	0	38	260
Embankment	1,000m^3	15,269	1,355	2,581	4,012	718
Revetment	1,000m^2	514	96	190	373	193
Groin	no.	958	244	1,070	952	1,095
Sluiceway	no.	16	2	26	39	16
Water Gate	no.	2	0	0	0	0
Bridge	no.	5	3	14	22	8
Fixed Weir	no.	1	0	0	0	0

3.3 Workable Days

River improvement works should be carried out only in the dry season because they consist mostly of earthwork such as excavation and embankment which cannot be expected to have good results under the rain; besides, it is a risky job to undertake such works under the threat of flooding.

Based on the rainfall data at Dagupan City (1951-1985), the annual workable days is 165 days excluding holidays and rainy days during dry season as follows:

Month	Rainfall (mm/month)	Rainy Days	Assumed Workable Days
January	6.2	2	25
February	6.2	2	23
March	6.2	2	25
April	17.6	3	23
May	216.1	13	11
June	346.6	17	0
July	462.1	22	0
August	608.4	24	0
September	324.8	20	0
October	158.5	12	11
November	63.1	5	23
December	13.8	2	24
Total	2,296.2	127	165

3.4 Work Volume

The kind and number of construction equipment are determined by the annual work volume of major work items for river improvement works. The maximum volume of works are given below in consideration of working condition in the study area.

Excavation : 250,000 m^3/year/group
Embankment : 200,000 m^3/year/group
Dredging : 300,000 m^3/year/group

The daily work production are calculated as follows:

$$\text{Excavation} : \frac{250{,}000\ m^3}{165\ \text{days}} = 1{,}515\ m^3/\text{day/group}$$

Embankment : $\frac{200,000\ m^3}{165\ days}$ = 1,212 m^3/day/group

Dredging : $\frac{300,000\ m^3}{165\ days}$ = 1,818 m^3/day/group

3.5 Standard Construction Method

3.5.1 Excavation Works

Excavation for river improvement works consists of river channel excavation for widening and deepening of channels, and excavation for cut-off channel construction, etc. Excavation works are classified into the following categories:

Excavation 1 : Common or sandy soil materials

Excavation 2 : Gravel with boulder and soft rock materials

Excavated materials which are suitable in quality and available in quantity are to be used for dike embankment, as discussed under Sub-section 3.5.2.

Unsuitable materials or materials in excess of the required embankment are to be dumped in the spoil bank area. The transportation distance of excavated materials is assumed at 1,000 m in average.

The excavation works per group are planned to be carried out by a combination of the following major equipment.

Excavation 1

Bulldozer, 15 ton class : 5 units (land excavation)
Backhoe, 1.0 m^3 class : 4 units (underwater excavation)
Crawler Loader, 1.3 m^3 class : 5 units
Dump Truck, 8 ton class : 9 units
Bulldozer, 15 ton class : 3 units (spoil bank)

Excavation 2

Bulldozer, 21 ton class	:	3 unit (land excavation)
Backhoe, 1.8 m^3 class	:	5 units (underwater excavation)
Crawler Loader, 3.2 m^3 class	:	5 units
Dump Truck, 8 ton class	:	12 units
Bulldozer, 15 ton class	:	3 units (spoil bank)

3.5.2 Embankment Works

Embankment for river improvement works consists of earth embankment for heightening of the existing dike and construction of new dike.

Embankment works are classified into the following categories:

Embankment 1	:	Embankment materials to be obtained from river channel excavation
Embankment 2	:	Embankment materials to be obtained from borrow area

Embankment 1

This works include the works of excavation and loading in river channel, hauling to the embankment site, materials moisture content control, stripping of surface soil of dike foundation, spreading and compacting of embankment materials. The hauling distance of materials is assumed at 1,000 m in average.

Embankment work 1 is planned to be carried out by a combination of the following major equipment.

Bulldozer, 15 ton class	:	4 units (river channel)
Crawler Loader, 1.3 m^3 class	:	4 units (river channel)
Dump Truck, 8 ton class	:	8 units
Bulldozer, 11 ton class	:	2 units (embankment site)
Tire Roller, 8/20 ton class	:	3 units (embankment site)
Plate Compactor, 80 kg class	:	3 units (embankment site)
Water Tanker, 3,800 ltr. class	:	2 units (embankment site)

Embankment 2

Since the sand and soil obtained from excavation and dredging of the river channel are not suitable for banking materials, the materials specially excavated at the borrow pit will be used.

This embankment works cover the works of excavation and loading in borrow area, hauling to the embankment site in addition to the work items in embankment 1.

Embankment works 2 are planned to be carried out by a combination of the following major equipment.

Bulldozer, 15 ton class	:	4 units (borrow area)
Wheel Loader, 1.4 m3 class	:	4 units (borrow area)
Dump Truck, 8 ton class	:	15 units
Bulldozer, 11 ton class	:	2 units (embankment site)
Tire Roller, 8/20 ton class	:	3 units (embankment site)
Plate Compactor, 80 kg class	:	3 units (embankment site)
Water Tanker, 3,800 ltr. class	:	2 units (embankment site)

3.5.3 Dredging Works

The dredging works section roughly corresponds to the tidal section. The work sections are assumed as follows:

Agno River Mainstream	:	From estuary up to 22 km.
Panto-Sinocalan River	:	From estuary up to 2.5 km.
Cayanga-Patalan River	:	From estuary up to 6.5 km.

The work is to be performed by a cutter suction dredger 800 Hp class, since riverbed materials are fine sand.

The dredged materials are conveyed from the dredger to the spoil bank through a floating pipe and shore pipe. The floating pipeline is to be installed between the dredger and the fixed shore pipe.

The floating pipeline is to be installed between the dredger and the fixed shore pipe, and the shorepipe is to be installed along the river bank to the spoil bank.

The spoil bank may be used as residential land or farm land after completion of the dredging works. The spoil bank are to be sufficiently compacted using bulldozers and vibratory rollers.

Dredger operation is executed in two shifts per day with an hourly production rate assumed at 140 m^3/hr. The dredging works per group are planned to be carried out by a combination of following major equipment.

Dredger, 800 Hp class	:	1 unit
Tug boat, 30 PS class	:	1 unit
Bulldozer, 15 ton class	:	3 unit (spoil bank)

3.6 Construction Materials

The construction materials required for the riparian structures such as cement, reinforcing bars, simple small steel gates, etc., are almost locally available. The concrete aggregates are also plentifully available from the riverbed at the job site.

Most of the hardware and equipment required for the work, such as water gates and some other materials which need to be of high precision and good quality plus machinery and equipment will have to be imported.

TABLES

Table 2.1 UNIT COST FOR RIVER CONSTRUCTION WORKS (FINANCIAL COST)

(Unit: Pesos)

Item No.	Item of Work	Unit	Direct Cost				Inderect Cost					Unit Cost	Remarks
			Material	Equipment	Labor	Total	Overhead Cont'cy & Misc.	Profit	Mob. & Demob.	Value Added Tax	Total		
1.	Excavation 1	cu.m	7.49	35.04	3.57	46.10	4.15	3.23	2.30	3.87	13.55	60	Common Soil
2.	Excavation 2	cu.m	9.36	40.59	4.17	54.12	4.78	3.72	2.65	4.48	15.63	69	Stony with Boulder
3.	Dredging	cu.m	8.10	17.88	1.48	27.46	2.47	1.92	1.37	1.94	7.70	36	Fine Sand
4.	Embankment 1	cu.m	12.53	49.31	5.74	67.58	6.08	4.73	3.38	5.52	19.71	88	Excavated Materials
5.	Embankment 2	cu.m	20.76	76.27	8.16	105.19	9.46	7.37	5.27	8.44	30.54	136	Borrow Materials
6.	Stone Masonry	cu.m	531.53	79.11	138.04	748.68	67.38	52.41	37.43	21.72	178.94	929	Rubble Concrete Class B
7.	Backfilling Gravel	cu.m	15.87	31.00	87.13	134.00	12.06	9.38	6.70	11.81	39.95	174	Hauling Distance: 20 km
8.	Sodding	sq.m	1.00	0.00	6.88	7.88	0.71	0.55	0.39	0.67	2.32	10	Native Grass
9.	Concrete (210 kg/cu cm)	cu.m	1,467.19	62.98	199.12	1,729.29	132.05	121.05	86.46	26.21	365.77	2,095	Class A
10.	Concrete (140 kg/cu cm)	cu.m	1,274.53	62.98	199.12	1,536.63	138.30	107.56	76.83	26.21	348.90	1,896	Class C
11.	Reinforcing Steel Bar	kg	18.80	1.50	2.47	22.77	2.05	1.59	1.14	0.40	5.18	29	Including Fabrication
12.	Stone Spurdike	cu.m	26.31	38.75	68.67	133.73	12.04	9.36	6.69	10.74	38.83	173	Boulder, 20-40 cm in diameter
13.	Gabion Cylinder	m	95.18	0.00	29.71	124.89	11.24	8.74	6.24	2.97	29.19	154	0.45 m in diameter, L=5.00 m
14.	Gabion Cylinder	m	136.89	0.00	44.21	181.10	16.30	12.68	9.06	4.42	42.46	224	0.60 m in diameter, L=5.00 m
15.	Gabion Mattress	sq.m	229.13	0.00	35.31	264.44	23.80	18.51	13.22	3.53	59.06	324	0.50 x 1.20 x 3.00 m
16.	RC Pile	m	656.02	195.73	267.05	1,118.80	100.69	78.32	55.94	46.28	281.23	1,400	0.40 x 0.40 m
17.	Wooden Pile 1	m	47.46	6.16	22.16	75.78	6.82	5.30	3.79	2.83	18.74	95	0.15 m in diameter
18.	Wooden Pile 2	m	84.00	8.62	31.03	123.65	11.13	8.66	6.18	3.97	29.94	154	0.20 m in diameter
19.	Steel Pipe Pile	m	3,027.45	284.57	116.57	3,428.59	308.57	240.00	171.43	40.11	760.11	4,189	0.80 m in diameter
20.	RC Sheet Pile	sq.m	831.12	445.16	310.03	1,586.31	142.77	111.04	79.32	75.52	408.65	1,995	0.45 x 0.20 m in diameter
21.	Steel Sheet Pile	sq.m	3,917.43	53.04	11.64	3,982.11	358.39	278.75	199.11	6.47	842.72	4,825	Type III
22.	Sluice Gate-1	set	194,000.00	39,000.00	30,000.00	263,000.00	24,000.00	18,000.00	13,000.00	7,000.00	62,000.00	325,000	1.5 x 1.5 m Steel Gate
23.	Sluice Gate-2	set	580,000.00	120,000.00	93,000.00	793,000.00	73,000.00	54,000.00	40,000.00	21,000.00	188,000.00	981,000	2.0 x 2.0 m Steel Gate
24.	Steel Roller Gate	ton	140,000.00	13,000.00	30,000.00	183,000.00	17,000.00	13,000.00	9,000.00	5,000.00	44,000.00	227,000	0.8 t/sq.m w/ Guide & Hoist
25.	Bridge	sq.m	7,844.00	1,159.00	1,074.00	10,077.00	907.00	705.00	504.00	223.00	2,339.00	12,420	RC Type
26.	Demolishment, Concrete	cu.m	132.86	334.42	726.72	1,194.00	107.46	83.58	59.70	106.11	356.85	1,550	Reinforced Structure
27.	Demolishment, Metal	ton	56.09	1,600.29	96.40	1,752.78	157.75	122.69	87.64	169.67	537.75	2,290	Metal Structure

Table 2.2 UNIT COST FOR DAM CONSTRUCTION WORKS (FINANCIAL COST)

(Unit: Pesos)

Item No.	Item of Work	Unit	Direct Cost				Inderect Cost					Unit Cost	Remarks
			Material	Equipment	Labor	Total	Overhead Cost'cy & Misc.	Profit	Mob. & Demob.	Value Added Tax	Total		
1.	RIVER DIVERSION WORKS												
1.1	Excavation (Common)	cu.m	8	42	6	56	5	4	3	5	17	73	Soil & Riverbed Materials.
1.2	Excavation (Rock)	cu.m	48	144	8	200	18	14	10	15	57	260	Sound Rock
1.3	Excavation (Tunnel)	cu.m	245	650	13	908	82	64	45	66	257	1,170	
1.4	Concrete (Inlet & Outlet)	cu.m	1,470	400	197	2,067	186	144	103	60	493	2,560	
1.5	Concrete (Tunnel Lining)	cu.m	1,470	455	300	2,225	200	156	111	76	543	2,770	
1.6	Concrete (Plug)	cu.m	1,270	400	130	1,800	162	126	90	53	431	2,230	
1.7	Consolidation Grout	m	1,350	90	60	1,500	135	105	75	15	330	1,830	
1.8	Reinforcing Steel Bar	kg	19	1	3	23	2	2	1	1	6	29	
1.9	Cofferdam	cu.m	12	99	6	117	10	8	6	11	35	160	
2.	DAM												
2.1	Excavation (Common)	cu.m	8	42	6	56	5	4	3	5	17	73	Soil & Riverbed Materials.
2.2	Excavation (Rock)	cu.m	48	144	8	200	18	14	10	15	57	260	Sound Rock
2.3	Embankment (Core)	cu.m	12	99	6	117	10	8	6	11	35	160	
2.4	Embankment (Filter)	cu.m	21	156	6	183	17	13	9	16	55	240	
2.5	Embankment (Rock)	cu.m	38	157	4	199	18	14	10	16	58	260	
2.6	Embankment (Riprap)	cu.m	52	232	8	292	26	20	15	24	85	380	
2.7	Curtain Grout	m	1,800	120	80	2,000	180	140	100	200	620	2,620	
2.8	Blanket/Consolidation Grout	m	1,350	90	60	1,500	135	105	75	15	330	1,830	
2.9	Mass Concrete (Concrete Dam)												
	(1) Volume: 100,000 cu.m	cu.m	576	436	256	1,268	151	89	84	69	393	1,661	
	(2) Volume: 250,000 cu.m	cu.m	561	425	249	1,235	147	86	82	67	382	1,617	
	(3) Volume: 500,000 cu.m	cu.m	540	409	240	1,189	142	83	79	65	369	1,559	
	(4) Volume: 1,000,000 cu.m	cu.m	510	386	227	1,123	134	79	74	61	348	1,471	
	(5) Volume: 2,000,000 cu.m	cu.m	488	370	217	1,075	126	75	71	59	333	1,408	
3.	SPILLWAY												
3.1	Excavation (Common)	cu.m	8	42	6	56	5	4	3	5	17	73	Soil & Riverbed Materials.
3.2	Excavation (Rock)	cu.m	48	144	8	200	18	14	10	15	57	260	Sound Rock
3.3	Concrete	cu.m	1,315	350	175	1,840	162	126	92	53	433	2,280	
3.4	Reinforcing Steel Bar	kg	19	1	3	23	2	2	1	1	6	29	
3.5	Bridge	sq.m	6,500	960	890	8,350	743	578	418	185	1,924	10,300	RC T-beam Type
4.	OUTLET FACILITIES												
4.1	Excavation (Common)	cu.m	8	42	6	56	5	4	3	5	17	73	Soil & Riverbed Materials.
4.2	Excavation (Rock)	cu.m	48	144	8	200	18	14	10	15	57	260	Sound Rock
4.3	Concrete	cu.m	1,470	400	197	2,067	186	144	103	60	493	2,560	
4.4	Reinforcing Steel Bar	kg	19	1	3	23	2	2	1	1	6	29	
5.	METAL WORKS												
5.1	Diversion Closure Gate	ton	98	9	21	128	12	9	6	3	30	158	0.9 t/sq.m, w/steel leg
5.2	Spillway Gate	ton	140	13	30	183	17	13	9	5	44	227	0.8 t/sq.m, w/guide and hoist
5.3	Intake Gate	ton	140	13	30	183	17	13	9	5	44	227	2.4 t/sq.m, w/guide and hoist
5.4	Valve	ton	210	18	42	270	24	19	14	6	63	333	40 kg/mm, w/guard gate & hoist
5.5	Other Steel Materials	ton	60	5	13	78	7	5	4	2	18	96	Screen, pipe, etc.

Table 2.3 UNIT COST FOR RIVER CONSTRUCTION WORKS (ECONOMIC COST)

(Unit: Pesos)

Item No.	Item of Work	Unit	Direct Cost				Inderect Cost					Unit Cost	Remarks
			Material	Equipment	Labor	Total	Overhead Cont'cy & Misc.	Profit	Mob. & Demob.	Value Added Tax	Total		
1.	Excavation 1	cu.m	6.74	35.04	3.57	45.35	4.08	0.00	2.27	0.00	6.35	52	Common Soil
2.	Excavation 2	cu.m	7.52	40.59	4.17	52.28	4.71	0.00	2.61	0.00	7.32	60	Stony with Boulder
3.	Dredging	cu.m	7.29	17.88	1.48	26.65	2.39	0.00	1.33	0.00	3.72	30	Fine Sand
4.	Embankment 1	cu.m	11.28	49.31	5.74	66.33	5.97	0.00	3.32	0.00	9.29	76	Excavated Materials
5.	Embankment 2	cu.m	18.68	76.27	8.16	103.11	9.28	0.00	5.16	0.00	14.44	118	Borrow Materials
6.	Stone Masonry	cu.m	478.38	79.11	138.04	695.53	62.60	0.00	34.78	0.00	97.38	793	Rubble Concrete Class B
7.	Backfilling Gravel	cu.m	14.28	31.00	87.13	132.41	11.92	0.00	6.62	0.00	18.54	151	Hauling Distance: 20 km
8.	Sodding	sq.m	0.90	0.00	6.88	7.78	0.70	0.00	0.39	0.00	1.09	9	Native Grass
9.	Concrete (210 kg/cu cm)	cu.m	1,320.47	62.98	199.12	1,582.57	142.43	0.00	79.13	0.00	221.56	1,804	Class A
10.	Concrete (140 kg/cu cm)	cu.m	1,147.08	62.98	199.12	1,409.18	126.83	0.00	70.46	0.00	197.29	1,606	Class C
11.	Reinforcing Steel Bar	kg	16.92	1.50	2.47	20.89	1.88	0.00	1.04	0.00	2.92	24	Including Fabrication
12.	Stone Spurdike	cu.m	23.68	38.75	68.67	131.10	11.80	0.00	6.56	0.00	18.36	150	Boulder, 20-40 cm in diameter
13.	Gabion Cylinder	m	85.66	0.00	29.71	115.37	10.38	0.00	5.77	0.00	16.15	132	0.45 m in diameter, L=5.00 m
14.	Gabion Cylinder	m	123.20	0.00	44.21	167.41	15.07	0.00	8.37	0.00	23.44	191	0.60 m in diameter, L=5.00 m
15.	Gabion Mattress	sq.m	206.22	0.00	35.31	241.53	21.74	0.00	12.08	0.00	33.82	275	0.50 x 1.20 x 3.00 m
16.	RC Pile	m	590.42	195.73	267.85	1,053.20	94.79	0.00	52.66	0.00	147.45	1,201	0.40 x 0.40 m
17.	Wooden Pile 1	m	42.71	6.16	22.16	71.03	6.39	0.00	3.55	0.00	9.94	81	0.15 m in diameter
18.	Wooden Pile 2	m	75.60	8.62	31.03	115.25	10.37	0.00	5.76	0.00	16.13	131	0.20 m in diameter
19.	Steel Pipe Pile	m	2,724.71	284.57	116.57	3,125.85	281.33	0.00	156.29	0.00	437.62	3,563	0.60 m in diameter
20.	RC Sheet Pile	sq.m	748.01	445.16	310.03	1,503.20	135.29	0.00	75.16	0.00	210.45	1,714	0.45 x 0.20 m in diameter
21.	Steel Sheet Pile	sq.m	3,525.69	53.04	11.64	3,590.37	323.13	0.00	179.52	0.00	502.65	4,093	Type III
22.	Sluice Gate-1	set	175,000.00	39,000.00	30,000.00	244,000.00	22,000.00	0.00	12,000.00	0.00	34,000.00	278,000	1.5 x 1.5 m Steel Gate
23.	Sluice Gate-2	set	522,000.00	120,000.00	93,000.00	735,000.00	66,000.00	0.00	37,000.00	0.00	103,000.00	838,000	2.0 x 2.0 m Steel Gate
24.	Steel Roller Gate	ton	126,000.00	13,000.00	30,000.00	169,000.00	15,000.00	0.00	8,000.00	0.00	23,000.00	192,000	0.8 t/sq.m w/ Guide & Hoist
25.	Bridge	sq.m	7,060.00	1,159.00	1,074.00	9,293.00	836.00	0.00	465.00	0.00	1,301.00	10,594	RC Type
26.	Demolishment, Concrete	cu.m	119.57	334.42	726.72	1,180.71	106.26	0.00	59.04	0.00	165.30	1,346	Reinforced Structure
27.	Demolishment, Metal	ton	50.48	1,600.29	96.40	1,747.17	157.25	0.00	87.35	0.00	244.60	1,992	Metal Structure

Table 2.4 UNIT COST FOR DAM CONSTRUCTION WORKS (ECONOMIC COST)

(Unit: Pesos)

Item No.	Item of Work	Unit	Direct Cost				Inderect Cost					Unit Cost	Remarks
			Material	Equipment	Labor	Total	Overhead Cont'cy & Misc.	Profit	Mob. & Demob.	Value Added Tax	Total		
1.	RIVER DIVERSION WORKS												
1.1	Excavation (Common)	cu.m	7	42	6	55	5	0	3	0	8	63	Soil & Riverbed Materials.
1.2	Excavation (Rock)	cu.m	43	144	8	195	18	0	10	0	28	223	Sound Rock
1.3	Excavation (Tunnel)	cu.m	221	650	13	884	80	0	44	0	124	1,008	
1.4	Concrete (Inlet & Outlet)	cu.m	1,323	400	197	1,920	173	0	96	0	269	2,189	
1.5	Concrete (Tunnel Lining)	cu.m	1,323	455	300	2,078	187	0	104	0	291	2,369	
1.6	Concrete (Plug)	cu.m	1,143	400	130	1,673	151	0	84	0	235	1,908	
1.7	Consolidation Grout	m	1,215	90	60	1,365	123	0	68	0	191	1,556	
1.8	Reinforcing Steel Bar	kg	17	1	3	21	2	0	1	0	3	24	
1.9	Cofferdam	cu.m	11	99	6	116	10	0	6	0	16	132	
2.	DAM												
2.1	Excavation (Common)	cu.m	7	42	6	55	5	0	3	0	8	63	Soil & Riverbed Materials.
2.2	Excavation (Rock)	cu.m	43	144	8	195	18	0	10	0	28	223	Sound Rock
2.3	Embankment (Core)	cu.m	11	99	6	116	10	0	6	0	16	132	
2.4	Embankment (Filter)	cu.m	19	156	6	181	16	0	9	0	25	206	
2.5	Embankment (Rock)	cu.m	34	157	4	195	18	0	10	0	28	223	
2.6	Embankment (Riprap)	cu.m	47	232	8	287	26	0	14	0	40	327	
2.7	Curtain Grout	m	1,620	120	80	1,820	164	0	91	0	255	2,075	
2.8	Blanket/Consolidation Grout	m	1,215	90	60	1,365	123	0	68	0	191	1,556	
2.9	Mass Concrete (Concrete Dam)												
	(1) Volume: 100,000 cu.m	cu.m	518	436	256	1,210	151	0	84	0	235	1,445	
	(2) Volume: 250,000 cu.m	cu.m	505	425	249	1,179	147	0	82	0	229	1,408	
	(3) Volume: 500,000 cu.m	cu.m	486	409	240	1,135	142	0	79	0	221	1,356	
	(4) Volume: 1,000,000 cu.m	cu.m	459	386	227	1,072	134	0	74	0	208	1,280	
	(5) Volume: 2,000,000 cu.m	cu.m	439	370	217	1,026	128	0	71	0	199	1,225	
3.	SPILLWAY												
3.1	Excavation (Common)	cu.m	7	42	6	55	5	0	3	0	8	63	Soil & Riverbed Materials.
3.2	Excavation (Rock)	cu.m	43	144	8	195	18	0	10	0	28	223	Sound Rock
3.3	Concrete	cu.m	1,184	350	175	1,709	154	0	85	0	239	1,948	
3.4	Reinforcing Steel Bar	kg	17	1	3	21	2	0	1	0	3	24	
3.5	Bridge	sq.m	5,850	960	890	7,700	693	0	385	0	1,078	8,778	RC T-beam Type
4.	OUTLET FACILITIES												
4.1	Excavation (Common)	cu.m	7	42	6	55	5	0	3	0	8	63	Soil & Riverbed Materials.
4.2	Excavation (Rock)	cu.m	43	144	8	195	18	0	10	0	28	223	Sound Rock
4.3	Concrete	cu.m	1,323	400	197	1,920	173	0	96	0	269	2,189	
4.4	Reinforcing Steel Bar	kg	17	1	3	21	2	0	1	0	3	24	
5.	METAL WORKS												
5.1	Diversion Closure Gate	ton	88	9	21	118	11	0	6	0	17	135	0.9 t/sq.m, w/steel log
5.2	Spillway Gate	ton	126	13	30	169	15	0	8	0	23	192	0.8 t/sq.m, w/guide and hoist
5.3	Intake Gate	ton	126	13	30	169	15	0	8	0	23	192	2.4 t/sq.m, w/guide and hoist
5.4	Valve	ton	189	18	42	249	22	0	12	0	34	283	40 kg/mm, w/guard gate & hoist
5.5	Other Steel Materials	ton	54	5	13	72	6	0	4	0	10	82	Screen, pipe, etc.

Table 2.5 STANDARD UNIT CONSTRUCTION COST FOR FLOOD CONTROL WORKS AND FACILITIES

(Unit: Peso)

Item No.	Work Items	Unit	Financial Cost			Economic Cost	Remarks
			Foreign Cost	Local Cost	Total		
1.	Excavation 1	cu.m	47	13	60	52	Common soil
2.	Excavation 2	cu.m	54	15	69	60	Stony with boulder
3.	Dredging	cu.m	27	9	36	30	Fine sand
4.	Embankment 1	cu.m	67	21	88	76	Excavated materials
5.	Embankment 2	cu.m	104	32	136	118	Borrow materials
6.	Sodding	sq.m	0	10	10	9	Native grass
7.	Revetment (L.W.C.)						Gabion type
	Type-A	sq.m	284	346	630	539	
	Type-B	sq.m	191	233	424	363	
8.	Revetment (H.W.C.)						Wet masonry type
	Type-A	sq.m	302	370	672	575	
	Type-B	sq.m	239	291	530	453	
9.	Groin (L.W.C.)						
	Type-A	pc.	33,860	97,140	131,000	112,000	Wooden pile type
	Type-B	pc.	287,000	390,000	677,000	575,000	Concrete frame type
10.	Groin (H.W.C.)						
	Type-A	pc.	33,500	61,500	95,000	80,000	Wooden pile type
	Type-B	pc.	232,000	317,000	549,000	465,000	Concrete frame type
11.	Sluice Way						
	Type-A	pc.	1,161,000	549,000	1,710,000	1,450,000	Culvert, 1.5 x 1.5 m
	Type-B	pc.	1,736,000	775,000	2,511,000	2,128,000	Culverts, 1.5 x 1.5 m x 2
12.	Water Gate						
	Type-A	pc.	14,730,000	5,881,000	20,611,000	17,459,000	Slide gate, 10.0 x 7.0 m
	Type-B	pc.	31,174,000	11,172,000	42,346,000	36,161,000	Slide gate, 20.0 x 8.0 m
13.	Demolishment						
	Concrete	cu.m	485	1,065	1,550	1,346	
	Metal	ton	1,970	320	2,290	1,992	
14.	Bridge	sq.m	6,620	5,800	12,420	10,594	Concrete type
15.	Fixed Weir	pc.	44,490,000	36,403,000	80,893,000	69,300,000	

Table 2.6 PROJECT ECONOMIC COST OF MAIN AGNO, TARLAC RIVERS AND DAMS FOR ALTERNATIVE FRAMEWORK PLANS

(Unit : Million Pesos)

Return Period	Alternatives	Main Agno River					Tarlac River			Dams	Grand Total
		Lower Agno River RM-AG282	Poponto Stretch: Bayambang	Poponto Stretch: Poponto Floodway	Upper Agno Rive AG309-AG473	Total of Agno River	Confluence AG180-TA200	TA200-TA265	Total of Tarlac River	Moriones and L'Odonnell	
1/100	Alternative-AG1 River Improvement	8,070	93	1,027	2,282	11,472	741	846	1,587	-	13,059
1/100	Alternative-AG2 River Improvement and Natural Retarding Basin	7,170	166	1,082	2,282	10,700	442	846	1,288	-	11,988
1/100	Alternative-AG3 River Improvement, Natural Retarding Basin and Dams	6,955	166	1,082	2,282	10,485	393	668	1,061	1,811	13,357
1/100	Alternative-AG4 River Improvement and Dams	7,800	93	1,027	1,027	11,202	597	668	1,265	1,811	14,278

(CE-AG100)

Table 2.7 (1/4) WORK QUANTITIES OF RIVER IMPROVEMENT OF MAIN AGNO AND TARLAC RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

River : Agno and Tarlac rivers
Study : Framework Plan
Alternative : River Improvement Only (AG-1)
Return Period : 1/100 - year

Work Item	Unit	Agno River Main Stream						Tarlac River		
		Lower Agno	Poponto Stretch			Upper Agno	Total of	Confluence	Upper Stretch	Total of
		RH-AG282 (1)	Bayambang (2)	Floodway (3)	Sub-total (2)+(3)=(4)	AG309-AG473 (5)	Agno River (1)+(4)+(5)	AG180-TA200 (6)	TA200-TA265 (7)	Tarlac River (6)+(7)
(1) Excavation 1	cu.m	15,275,000	0	6,800,000	6,800,000	3,300,000	25,375,000	2,600,000	2,450,000	5,050,000
Excavation 2	cu.m	0	0	0	0	2,850,000	2,850,000	0	0	0
Totoal of (1)	cu.m	15,275,000	0	6,800,000	6,800,000	6,150,000	28,225,000	2,600,000	2,450,000	5,050,000
(2) Dredging	cu.m	17,075,000	0	0	0	0	17,075,000	0	0	0
(3) Embankment 1										
Left Dike	cu.m	2,392,000	483,500	1,609,600	2,093,100	1,162,000	5,647,100	936,000	694,000	1,630,000
Right Dike	cu.m	1,499,000	0	852,100	852,100	1,704,000	4,055,100	1,755,000	916,700	2,671,700
Embankment 2										
Left Dike	cu.m	6,377,000	0	0	0	443,000	6,820,000	0	0	0
Right Dike	cu.m	6,629,000	0	0	0	2,500,000	9,129,000	0	0	0
Totoal of (3)	cu.m	16,897,000	483,500	2,461,700	2,945,200	5,809,000	25,651,200	2,691,000	1,610,700	4,301,700
(4) Sodding	cu.m	3,838,000	0	717,700	717,700	1,991,300	6,547,000	523,890	1,143,800	1,667,690
(5) Revetment (L.W.C.)										
Type-A	sq.m	40,000	0	59,800	59,800	132,300	232,100	18,400	58,300	76,700
Type-B	sq.m	130,200	0	0	0	0	130,200	12,100	0	12,100
Revetment (H.W.C.)										
Type-A	sq.m	0	0	0	0	63,700	63,700	0	8,300	8,300
Type-B	sq.m	67,600	23,700	0	23,700	0	91,300	0	0	0
Totoal of (5)	sq.m	237,800	23,700	59,800	83,500	196,000	517,300	30,500	66,600	97,100
(6) Groin (L.W.C.)										
Type-A	pc.	460	0	0	0	198	658	0	244	244
Type-B	pc.	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)										
Type-A	pc.	0	0	0	0	148	148	0	0	0
Type-B	pc.	0	0	0	0	152	152	0	0	0
Totoal of (6)	pc.	460	0	0	0	498	958	0	244	244
(7) Sluice Way										0
Type-A	pc.	2	1	1	2	3	7	0	2	2
Type-B	pc.	8	2	0	2	1	11	0	0	0
Totoal of (7)	pc.	10	3	1	4	4	18	0	2	2
(8) Water Gate										0
Type-A	pc.	0	0	0	0	0	0	0	0	0
Type-B	pc.	2	0	0	0	0	2	1	0	1
Totoal of (8)	pc.	2	0	0	0	0	2	1	0	1
(9) Bridge										0
Newly Const.	sq.m	45,000	0	0	0	6,750	51,750	0	13,500	13,500
Rehabilit.	sq.m	0	0	0	0	0	0	0	0	0
Demolishment										0
Concrete	cu.m	5,800	0	0	0	3,800	9,600	0	2,500	2,500
Metal	ton	1,060	0	0	0	1,300	2,360	0	0	0
(10) Fixed Weir	pc.	0	0	0	0	0	0	0	0	0
(11) Others	L.S	1	0	0	0	0	1	0	0	0

(File cord : WQ-AGNF1)

Table 2.7 (2/4) WORK QUANTITIES OF RIVER IMPROVEMENT OF MAIN AGNO AND TARLAC RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

River : Agno and Tarlac rivers
Study : Framework Plan
Alternative : River Improvement and Natural Retarding Baisn (AG-2)
Return Period : 1/100 - year

Work Item	Unit	Agno River Main Stream						Tarlac River		
		Lower Agno	Poponto Stretch			Upper Agno	Total of	Confluence	Upper Stretch	Total of
		RM-AG282 (1)	Bayambang (2)	Floodway (3)	Sub-total (2)+(3)=(4)	AG309-AG473 (5)	Agno River (1)+(4)+(5)	AG180-TA200 (6)	TA200-TA265 (7)	Tarlac River (6)+(7)
(1) Excavation 1	cu.m	15,275,000	650,000	6,800,000	7,450,000	3,300,000	26,025,000	2,600,000	2,450,000	5,050,000
Excavation 2	cu.m	0	0	0	0	2,850,000	2,850,000	0	0	0
Totoal of (1)	cu.m	15,275,000	650,000	6,800,000	7,450,000	6,150,000	28,875,000	2,600,000	2,450,000	5,050,000
(2) Dredging	cu.m	17,075,000	0	0	0	0	17,075,000	0	0	0
(3) Embankment 1										
Left Dike	cu.m	1,812,700	343,000	288,100	631,100	1,162,000	3,605,800	936,000	694,000	1,630,000
Right Dike	cu.m	934,400	374,000	1,431,900	1,805,900	1,704,000	4,444,300	0	918,700	918,700
Embankment 2										
Left Dike	cu.m	4,754,200	0	0	0	443,000	5,197,200	0	0	0
Right Dike	cu.m	5,067,100	0	0	0	2,500,000	7,567,100	0	0	0
Totoal of (3)	cu.m	12,568,400	717,000	1,720,000	2,437,000	5,809,000	20,814,400	936,000	1,610,700	2,546,700
(4) Sodding	cu.m	3,156,000	237,200	402,000	639,200	1,991,300	5,786,500	523,890	1,143,800	1,667,690
(5) Revetment (L.W.C.)										
Type-A	sq.m	40,000	3,150	59,800	62,950	132,300	235,250	18,400	58,300	76,700
Type-B	sq.m	130,200	4,670	0	4,670	0	134,870	12,100	0	12,100
Revetment (H.W.C.)										
Type-A	sq.m	0	0	0	0	63,700	63,700	0	8,300	8,300
Type-B	sq.m	53,300	23,700	79,800	103,500	0	156,800	0	0	0
Totoal of (5)	sq.m	223,500	31,520	139,600	171,120	196,000	590,620	30,500	66,600	97,100
(6) Groin (L.W.C.)										
Type-A	pc.	460	0	0	0	198	658	0	244	244
Type-B	pc.	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)										
Type-A	pc.	0	0	0	0	148	148	0	0	0
Type-B	pc.	0	0	0	0	152	152	0	0	0
Totoal of (6)	pc.	460	0	0	0	498	958	0	244	244
(7) Sluice Way										0
Type-A	pc.	2	1	1	2	3	7	0	2	2
Type-B	pc.	8	0	0	0	1	9	0	0	0
Totoal of (7)	pc.	10	1	1	2	4	16	0	2	2
(8) Water Gate										0
Type-A	pc.	0	0	0	0	0	0	0	0	0
Type-B	pc.	2	0	0	0	0	2	1	0	1
Totoal of (8)	pc.	2	0	0	0	0	2	1	0	1
(9) Bridge										0
Newly Const.	sq.m	45,000	0	0	0	6,750	51,750	0	13,500	13,500
Rehabilit.	sq.m	0	0	0	0	0	0	0	0	0
Demolishment										0
Concrete	cu.m	5,800	0	0	0	3,800	9,600	0	2,500	2,500
Metal	ton	1,060	0	0	0	1,300	2,360	0	0	0
(10) Fixed Weir	pc.	0	0	1	1	0	1	0	0	0
(11) Others	L.S	1	0	0	0	0	1	0	0	0

(File cord : WQ-AGNF2)

Table 2.7 (3/4) WORK QUANTITIES OF RIVER IMPROVEMENT OF MAIN AGNO AND TARLAC RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

River : Agno and Tarlac rivers
Study : Framework Plan
Alternative : River Improvement, Natural Retarding Baisn and Dams (AG-3)
Return Period : 1/100 - year

Work Item	Unit	Agno River Main Stream						Tarlac River		
		Lower Agno	Poponto Stretch			Upper Agno	Total of	Confluence	Upper Stretch	Total of
		RH-AG282 (1)	Bayambang (2)	Floodway (3)	Sub-total (2)+(3)-(4)	AG309-AG473 (5)	Agno River (1)+(4)+(5)	AG180-TA200 (6)	TA200-TA265 (7)	Tarlac River (6)+(7)
(1) Excavation 1	cu.m	15,275,000	650,000	6,800,000	7,450,000	3,300,000	26,025,000	2,600,000	1,700,000	4,300,000
Excavation 2	cu.m	0	0	0	0	2,850,000	2,850,000	0	0	0
Totoal of (1)	cu.m	15,275,000	650,000	6,800,000	7,450,000	6,150,000	28,875,000	2,600,000	1,700,000	4,300,000
(2) Dredging	cu.m	17,075,000	0	0	0	0	17,075,000	0	0	0
(3) Embankment 1										
Left Dike	cu.m	1,754,400	343,000	288,100	631,100	1,162,000	3,547,500	558,000	315,500	873,500
Right Dike	cu.m	849,900	374,000	1,431,900	1,805,900	1,704,000	4,359,800	0	481,600	481,600
Embankment 2										
Left Dike	cu.m	4,586,900	0	0	0	443,000	5,029,900	0	0	0
Right Dike	cu.m	4,932,800	0	0	0	2,500,000	7,432,800	0	0	0
Totoal of (3)	cu.m	12,124,000	717,000	1,720,000	2,437,000	5,809,000	20,370,000	558,000	797,100	1,355,100
(4) Sodding	cu.m	3,265,500	237,200	402,000	639,200	1,991,300	5,896,000	153,200	979,800	1,133,000
(5) Revetment (L.W.C.)										
Type-A	sq.m	40,000	3,150	59,800	62,950	132,300	235,250	18,400	58,300	76,700
Type-B	sq.m	130,200	4,670	0	4,670	0	134,870	12,100	0	12,100
Revetment (H.W.C.)										
Type-A	sq.m	0	0	0	0	63,700	63,700	0	6,800	6,800
Type-B	sq.m	50,600	23,700	79,800	103,500	0	154,100	0	0	0
Totoal of (5)	sq.m	220,800	31,520	139,600	171,120	196,000	587,920	30,500	65,100	95,600
(6) Groin (L.W.C.)										
Type-A	pc.	460	0	0	0	198	658	0	244	244
Type-B	pc.	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)										
Type-A	pc.	0	0	0	0	148	148	0	0	0
Type-B	pc.	*0*	*0*	*0*	*0*	*152*	*152*	*0*	*0*	*0*
Totoal of (6)	pc.	460	0	0	0	498	958	0	244	244
(7) Sluice Way										0
Type-A	pc.	2	1	1	2	3	7	0	2	2
Type-B	pc.	8	0	0	0	1	9	0	0	0
Totoal of (7)	pc.	10	1	1	2	4	16	0	2	2
(8) Water Gate										0
Type-A	pc.	0	0	0	0	0	0	0	0	0
Type-B	pc.	2	0	0	0	0	2	0	0	0
Totoal of (8)	pc.	2	0	0	0	0	2	0	0	0
(9) Bridge										0
Newly Const.	sq.m	45,000	0	0	0	6,750	51,750	0	13,500	13,500
Rehabilit.	sq.m	0	0	0	0	0	0	0	0	0
Demolishment										0
Concrete	cu.m	5,800	0	0	0	3,800	9,600	0	2,500	2,500
Metal	ton	1,060	0	0	0	1,300	2,360	0	0	0
(10) Fixed Weir	pc.	0	0	1	1	0	1	0	0	0
(11) Others	L.S	1	0	0	0	0	1	0	0	0

(File cord : WQ-AGNF3)

Table 2.7 (4/4) WORK QUANTITIES OF RIVER IMPROVEMENT OF MAIN AGNO AND TARLAC RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

River : Agno and Tarlac rivers
Study : Framework Plan
Alternative : River Improvement and Dams
Return Period : 1/100 - year.

Work Item	Unit	Agno River Main Stream						Tarlac River		
		Lower Agno	Poponto Stretch			Upper Agno	Total of	Confluence	Upper Stretch	Total of
		RM-AG282 (1)	Bayambang (2)	Floodway (3)	Sub-total (2)+(3)=(4)	AG309-AG473 (5)	Agno River (1)+(4)+(5)	AG180-TA200 (6)	TA200-TA265 (7)	Tarlac River (6)+(7)
(1) Excavation 1	cu.m	15,275,000	0	6,800,000	6,800,000	3,300,000	25,375,000	2,600,000	1,700,000	4,300,000
Excavation 2	cu.m	0	0	0	0	2,850,000	2,850,000	0	0	0
Totoal of (1)	cu.m	15,275,000	0	6,800,000	6,800,000	6,150,000	28,225,000	2,600,000	1,700,000	4,300,000
(2) Dredging	cu.m	17,075,000	0	0	0	0	17,075,000	0	0	0
(3) Embankment 1										
Left Dike	cu.m	2,259,500	483,500	1,609,600	2,093,100	1,162,000	5,514,600	558,000	315,500	873,500
Right Dike	cu.m	1,341,600	0	852,100	852,100	1,704,000	3,897,700	1,046,000	481,600	1,527,600
Embankment 2										
Left Dike	cu.m	6,003,000	0	0	0	443,000	6,446,000	0	0	0
Right Dike	cu.m	6,306,200	0	0	0	2,500,000	8,806,200	0	0	0
Totoal of (3)	cu.m	15,910,300	483,500	2,461,700	2,945,200	5,809,000	24,664,500	1,604,000	797,100	2,401,100
(4) Sodding	cu.m	3,776,300	0	717,700	717,700	1,991,300	6,485,300	437,800	979,800	1,417,600
(5) Revetment (L.W.C.)										
Type-A	sq.m	40,000	0	59,800	59,800	132,300	232,100	18,400	58,300	76,700
Type-B	sq.m	130,200	0	0	0	0	130,200	12,100	0	12,100
Revetment (H.W.C.)										
Type-A	sq.m	0	0	0	0	63,700	63,700	0	6,800	6,800
Type-B	sq.m	63,200	23,700	0	23,700	0	86,900	0	0	0
Totoal of (5)	sq.m	233,400	23,700	59,800	83,500	196,000	512,900	30,500	65,100	95,600
(6) Groin (L.W.C.)										
Type-A	pc.	460	0	0	0	198	658	0	244	244
Type-B	pc.	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)										
Type-A	pc.	0	0	0	0	148	148	0	0	0
Type-B	pc.	0	0	0	0	152	152	0	0	0
Totoal of (6)	pc.	460	0	0	0	498	958	0	244	244
(7) Sluice Way										0
Type-A	pc.	2	1	1	2	3	7	0	2	2
Type-B	pc.	8	2	0	2	1	11	0	0	0
Totoal of (7)	pc.	10	3	1	4	4	18	0	2	2
(8) Water Gate										0
Type-A	pc.	0	0	0	0	0	0	0	0	0
Type-B	pc.	2	0	0	0	0	2	1	0	1
Totoal of (8)	pc.	2	0	0	0	0	2	1	0	1
(9) Bridge										0
Newly Const.	sq.m	45,000	0	0	0	6,750	51,750	0	13,500	13,500
Rehabilit.	sq.m	0	0	0	0	0	0	0	0	0
Demolishment										0
Concrete	cu.m	5,800	0	0	0	3,800	9,600	0	2,500	2,500
Metal	ton	1,060	0	0	0	1,300	2,360	0	0	0
(10) Fixed Weir	pc.	0	0	0	0	0	0	0	0	0
(11) Others	L.S	1	0	0	0	0	1	0	0	0

(File cord : WQ-AGNF4)

Table 2.8 PROJECT ECONOMIC COST OF AGNO RIVER TRIBUTARIES FOR ALTERNATIVE FRAMEWORK PLANS

(Unit: Million Pesos)

Return Period	Work Item	Camiling River	Banila River	Viray-Dipalo River	Ambayoan River	Total
1/50	I. Main Construction Cost					
	1. Preparatory Works	24	54	15	9	102
	2. Main Works	239	543	148	92	1,022
	3. Miscellaneous Works	40	90	24	15	169
	Total of I.	303	687	187	116	1,293
	II. Compensation	30	69	19	12	130
	III. Administration	17	38	10	6	71
	IV. Engineering Services	48	110	30	19	207
	V. Physical Contingency	53	119	32	20	224
	Grand Total	451	1,023	278	173	1,925

Table 2.9 WORK QUANTITIES OF RIVER IMPROVEMENT OF AGNO RIVER TRIBUTARIES FOR ALTERNATIVE FRAMEWORK PLANS

Filename : Tributaries of Agno River
Study : Framework Plan
Alternative : River Inprovement Only
Return Period : 50 - year

Work Item	Unit	Tributaries of Agno River				
		Camiling River	Banila River	Viray-Dipalo River	Ambayaoan River	Total of Tributaries
(1) Excavation 1	cu.m	845,000	919,000	185,000	0	1,949,000
Excavation 2	cu.m	0	49,000	0	85,000	134,000
Total of (1)	cu.m	845,000	968,000	185,000	85,000	2,083,000
(2) Dredging	cu.m	0	0	0	0	0
(3) Embankment 1						
Left Dike	cu.m	642,600	797,200	62,800	164,800	1,667,400
Right Dike	cu.m	586,200	854,600	81,400	167,700	1,689,900
Embankment 2						
Left Dike	cu.m	0	13,000	0	0	13,000
Right Dike	cu.m	0	0	0	0	0
Total of (3)	cu.m	1,228,800	1,664,800	144,200	332,500	3,370,300
(4) Sodding	cu.m	537,100	827,200	134,400	171,500	1,670,200
(5) Revetment (L.W.C.)						
Type-A	sq.m	48,100	67,000	39,700	15,900	170,700
Type-B	sq.m	0	0	0	3,500	3,500
Revetment (H.W.C.)						
Type-A	sq.m	11,800	0	220	4,000	16,020
Type-B	sq.m	0	0	0	0	0
Total of (5)	sq.m	59,900	67,000	39,920	23,400	190,220
(6) Groin (L.W.C.)						
Type-A	pc.	276	420	286	88	1,070
Type-B	pc.	0	0	0	0	0
Groin (H.W.C.)						
Type-A	pc.	0	0	0	0	0
Type-B	pc.	0	0	0	0	0
Total of (6)	pc.	276	420	286	88	1,070
(7) Sluice Way						
Type-A	pc.	1	14	4	4	23
Type-B	pc.	3	0	0	0	3
Total of (7)	pc.	4	14	4	4	26
(8) Water Gate						
Type-A	pc.	0	0	0	0	0
Type-B	pc.	0	0	0	0	0
Total of (8)	pc.	0	0	0	0	0
(9) Bridge						
Newly Const.	sq.m	2,300	8,600	6,200	3,000	20,100
Rehabilit.	sq.m	0	0	0	0	0
Demolishment						
Concrete	cu.m	1,100	2,300	600	200	4,200
Metal	ton	0	0	0	0	0
(10) Fixed Weir	pc.	0	0	0	0	0
(11) Others	L.S	0	1	0	0	1

(File cord : WQ-AGT50)

Table 2.10 (1/2) PROJECT ECONOMIC COST OF ALLIED RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

Alternative-AL1: River Improvement with Bued Closure Dike
River : Panto-Sinocalan River

(Unit: Million Pesos)

Return Period		Work Item	Panto-Sinocalan River	Dagupan River	Ingalera River	Macalong River	Total
1/50	I.	Main Construction Cost					
		1. Preparatory Works	65	40	38	7	150
		2. Main Works	652	401	375	71	1,499
		3. Miscellaneous Works	108	66	62	12	248
		Total of I.	825	507	475	90	1,897
	II.	Compensation	83	51	48	9	191
	III.	Administration	45	28	26	5	104
	IV.	Engineering Services	132	81	76	14	303
	V.	Physical Contingency	143	88	82	16	329
		Grand Total	1,228	755	707	134	2,824

River: Cayanga-Patalan River

(Unit: Million Pesos)

Return Period		Work Item	Cayanga-Pataran River	Bued River	Aloragat River	Total
1/50	I.	Main Construction Cost				
		1. Preparatory Works	35	19	7	61
		2. Main Works	354	190	71	615
		3. Miscellaneous Works	58	31	12	101
		Total of I.	447	240	90	777
	II.	Compensation	45	24	9	78
	III.	Administration	25	13	5	43
	IV.	Engineering Services	72	38	14	124
	V.	Physical Contingency	78	42	16	136
		Grand Total	667	357	134	1,158

Table 2.10 (2/2) PROJECT ECONOMIC COST OF ALLIED RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

Alternative-AL2: River Improvement with Bued Closure Dike and Binalonan Floodway
River : Panto-Sinocalan River

(Unit: Million Pesos)

Return Period		Work Item	Panto-Sinocalan River	Dagupan River	Ingalera River	Macalong River	Binalona Floodway	Total
1/50	I.	Main Construction Cost						
		1. Preparatory Works	39	39	38	7	13	136
		2. Main Works	389	389	375	71	131	1,355
		3. Miscellaneous Works	64	64	62	12	22	224
		Total of I.	492	492	475	90	166	1,715
	II.	Compensation	49	49	48	9	17	172
	III.	Administration	27	27	26	5	9	94
	IV.	Engineering Services	79	79	76	14	27	275
	V.	Physical Contingency	85	85	82	16	29	297
		Grand Total	732	732	707	134	248	2,553

River: Cayanga-Patalan River

(Unit: Million Pesos)

Return Period		Work Item	Cayanga-Patalan River	Bued River	Aloragat River	Total
1/50	I.	Main Construction Cost				
		1. Preparatory Works	40	19	7	66
		2. Main Works	401	190	71	662
		3. Miscellaneous Works	66	31	12	109
		Total of I.	507	240	90	837
	II.	Compensation	51	24	9	84
	III.	Administration	28	13	5	46
	IV.	Engineering Services	81	38	14	133
	V.	Physical Contingency	88	42	16	146
		Grand Total	755	357	134	1,246

Table 2.11 (1/2) WORK QUANTITIES OF RIVER IMPROVEMENT OF ALLIED RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

River : Allied rivers
Study : Framework Plan
Alternative : River Improvement with Bued Closure Dike (AL-1)
Return Period : 1/50 - year

Work Item	Unit	Allied River										Total of Allied River
		Panto - Sinocalan River						Cayanga - Patalan River				
		*Panto-Sinocalan R.	Dagupan River	Ingalera River	Macalong River	Binalonan Floodway	Sub-total	**Cayanga-Patalan R.	Bued River	Aloragat River	Sub-total	
(1) Excavation 1	cu.m	2,968,000	1,399,000	1,815,000	194,000	0	6,376,000	1,549,000	183,800	300,000	2,032,800	8,408,800
Excavation 2	cu.m	0	0	0	0	0	0	0	188,000	0	188,000	188,000
Total of (1)	cu.m	2,968,000	1,399,000	1,815,000	194,000	0	6,376,000	1,549,000	371,800	300,000	2,220,800	8,596,800
(2) Dredging	cu.m	113,000	0	0	0	0	113,000	390,000	0	0	390,000	503,000
(3) Embankment 1												
Left Dike	cu.m	1,508,000	1,428,100	871,600	221,300	0	4,029,000	547,800	57,400	0	605,200	4,634,200
Right Dike	cu.m	1,508,000	1,428,100	871,600	221,300	0	4,029,000	547,800	57,400	0	605,200	4,634,200
Embankment 2												
Left Dike	cu.m	0	0	0	0	0	0	0	39,600	0	39,600	39,600
Right Dike	cu.m	0	0	0	0	0	0	0	80,600	0	80,600	80,600
Total of (3)	cu.m	3,016,000	2,856,200	1,743,200	442,600	0	8,058,000	1,095,600	235,000	0	1,330,600	9,388,600
(4) Sodding	cu.m	1,489,600	1,228,000	1,179,500	257,000	0	4,154,100	538,700	151,500	0	690,200	4,844,300
(5) Revetment (L.W.C.)												
Type-A	sq.m	73,000	33,800	18,900	37,700	0	163,400	75,200	39,700	40,800	155,700	319,100
Type-B	sq.m	38,000	43,400	124,200	0	0	205,600	30,300	0	0	30,300	235,900
Revetment (H.W.C.)												
Type-A	sq.m	30,500	0	0	0	0	30,500	5,800	1,700	0	7,500	38,000
Type-B	sq.m	0	0	0	0	0	0	0	0	0	0	0
Total of (5)	sq.m	141,500	77,200	143,100	37,700	0	399,500	111,300	41,400	40,800	193,500	593,000
(6) Groin (L.W.C.)												
Type-A	pc.	566	100	242	54	0	962	542	281	272	1,095	2,057
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)												
Type-A	pc.	0	0	0	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Total of (6)	pc.	566	100	242	54	0	962	542	281	272	1,095	2,057
(7) Sluice Way												
Type-A	pc.	16	4	8	8	0	36	10	6	0	16	52
Type-B	pc.	0	3	0	0	0	3	0	0	0	0	3
Total of (7)	pc.	16	7	8	8	0	39	10	6	0	16	55
(8) Water Gate												
Type-A	pc.	0	0	0	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Total of (8)	pc.	0	0	0	0	0	0	0	0	0	0	0
(9) Bridge												
Newly Const.	sq.m	8,000	3,905	3,900	193	0	15,998	1,200	3,800	263	4,463	20,461
Rehabilit.	sq.m	338	0	0	413	0	751	2,675	0	0	2,675	3,426
Demolishment												
Concrete	cu.m	4,590	1,200	1,700	1,030	0	8,520	1,700	300	200	2,200	10,720
Metal	ton	0	0	0	0	0	0	0	0	0	0	0
(10) Fixed Weir	pc.	0	0	0	0	0	0	0	0	0	0	0
(11) Others	L.S.	0	0	0	0	0	0	0	1	0	1	1

Remarks: * Panto-Sinocalan River Consists of Panto, Marusay, Sinocalan, Tagumising and Tuboy Rivers. (File cord : WQ-ALEA1)
** Cayanga-Patalan River consists of Cayanga, Patalan and Angalacan Rivers.

Table 2.11 (2/2) WORK QUANTITIES OF RIVER IMPROVEMENT OF ALLIED RIVERS FOR ALTERNATIVE FRAMEWORK PLANS

River : Allied rivers
Study : Framework Plan
Alternative : River Improvement with Bued Closure Dike/Binalonan Floodway (AL-2)
Return Period : 50 - year

Work Item	Unit	Allied River									
		Panto - Sinocalan River						Cayanga - Patalan River				Total of Allied River
		*Panto-Sinocalan R.	Dagupan River	Ingalera River	Macaloog River	Binalonan Floodway	Sub-total	**Cayanga-Patalan R.	Bued River	Alorasat River	Sub-total	
(1) Excavation 1	cu.m	1,699,000	1,399,000	1,815,000	194,000	604,800	5,711,800	1,689,500	183,800	300,000	2,173,300	7,885,100
Excavation 2	cu.m	0	0	0	0	0	0	0	188,000	0	188,000	188,000
Total of (1)	cu.m	1,699,000	1,399,000	1,815,000	194,000	604,800	5,711,800	1,689,500	371,800	300,000	2,361,300	8,073,100
(2) Dredging	cu.m	38,000	0	0	0	0	38,000	440,000	0	0	440,000	478,000
(3) Embankment 1												
Left Dike	cu.m	660,400	1,350,000	871,600	221,300	154,000	3,257,300	768,800	57,400	0	826,200	4,083,500
Right Dike	cu.m	660,400	1,350,000	871,600	221,300	154,000	3,257,300	768,800	57,400	0	826,200	4,083,500
Embankment 2												
Left Dike	cu.m	0	0	0	0	0	0	0	39,600	0	39,600	39,600
Right Dike	cu.m	0	0	0	0	0	0	0	80,600	0	80,600	80,600
Total of (3)	cu.m	1,320,800	2,700,000	1,743,200	442,600	308,000	6,514,600	1,537,600	235,000	0	1,772,600	8,287,200
(4) Sodding	cu.m	821,000	1,161,000	1,179,500	257,000	107,000	3,525,500	731,600	151,500	0	883,100	4,408,600
(5) Revetment (L.W.C.)												
Type-A	sq.m	73,000	33,800	18,900	37,700	76,800	240,200	75,200	39,700	40,800	155,700	395,900
Type-B	sq.m	38,000	43,400	124,200	0	0	205,600	30,300	0	0	30,300	235,900
Revetment (R.W.C.)												
Type-A	sq.m	24,600	0	0	0	0	24,600	6,100	1,700	0	7,800	32,400
Type-B	sq.m	0	0	0	0	0	0	0	0	0	0	0
Total of (5)	sq.m	135,600	77,200	143,100	37,700	76,800	470,400	111,600	41,400	40,800	193,800	664,200
(6) Groin (L.W.C.)												
Type-A	pc.	358	100	242	54	0	754	542	281	272	1,095	1,849
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)												
Type-A	pc.	0	0	0	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Total of (6)	pc.	358	100	242	54	0	754	542	281	272	1,095	1,849
(7) Sluice Way												
Type-A	pc.	8	4	8	8	2	30	10	6	0	16	46
Type-B	pc.	0	3	0	0	0	3	0	0	0	0	3
Total of (7)	pc.	8	7	8	8	2	33	10	6	0	16	49
(8) Water Gate												
Type-A	pc.	0	0	0	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Total of (8)	pc.	0	0	0	0	0	0	0	0	0	0	0
(9) Bridge												
Newly Const.	sq.m	6,195	3,905	3,900	193	780	14,973	1,135	3,060	263	4,398	19,371
Rehabilit.	sq.m	0	0	0	413	0	413	3,040	0	0	3,040	3,453
Demolishment												
Concrete	cu.m	3,430	1,200	1,700	1,030	400	7,760	1,150	300	200	1,650	9,410
Metal	ton	0	0	0	0	0	0	0	0	0	0	0
(10) Fixed Weir	pc.	0	0	0	0	0	0	0	0	0	0	0
(11) Others	L.S.	0	0	0	0	1	1	0	1	0	1	2

Remarks: * Panto-Sinocalan River Consists of Panto, Marusay, Sinocalan, Taguising and Tuboy Rivers.
** Cayanga-Patalan River consists of Cayanga, Patalan and Angalacan Rivers.

(File cord : WQ-ALEA2)

Table 2.12 PROJECT ECONOMIC COST OF MAIN AGNO AND TARLAC RIVERS FOR OPTIMIZATION OF LONG TERM PLAN

(Unit: Million Pesos)

Return Period	Work Item	Main Agno River					Tarlac River			Grand Total
			Poponto Stretch							
		Lower Agno River RM-AG282	Bayambang Stretch	Poponto Floodway	Upper Agno River AG309-AG473	Total of Agno River	Confluence AG180-TA200	TA200-TA265	Total of Tarlac River	
1/100	I. Main Construction Cost	4,509	121	774	1,548	6,952	281	598	879	7,831
	II. Compensation	533	1	19	137	690	48	23	71	761
	III. Administration	252	6	40	84	382	16	31	47	429
	IV. Engineering Services	721	19	124	248	1,112	45	96	141	1,253
	V. Physical Contigency	795	19	125	265	1,204	52	98	150	1,354
	Grand Total	6,810	166	1,082	2,282	10,340	442	846	1,288	11,628
1/50	I. Main Construction Cost	3,979	98	730	1,457	6,264	263	529	792	7,056
	II. Compensation	533	1	19	137	690	48	23	71	761
	III. Administration	226	5	37	80	348	16	28	44	392
	IV. Engineering Services	637	16	117	233	1,003	42	85	127	1,130
	V. Physical Contigency	710	16	118	251	1,095	49	87	136	1,231
	Grand Total	6,085	136	1,021	2,158	9,400	418	752	1,170	10,570
1/25	I. Main Construction Cost	3,526	66	619	1,317	5,528	245	468	713	6,241
	II. Compensation	533	1	19	137	690	48	23	71	761
	III. Administration	203	3	32	73	311	15	25	40	351
	IV. Engineering Services	564	11	99	211	885	39	75	114	999
	V. Physical Contigency	639	11	101	229	980	46	77	123	1,103
	Grand Total	5,465	92	870	1,967	8,394	393	668	1,061	9,455
1/10	I. Main Construction Cost	2,955	58	572	1,226	4,811	230	382	612	5,423
	II. Compensation	533	1	19	137	690	48	23	71	761
	III. Administration	174	3	30	68	275	14	20	34	309
	IV. Engineering Services	473	9	92	196	770	37	61	98	868
	V. Physical Contigency	550	9	93	215	867	44	64	108	975
	Grand Total	4,685	80	806	1,842	7,413	373	550	923	8,336

Table 2.13 PROJECT ECONOMIC COST OF AGNO RIVER TRIBUTARIES FOR OPTIMIZATION OF LONG TERM PLAN

(Unit: Million Pesos)

Return Period	Work Item	Camiling River	Banila River	Viray-Dipalo River	Ambayaoan River	Total
1/50	I. Main Construction Cost					
	1. Preparatory Works	24	54	15	9	102
	2. Main Works	239	543	148	92	1,022
	3. Miscellaneous Works	40	90	24	15	169
	Total of I.	303	687	187	116	1,293
	II. Compensation	30	69	19	12	130
	III. Administration	17	38	10	6	71
	IV. Engineering Services	48	110	30	19	207
	V. Physical Contigency	53	119	32	20	224
	Grand Total	451	1,023	278	173	1,925
1/25	I. Main Construction Cost					
	1. Preparatory Works	19	38	14	9	80
	2. Main Works	190	379	144	87	800
	3. Miscellaneous Works	31	63	24	14	132
	Total of I.	240	480	182	110	1,012
	II. Compensation	24	48	18	11	101
	III. Administration	13	26	10	6	55
	IV. Engineering Services	38	77	29	18	162
	V. Physical Contigency	42	83	32	19	176
	Grand Total	357	714	271	164	1,506
1/10	I. Main Construction Cost					
	1. Preparatory Works	15	34	14	8	71
	2. Main Works	148	337	140	81	706
	3. Miscellaneous Works	24	56	23	13	116
	Total of I.	187	427	177	102	893
	II. Compensation	19	43	18	10	90
	III. Administration	10	24	10	6	50
	IV. Engineering Services	30	68	28	16	142
	V. Physical Contigency	32	74	31	18	155
	Grand Total	278	636	264	152	1,330

Table 2.14 (1/2) PROJECT ECONOMIC COST OF ALLIED RIVERS FOR OPTIMIZATION OF LONG TERM PLAN

1. Panto-Sinocalan River with Binalonan Floodway

(Unit: Million Pesos)

Return Period	Work Item	Panto-Sinocalan River	Dagupan River	Ingalera River	Macalong River	Binalonan Floodway	Total
1/50	I. Main Construction Cost						
	1. Preparatory Works	39	39	38	7	13	136
	2. Main Works	389	389	375	71	131	1,355
	3. Miscellaneous Works	64	64	62	12	22	224
	Total of I.	492	492	475	90	166	1,715
	II. Compensation	49	49	48	9	17	172
	III. Administration	27	27	26	5	9	94
	IV. Engineering Services	79	79	76	14	27	275
	V. Physical Contigency	85	85	82	16	29	297
	Grand Total	732	732	707	134	248	2,553
1/25	I. Main Construction Cost						
	1. Preparatory Works	36	34	34	7	12	123
	2. Main Works	360	342	339	65	116	1,222
	3. Miscellaneous Works	59	56	56	11	19	201
	Total of I.	455	432	429	83	147	1,546
	II. Compensation	46	43	43	8	15	155
	III. Administration	25	24	24	5	8	86
	IV. Engineering Services	73	69	69	13	24	248
	V. Physical Contigency	79	75	74	14	26	268
	Grand Total	678	643	639	123	220	2,303
1/10	I. Main Construction Cost						
	1. Preparatory Works	33	29	27	5	11	105
	2. Main Works	326	287	273	48	108	1,042
	3. Miscellaneous Works	54	47	45	8	18	172
	Total of I.	413	363	345	61	137	1,319
	II. Compensation	41	36	35	6	14	132
	III. Administration	23	20	19	3	8	73
	IV. Engineering Services	66	58	55	10	22	211
	V. Physical Contigency	72	63	60	11	24	230
	Grand Total	615	540	514	91	205	1,965

Table 2.14 (2/2) PROJECT ECONOMIC COST OF ALLIED RIVERS FOR OPTIMIZATION OF LONG TERM PLAN

2. Cayanga-Patalan River with Binalonan Floodway

(Unit: Million Pesos)

Return Period	Work Item	Cayanga-Patalan River	Bued River	Aloragat River	Total
1/50	I. Main Construction Cost				
	1. Preparatory Works	40	19	7	66
	2. Main Works	401	190	71	662
	3. Miscellaneous Works	66	31	12	109
	Total of I.	507	240	90	837
	II. Compensation	51	24	9	84
	III. Administration	28	13	5	46
	IV. Engineering Services	81	38	14	133
	V. Physical Contigency	88	42	16	146
	Grand Total	755	357	134	1,246
1/25	I. Main Construction Cost				
	1. Preparatory Works	36	19	7	62
	2. Main Works	360	186	68	614
	3. Miscellaneous Works	59	31	11	101
	Total of I.	455	236	86	777
	II. Compensation	46	24	9	79
	III. Administration	25	13	5	43
	IV. Engineering Services	73	38	14	125
	V. Physical Contigency	79	41	15	135
	Grand Total	678	352	129	1,159
1/10	I. Main Construction Cost				
	1. Preparatory Works	32	18	7	57
	2. Main Works	317	181	67	565
	3. Miscellaneous Works	52	30	11	93
	Total of I.	401	229	85	715
	II. Compensation	40	23	9	72
	III. Administration	22	13	5	40
	IV. Engineering Services	64	37	14	115
	V. Physical Contigency	69	40	15	124
	Grand Total	596	342	128	1,066

Table 2.15 SUMMARY OF PROJECT FINANCIAL COST OF AGNO RIVER FOR LONG TERM PLAN (25-YEAR FLOOD)

(Unit: 1,000 Pesos)

River	F.C.	L.C.	Total
I. Agno River			
1. Lower Agno River			
(1) RM-AG045	955,609	679,183	1,634,792
(2) AG045-AG122	1,958,053	963,113	2,921,166
(3) AG122-AG282	979,063	519,039	1,498,102
Sub-total of 1	3,892,725	2,161,335	6,054,060
2. Poponto Stretch			
(1) Bayambang Stretch	76,139	53,450	129,589
(2) Poponto Floodway	685,298	312,500	997,798
Sub-total of 2	761,437	365,950	1,127,387
3. Upper Agno River			
(1) AG309-AG351	299,418	225,551	524,969
(2) AG351-AG405	222,559	155,322	377,881
(3) AG405-AG473	871,344	429,655	1,300,999
Sub-total of 3	1,393,321	810,528	2,203,849
Total of I	6,047,483	3,337,813	9,385,296
II. Tarlac River			
(1) AG180-TA200	456,111	184,589	640,700
(2) TA200-TA265	446,532	333,839	780,371
Total of II	902,643	518,428	1,421,071
III. Agno River Tributary			
(1) Camiling River	225,737	161,015	386,752
(2) Banila River	459,202	314,534	773,736
(3) Viray-Dipalo River	150,801	149,433	300,234
(4) Ambayoan River	101,274	78,013	179,287
Total of III	937,014	702,995	1,640,009
GRAND TOTAL (I+II+III)	7,887,140	4,559,236	12,446,376

(CF-LG25A)

Table 2.16 SUMMARY OF PROJECT FINANCIAL COST OF ALLIED RIVERS FOR LONG TERM PLAN (10-YEAR FLOOD)

(Unit: 1,000 Pesos)

River	F.C.	L.C.	Total
I. Panto-Sinocalan River			
(1) Panto-Sinocalan River	539,589	376,417	916,006
(2) Dagupan River	379,441	207,483	586,924
(3) Ingalera River	334,582	219,499	554,081
(4) Macalong River	57,757	45,235	102,992
(5) Binalonan Floodway	0	0	0
Sub-Total I.	1,311,369	848,634	2,160,003
II. Cayanga-Patalan River			
(1) Cayanga-Patalan River	338,684	262,748	601,432
(2) Bued River	214,179	161,985	376,164
(3) Aloragat River	61,882	86,802	148,684
Sub-Total I.	614,745	511,535	1,126,280
Total of I. and II.	1,926,114	1,360,169	3,286,283

(CF-LG25B)

Table 2.17 (1/2) SUMMARY OF WORK QUANTITIES OF RIVER IMPROVEMENT OF AGNO RIVER FOR LONG TERM PLAN

River : Main Agno
Study : Long Term Plan (River Improvement and Natural Retarding Basin)
Return Period : 25 - year

Work Item	Unit	Agno River Main Stream											Total of Agno River
		Lower Agno River				Poponto Stretch			Upper Agno River				
		RM-AG045	*AG045-AG122	AG122-AG282	Sub-total	Bayambang Stretch	Poponto Floodway	Sub-total	AG309-AG351	AG351-AG405	AG405-AG473	Sub-total	
(1) Excavation 1	cu.m	0	5,333,000	7,100,000	12,433,000	650,000	5,440,000	6,090,000	1,900,000	1,400,000	0	3,300,000	21,823,000
Excavation 2	cu.m	0	0	0	0	0	0	0	0	0	2,850,000	2,850,000	2,850,000
Totoal of (1)	cu.m	0	5,333,000	7,100,000	12,433,000	650,000	5,440,000	6,090,000	1,900,000	1,400,000	2,850,000	6,150,000	24,673,000
(2) Dredging	cu.m	5,770,000	7,257,000	0	13,027,000	0	0	0	0	0	0	0	13,027,000
(3) Enbankment 1													
Left Dike	cu.m	0	0	1,440,800	1,440,000	84,300	133,700	218,000	77,700	236,000	0	313,700	1,971,700
Right Dike	cu.m	0	0	625,000	625,000	84,300	953,300	1,037,600	66,600	467,000	0	533,600	2,196,200
Enbankment 2													
Left Dike	cu.m	862,000	5,950,000	0	6,812,000	0	0	0	0	0	240,000	240,000	7,052,000
Right Dike	cu.m	798,000	752,000	0	1,550,000	0	0	0	0	0	2,500,000	2,500,000	4,050,000
Totoal of (3)	cu.m	1,660,000	6,702,000	2,065,000	10,427,000	168,600	1,087,000	1,255,600	144,300	703,000	2,740,000	3,587,300	15,269,900
(4) Sodding	cu.m	524,000	1,440,000	756,000	2,720,000	74,200	310,500	384,700	703,500	655,500	366,000	1,725,000	4,829,700
(5) Revetment (L.W.C.)													
Type-A	sq.m	16,000	24,000	0	40,000	3,150	59,800	62,950	32,800	24,400	75,100	132,300	235,250
Type-B	sq.m	0	21,600	58,600	130,200	4,670	0	4,670	0	0	0	0	134,870
Revetment (H.W.C.)													
Type-A	sq.m	0	0	0	0	0	0	0	30,500	13,400	13,600	57,500	57,500
Type-B	sq.m	14,400	21,600	11,800	47,800	0	38,100	38,100	0	0	0	0	85,900
Totoal of (5)	sq.m	30,400	117,200	70,400	218,000	7,820	97,900	105,720	63,300	37,800	88,700	189,800	513,520
(6) Groin (L.W.C.)													
Type-A	pc.	59	277	124	460	0	0	0	114	84	0	198	658
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)													
Type-A	pc.	0	0	0	0	0	0	0	0	0	148	148	148
Type-B	pc.	0	0	0	0	0	0	0	0	0	152	152	152
Totoal of (6)	pc.	59	277	124	460	0	0	0	114	84	300	498	958
(7) Sluice Way													
Type-A	pc.	0	0	2	2	1	1	2	0	2	1	3	7
Type-B	pc.	0	6	2	8	0	0	0	0	0	1	1	9
Totoal of (7)	pc.	0	6	4	10	1	1	2	0	2	2	4	16
(8) Water Gate													
Type-A	pc.	0	0	0	0	0	0	0	0	0	0	0	0
Type-B	pc.	2	0	0	2	0	0	0	0	0	0	0	2
Totoal of (8)	pc.	2	0	0	2	0	0	0	0	0	0	0	2
(9) Bridge													
Newly Const.	sq.m	22,500	11,850	11,250	45,600	0	0	0	6,750	0	0	6,750	52,350
Rehabilit.	sq.m	0	0	0	0	0	0	0	0	0	0	0	0
Demolishment													
Concrete	cu.m	3,400	1,480	1,400	6,280	0	0	0	3,800	0	0	3,800	10,080
Metal	ton	510	550	0	1,060	0	0	0	1,300	0	0	1,300	2,360
(10) Fixed Weir	pc.	0	0	0	0	0	1	1	0	0	0	0	1
(11) Others	L.S	0	0	0	0	0	0	0	0	0	0	0	0

Remarks : * AG045-AG122 include Dunuloc, Sobol, Bayaoas, and Olo Rivers of other tributaries of Agno River. (File cord : WQ-AGN25)

Table 2.17 (2/2) SUMMARY OF WORK QUANTITIES OF RIVER IMPROVEMENT OF AGNO RIVER FOR LONG TERM PLAN

River : Tarlac/other tributaries
Study : Long Term Plan (River Improvement and Natural Retarding Basin)
Return Period : 25 - year

Work Item	Unit	Tarlac River			Tributaries of Agno River				
		AG180-TA200 (Confluence)	TA200-TA265	Total of Tarlac River	Camiling River	Banila River	Viray-Dipalo River	Ambayaoan River	Total of Tributaries
(1) Excavation 1	cu.m	2,600,000	1,700,000	4,300,000	414,000	478,000	185,000	0	1,077,000
Excavation 2	cu.m	0	0	0	0	38,000	0	85,000	123,000
Total of (1)	cu.m	2,600,000	1,700,000	4,300,000	414,000	516,000	185,000	85,000	1,200,000
(2) Dredging	cu.m	0	0	0	0	0	0	0	0
(3) Embankment 1									
Left Dike	cu.m	558,000	315,500	873,500	467,600	623,500	42,000	134,200	1,267,300
Right Dike	cu.m	0	481,600	481,600	424,400	680,900	60,200	140,400	1,305,900
Embankment 2									
Left Dike	cu.m	0	0	0	0	7,800	0	0	7,800
Right Dike	cu.m	0	0	0	0	0	0	0	0
Total of (3)	cu.m	558,000	797,100	1,355,100	892,000	1,312,200	102,200	274,600	2,581,000
(4) Sodding	cu.m	437,800	979,800	1,417,600	441,400	739,000	119,200	152,400	1,452,000
(5) Revetment (L.W.C.)									
Type-A	sq.m	18,400	58,300	76,700	48,100	67,000	39,700	15,900	170,700
Type-B	sq.m	12,100	0	12,100	0	0	0	3,500	3,500
Revetment (H.W.C.)									
Type-A	sq.m	0	6,800	6,800	10,500	0	200	3,800	14,500
Type-B	sq.m	0	0	0	0	0	0	0	0
Total of (5)	sq.m	30,500	65,100	95,600	58,600	67,000	39,900	23,200	188,700
(6) Groin (L.W.C.)									
Type-A	pc.	0	244	244	276	420	286	88	1,070
Type-B	pc.	0	0	0	0	0	0	0	0
Groin (H.W.C.)									
Type-A	pc.	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0
Total of (6)	pc.	0	244	244	276	420	286	88	1,070
(7) Sluice Way									
Type-A	pc.	0	2	2	1	14	4	4	23
Type-B	pc.	0	0	0	3	0	0	0	3
Total of (7)	pc.	0	2	2	4	14	4	4	26
(8) Water Gate									
Type-A	pc.	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0
Total of (8)	pc.	0	0	0	0	0	0	0	0
(9) Bridge									
Newly Const.	sq.m	0	13,500	13,500	2,300	8,600	6,200	3,000	20,100
Rehabilit.	sq.m	0	0	0	0	0	0	0	0
Demolishment									
Concrete	cu.m	0	2,500	2,500	1,100	2,300	600	200	4,200
Metal	ton	0	0	0	0	0	0	0	0
(10) Fixed Weir	pc.	0	0	0	0	0	0	0	0
(11) Others	L.S	0	0	0	0	1	0	0	1

(File cord : WQ/TAL25)

Table 2.18 SUMMARY OF WORK QUANTITIES OF RIVER IMPROVEMENT OF ALLIED RIVERS FOR LONG TERM PLAN

River : Allied River
Study : Long Term Plan (River Improvement with Bued Closure Dike/without Binalonan Floodway)
Return Period : 10 - year

Work Item	Unit	Allied River										Total of Allied River
		Panto - Sinocalan River						Cayanga - Patalan River				
		*Panto-Sinocalan R.	Dagupan River	Ingalera River	Macalong River	Binalonan Floodway	Sub-total	**Cayanga-Patalan R.	Bued River	Aloragat River	Sub-total	
(1) Excavation 1	cu.m	1,925,000	702,000	1,395,000	194,000	0	4,216,000	1,254,000	183,800	216,000	1,653,800	5,869,800
Excavation 2	cu.m	0	0	0	0	0	0	0	188,000	0	188,000	188,000
Total of (1)	cu.m	1,925,000	702,000	1,395,000	194,000	0	4,216,000	1,254,000	371,800	216,000	1,841,800	6,057,800
(2) Dredging	cu.m	38,000	0	0	0	0	38,000	260,000	0	0	260,000	298,000
(3) Embankment 1												
Left Dike	cu.m	618,400	967,900	384,000	35,500	0	2,005,800	288,700	33,000	0	321,700	2,327,500
Right Dike	cu.m	618,400	967,900	384,000	35,500	0	2,005,800	288,700	33,000	0	321,700	2,327,500
Embankment 2												
Left Dike	cu.m	0	0	0	0	0	0	0	23,700	0	23,700	23,700
Right Dike	cu.m	0	0	0	0	0	0	0	51,100	0	51,100	51,100
Total of (3)	cu.m	1,236,800	1,935,800	768,000	71,000	0	4,011,600	577,400	140,800	0	718,200	4,729,800
(4) Sodding	cu.m	628,000	995,000	520,000	64,000	0	2,207,000	231,100	97,200	0	328,300	2,535,300
(5) Revetment (L.W.C.)												
Type-A	sq.m	73,000	30,400	18,900	20,900	0	143,200	75,200	39,700	40,800	155,700	298,900
Type-B	sq.m	38,000	40,300	124,200	0	0	202,500	30,300	0	0	30,300	232,800
Revetment (H.W.C.)												
Type-A	sq.m	27,200	0	0	0	0	27,200	5,800	1,500	0	7,300	34,500
Type-B	sq.m	0	0	0	0	0	0	0	0	0	0	0
Total of (5)	sq.m	138,200	70,700	143,100	20,900	0	372,900	111,300	41,200	40,800	193,300	566,200
(6) Groin (L.W.C.)												
Type-A	pc.	556	100	242	54	0	952	542	281	272	1,095	2,047
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Groin (H.W.C.)												
Type-A	pc.	0	0	0	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Total of (6)	pc.	556	100	242	54	0	952	542	281	272	1,095	2,047
(7) Sluice Way												
Type-A	pc.	16	4	8	8	0	36	10	6	0	16	52
Type-B	pc.	0	3	0	0	0	3	0	0	0	0	3
Total of (7)	pc.	16	7	8	8	0	39	10	6	0	16	55
(8) Water Gate												
Type-A	pc.	0	0	0	0	0	0	0	0	0	0	0
Type-B	pc.	0	0	0	0	0	0	0	0	0	0	0
Total of (8)	pc.	0	0	0	0	0	0	0	0	0	0	0
(9) Bridge												
Newly Const.	sq.m	8,000	0	3,900	38	0	11,938	1,210	3,000	263	4,473	16,411
Rehabilit.	sq.m	338	3,905	0	193	0	4,436	2,678	0	0	2,678	7,114
Demolishment												
Concrete	cu.m	4,590	1,200	1,700	470	0	7,960	1,700	300	200	2,200	10,160
Metal	ton	0	0	0	0	0	0	0	0	0	0	0
(10) Fixed Weir	pc.	0	0	0	0	0	0	0	0	0	0	0
(11) Others	L.S	0	0	0	0	0	0	0	1	0	1	1

Remarks: * Panto-Sinocalan River Consists of Panto, Marusay, Sinocalan, Tagumising and Tuboy Rivers. (File cord : WQ-ALE10)
** Cayanga-Patalan River consists of Cayanga, Patalan and Angalacan Rivers.

Table 2.19 (1/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-L01
River: Lower Agno River
Stretch: RN-AG45, L=6,850 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					55,237		28,238	83,474
2. Main Works								
(1) Excavation	1	m3	0	47	0	13	0	0
	2	m3	0	54	0	15	0	0
(2) Dredging		m3	5,770,000	27	155,790	9	51,930	207,720
(3) Embankment	1 Left Dike	m3	0	67	0	21	0	0
	Right Dike	m3	0	67	0	21	0	0
Embankment	2 Left Dike	m3	862,000	104	89,648	32	27,584	117,232
	Right Dike	m3	798,000	104	82,992	32	25,536	108,528
(4) Sodding		m2	524,000	0	0	10	5,240	5,240
(5) Revetment(L.W.C)	Type-A	m2	16,000	284	4,544	346	5,536	10,080
	Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)	Type-A	m2	0	302	0	370	0	0
	Type-B	m2	14,400	239	3,442	291	4,190	7,632
(6) Groin (L.W.C)	Type-A	pc.	59	33,860	1,998	97,140	5,731	7,729
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	0	1,161,000	0	549,000	0	0
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	2	31,174,000	62,348	11,172,000	22,344	84,692
(9) Demolishment	Concrete	m3	3,400	485	1,649	1,065	3,621	5,270
	Metal	ton	510	1,970	1,005	320	163	1,168
(10)Bridge	Newly const.	m2	22,500	6,620	148,950	5,800	130,500	279,450
	Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works					552,365		282,376	834,741
3. Miscellaneous Works					91,140		46,592	137,732
Total of 1					698,742		357,205	1,055,947
II. Compensation					0		158,000	158,000
III. Administration					0		60,697	60,697
IV. Physical Contingency					104,811		86,385	191,197
Total of I,II,III and IV					803,553		662,288	1,465,841
V. Enginnering Services					152,056		16,895	168,952
Grand Total					955,609		679,183	1,634,793

Table 2.19 (2/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-L02
River: Lower Agno River
Stretch: AG45-AG122, L=25,100 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						114,501		45,987	160,488
2. Main Works									
(1) Excavation	1		m3	5,333,000	47	250,651	13	69,329	319,980
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	7,257,000	27	195,939	9	65,313	261,252
(3) Embankment	1	Left Dike	m3	0	67	0	21	0	0
		Right Dike	m3	0	67	0	21	0	0
Embankment	2	Left Dike	m3	2,591,000	104	269,464	32	82,912	352,376
		Right Dike	m3	752,000	104	78,208	32	24,064	102,272
(4) Sodding			m2	1,440,000	0	0	10	14,400	14,400
(5) Revetment(L.W.C)		Type-A	m2	24,000	284	6,816	346	8,304	15,120
		Type-B	m2	71,600	191	13,676	233	16,683	30,358
Revetment(H.W.C)		Type-A	m2	0	302	0	370	0	0
		Type-B	m2	21,600	239	5,162	291	6,286	11,448
(6) Groin (L.W.C)		Type-A	pc.	277	33,860	9,379	97,140	26,908	36,287
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	0	1,161,000	0	549,000	0	0
		Type-B	pc.	6	1,736,000	10,416	775,000	4,650	15,066
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	1,000	485	485	1,065	1,065	1,550
		Metal	ton	550	1,970	1,084	320	176	1,260
(10)Bridge		Newly const.	m2	11,250	6,620	74,475	5,800	65,250	139,725
		Rehabili.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
*(13)Other Tributaries			L.S			229,258		74,530	303,788
Total of Main Works						1,145,013		459,869	1,604,882
3. Miscellaneous Works						188,927		75,878	264,806
Total of I						1,448,441		581,735	2,030,176
II. Compensation						0		120,000	120,000
III. Administration						0		107,509	107,509
IV. Physical Contingency						217,266		121,386	338,653
Total of I,II,III and IV						1,665,707		930,630	2,596,337
V. Enginnering Services						292,345		32,483	324,828
Grand Total						1,958,053		963,113	2,921,165

Note: * Refer to Table 2.19.(15/22)

Table 2.19 (3/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-L03
River:Lower Agno River
Stretch: AG122-AG282, L=12,400 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						57,121		24,175	81,296
2. Main Works									
(1) Excavation	1		m3	7,100,000	47	333,700	13	92,300	426,000
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	1,440,000	67	96,480	21	30,240	126,720
		Right Dike	m3	625,000	67	41,875	21	13,125	55,000
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	756,000	0	0	10	7,560	7,560
(5) Revetment(L.W.C)		Type-A	m2	0	284	0	346	0	0
		Type-B	m2	58,600	191	11,193	233	13,654	24,846
Revetment(H.W.C)		Type-A	m2	0	302	0	370	0	0
		Type-B	m2	11,800	239	2,820	291	3,434	6,254
(6) Groin (L.W.C)		Type-A	pc.	124	33,860	4,199	97,140	12,045	16,244
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	2	1,161,000	2,322	549,000	1,098	3,420
		Type-B	pc.	2	1,736,000	3,472	775,000	1,550	5,022
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	1,400	485	679	1,065	1,491	2,170
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	11,250	6,620	74,475	5,800	65,250	139,725
		Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						571,214		241,747	812,961
3. Miscellaneous Works						94,250		39,888	134,139
Total of I						722,586		305,810	1,028,396
II. Compensation						0		76,000	76,000
III. Administration						0		55,220	55,220
IV. Physical Contingency						108,388		65,554	173,942
Total of I,II,III and IV						830,974		502,584	1,333,558
V. Enginnering Services						148,089		16,454	164,543
Grand Total						979,063		519,039	1,498,102

Table 2.19 (4/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-PPE
River: Bayambang Stretch, Agno River
Stretch: AG282-AG307, L=9,800 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					4,479		1,546	6,025
2. Main Works								
(1) Excavation	1	m3	650,000	47	30,550	13	8,450	39,000
	2	m3	0	54	0	15	0	0
(2) Dredging		m3	0	27	0	9	0	0
(3) Embankment	1 Left Dike	m3	84,300	67	5,648	21	1,770	7,418
	Right Dike	m3	84,300	67	5,648	21	1,770	7,418
Embankment	2 Left Dike	m3	0	104	0	32	0	0
	Right Dike	m3	0	104	0	32	0	0
(4) Sodding		m2	74,200	0	0	10	742	742
(5) Revetment(L.W.C)	Type-A	m2	3,150	284	895	346	1,090	1,985
	Type-B	m2	4,670	191	892	233	1,088	1,980
Revetment(H.W.C)	Type-A	m2	0	302	0	370	0	0
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	0	33,860	0	97,140	0	0
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	1	1,161,000	1,161	549,000	549	1,710
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment	Concrete	m3	0	485	0	1,065	0	0
	Metal	ton	0	1,970	0	320	0	0
(10)Bridge	Newly const.	m2	0	6,620	0	5,800	0	0
	Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works					44,794		15,460	60,253
3. Miscellaneous Works					7,391		2,551	9,942
Total of I					56,664		19,556	76,221
II. Compensation					0		21,000	21,000
III. Administration					0		4,861	4,861
IV. Physical Contingency					8,500		6,813	15,312
Total of I,II,III and IV					65,164		52,230	117,394
V. Enginnering Services					10,976		1,220	12,195
Grand Total					76,139		53,450	129,589

Table 2.19 (5/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-PPF
River:Poponto Floodway, Agno River
Stretch: AG282-AG309, L=10,100 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						40,025		16,538	56,563
2. Main Works									
(1) Excavation	1		m3	5,440,000	47	255,680	13	70,720	326,400
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	133,700	67	8,958	21	2,808	11,766
		Right Dike	m3	953,300	67	63,871	21	20,019	83,890
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	310,500	0	0	10	3,105	3,105
(5) Revetment(L.W.C)		Type-A	m2	59,800	284	16,983	346	20,691	37,674
		Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)		Type-A	m2	0	302	0	370	0	0
		Type-B	m2	38,100	239	9,106	291	11,087	20,193
(6) Groin (L.W.C)		Type-A	pc.	0	33,860	0	97,140	0	0
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	1	1,161,000	1,161	549,000	549	1,710
		Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	0	485	0	1,065	0	0
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	0	6,620	0	5,800	0	0
		Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	1	44,490,000	44,490	36,403,000	36,403	80,893
Total of Main Works						400,249		165,382	565,631
3. Miscellaneous Works						66,041		27,288	93,329
Total of I						506,315		209,208	715,523
II. Compensation						0		16,000	16,000
III. Administration						0		36,576	36,576
IV. Physical Contingency						75,947		39,268	115,215
Total of I,II,III and IV						582,262		301,052	883,314
V. Enginnering Services						103,035		11,448	114,484
Grand Total						685,298		312,500	997,798

Table 2.19 (6/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-UP1
River:Upper Agno River
Stretch: AG309-AG351, L=14,300 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					17,044		11,209	28,253
2. Main Works								
(1) Excavation	1	m3	1,900,000	47	89,300	13	24,700	114,000
	2	m3	0	54	0	15	0	0
(2) Dredging		m3	0	27	0	9	0	0
(3) Embankment	1 Left Dike	m3	77,700	67	5,206	21	1,632	6,838
	Right Dike	m3	66,600	67	4,462	21	1,399	5,861
Embankment	2 Left Dike	m3	0	104	0	32	0	0
	Right Dike	m3	0	104	0	32	0	0
(4) Sodding		m2	703,500	0	0	10	7,035	7,035
(5) Revetment(L.W.C)	Type-A	m2	32,800	284	9,315	346	11,349	20,664
	Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)	Type-A	m2	30,500	302	9,211	370	11,285	20,496
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	114	33,860	3,860	97,140	11,074	14,934
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	0	1,161,000	0	549,000	0	0
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment	Concrete	m3	3,800	485	1,843	1,065	4,047	5,890
	Metal	ton	1,300	1,970	2,561	320	416	2,977
(10)Bridge	Newly const.	m2	6,750	6,620	44,685	5,800	39,150	83,835
	Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works					170,443		112,086	282,529
3. Miscellaneous Works					28,123		18,494	46,617
Total of I					215,611		141,789	357,400
II. Compensation					0		30,000	30,000
III. Administration					0		19,370	19,370
IV. Physical Contingency					32,342		28,674	61,015
Total of I,II,III and IV					247,952		219,833	467,785
V. Enginnering Services					51,466		5,718	57,184
Grand Total					299,418		225,551	524,969

Table 2.19 (7/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-UP2
River:Upper Agno River
Stretch: AG351-AG405, L=10,600 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						12,904		6,218	19,122
2. Main Works									
(1) Excavation	1		m3	1,400,000	47	65,800	13	18,200	84,000
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	236,000	67	15,812	21	4,956	20,768
		Right Dike	m3	467,000	67	31,289	21	9,807	41,096
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	655,500	0	0	10	6,555	6,555
(5) Revetment(L.W.C)		Type-A	m2	24,400	284	6,930	346	8,442	15,372
		Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)		Type-A	m2	13,400	302	4,047	370	4,958	9,005
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	84	33,860	2,844	97,140	8,160	11,004
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	2	1,161,000	2,322	549,000	1,098	3,420
		Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	0	485	0	1,065	0	0
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	0	6,620	0	5,800	0	0
		Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						129,044		62,176	191,220
3. Miscellaneous Works						21,292		10,259	31,551
Total of I						163,240		78,653	241,893
II. Compensation						0		39,000	39,000
III. Administration						0		14,045	14,045
IV. Physical Contingency						24,486		19,755	44,241
Total of I,II,III and IV						187,726		151,452	339,178
V. Enginnering Services						34,833		3,870	38,703
Grand Total						222,559		155,322	377,881

Table 2.19 (8/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-UP3
River: Upper Agno River
Stretch: AG405-AG473, L=19,600 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						50,741		22,372	73,113
2. Main Works									
(1) Excavation	1		m3	0	47	0	13	0	0
	2		m3	2,850,000	54	153,900	15	42,750	196,650
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	0	67	0	21	0	0
		Right Dike	m3	0	67	0	21	0	0
Embankment	2	Left Dike	m3	240,000	104	24,960	32	7,680	32,640
		Right Dike	m3	2,500,000	104	260,000	32	80,000	340,000
(4) Sodding			m2	366,000	0	0	10	3,660	3,660
(5) Revetment(L.W.C)		Type-A	m2	75,100	284	21,328	346	25,985	47,313
		Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)		Type-A	m2	13,600	302	4,107	370	5,032	9,139
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	0	33,860	0	97,140	0	0
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	148	33,500	4,958	61,500	9,102	14,060
		Type-B	pc.	152	232,000	35,264	317,000	48,184	83,448
(7) Sluice Way		Type-A	pc.	1	1,161,000	1,161	549,000	549	1,710
		Type-B	pc.	1	1,736,000	1,736	775,000	775	2,511
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	0	485	0	1,065	0	0
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	0	6,620	0	5,800	0	0
		Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						507,415		223,717	731,131
3. Miscellaneous Works						83,723		36,913	120,637
Total of I						641,879		283,001	924,881
II. Compensation						0		30,000	30,000
III. Administration						0		47,744	47,744
IV. Physical Contingency						96,282		54,112	150,394
Total of I,II,III and IV						738,161		414,857	1,153,019
V. Enginnering Services						133,183		14,798	147,981
Grand Total						871,344		429,655	1,301,000

Table 2.19 (9/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-TA1
River:Tarlac River
Stretch: AG180-TA200, L=8,850 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					26,838		9,222	36,060
2. Main Works								
(1) Excavation	1	m3	2,600,000	47	122,200	13	33,800	156,000
	2	m3	0	54	0	15	0	0
(2) Dredging		m3	0	27	0	9	0	0
(3) Embankment	1 Left Dike	m3	558,000	67	37,386	21	11,718	49,104
	Right Dike	m3	1,046,000	67	70,082	21	21,966	92,048
Embankment	2 Left Dike	m3	0	104	0	32	0	0
	Right Dike	m3	0	104	0	32	0	0
(4) Sodding		m2	437,800	0	0	10	4,378	4,378
(5) Revetment(L.W.C)	Type-A	m2	18,400	284	5,226	346	6,366	11,592
	Type-B	m2	12,100	191	2,311	233	2,819	5,130
Revetment(H.W.C)	Type-A	m2	0	302	0	370	0	0
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	0	33,860	0	97,140	0	0
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	0	1,161,000	0	549,000	0	0
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	1	31,174,000	31,174	11,172,000	11,172	42,346
(9) Demolishment	Concrete	m3	0	485	0	1,065	0	0
	Metal	ton	0	1,970	0	320	0	0
(10)Bridge	Newly const.	m2	0	6,620	0	5,800	0	0
	Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works					268,379		92,220	360,598
3. Miscellaneous Works					44,282		15,216	59,499
Total of I					339,499		116,658	456,157
II. Compensation					0		14,000	14,000
III. Administration					0		23,508	23,508
IV. Physical Contingency					50,925		23,125	74,050
Total of I,II,III and IV					390,424		177,291	567,715
V. Enginnering Services					65,687		7,299	72,985
Grand Total					456,111		184,589	640,700

Table 2.19 (10/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-TA2
River:Tarlac River
Stretch: TA200-TA265, L=30,450 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						25,308		17,709	43,017
2. Main Works									
(1) Excavation	1		m3	1,700,000	47	79,900	13	22,100	102,000
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	315,500	67	21,139	21	6,626	27,764
		Right Dike	m3	481,600	67	32,267	21	10,114	42,381
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	979,800	0	0	10	9,798	9,798
(5) Revetment(L.W.C)		Type-A	m2	58,300	284	16,557	346	20,172	36,729
		Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)		Type-A	m2	6,800	302	2,054	370	2,516	4,570
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	244	33,860	8,262	97,140	23,702	31,964
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	2	1,161,000	2,322	549,000	1,098	3,420
		Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	2,500	485	1,213	1,065	2,663	3,875
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	13,500	6,620	89,370	5,800	78,300	167,670
		Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						253,083		177,088	430,170
3. Miscellaneous Works						41,759		29,219	70,978
Total of I						320,150		224,016	544,166
II. Compensation						0		30,000	30,000
III. Administration						0		28,708	28,708
IV. Physical Contingency						48,022		42,409	90,431
Total of I,II,III and IV						368,172		325,133	693,305
V. Enginnering Services						78,360		8,707	87,066
Grand Total						446,532		333,839	780,371

Table 2.19 (11/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-CAM
River: Camiling, Tributary of Agno River
Stretch: CA154-CA174, L=18,550 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						12,753		9,325	22,078
2. Main Works									
(1) Excavation	1		m3	414,000	47	19,458	13	5,382	24,840
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	467,600	67	31,329	21	9,820	41,149
		Right Dike	m3	424,400	67	28,435	21	8,912	37,347
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	441,400	0	0	10	4,414	4,414
(5) Revetment(L.W.C)		Type-A	m2	48,100	284	13,660	346	16,643	30,303
		Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)		Type-A	m2	10,500	302	3,171	370	3,885	7,056
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	276	33,860	9,345	97,140	26,811	36,156
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	1	1,161,000	1,161	549,000	549	1,710
		Type-B	pc.	3	1,736,000	5,208	775,000	2,325	7,533
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	1,100	485	534	1,065	1,172	1,705
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	2,300	6,620	15,226	5,800	13,340	28,566
		Rehabili.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						127,527		93,252	220,779
3. Miscellaneous Works						21,042		15,387	36,429
Total of I						161,322		117,963	279,285
II. Compensation						0		4,000	4,000
III. Administration						0		14,164	14,164
IV. Physical Contingency						24,198		20,419	44,617
Total of I,II,III and IV						185,520		156,547	342,067
V. Enginnering Services						40,217		4,469	44,686
Grand Total						225,737		161,015	386,753

Table 2.19 (12/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-BAN
River: Banila, Tributary of Agno River
Stretch: AG351-BN401, L=30,900 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					26,017		18,291	44,309
2. Main Works								
(1) Excavation	1	m3	478,000	47	22,466	13	6,214	28,680
	2	m3	38,000	54	2,052	15	570	2,622
(2) Dredging		m3	0	27	0	9	0	0
(3) Embankment	1 Left Dike	m3	623,500	67	41,775	21	13,094	54,868
	Right Dike	m3	680,900	67	45,620	21	14,299	59,919
Embankment	2 Left Dike	m3	7,800	104	811	32	250	1,061
	Right Dike	m3	0	104	0	32	0	0
(4) Sodding		m2	739,000	0	0	10	7,390	7,390
(5) Revetment(L.W.C)	Type-A	m2	67,000	284	19,028	346	23,182	42,210
	Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)	Type-A	m2	0	302	0	370	0	0
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	420	33,860	14,221	97,140	40,799	55,020
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	14	1,161,000	16,254	549,000	7,686	23,940
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment	Concrete	m3	2,300	485	1,116	1,065	2,450	3,565
	Metal	ton	0	1,970	0	320	0	0
(10)Bridge	Newly const.	m2	8,600	6,620	56,932	5,800	49,880	106,812
	Rehabilit.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
(12)Exist. Head Weir	Repair Works	pc.	3	10,500,000	31,500	4,500,000	13,500	45,000
(13)Exist. Intake Weir	Repair Works	pc.	2	4,200,000	8,400	1,800,000	3,600	12,000
Total of Main Works					260,175		182,912	443,087
3. Miscellaneous Works					42,929		30,181	73,109
Total of I					329,121		231,384	560,505
II. Compensation					0		6,000	6,000
III. Administration					0		28,325	28,325
IV. Physical Contingency					49,368		39,856	89,225
Total of I,II,III and IV					378,489		305,566	684,055
V. Enginnering Services					80,713		8,968	89,681
Grand Total					459,202		314,534	773,736

Table 2.19 (13/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-VDP
River: Viray-Dipalo, Tributary of Agno River
Stretch: VD424-VD443, L=20,550 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						8,254		8,613	16,867
2. Main Works									
(1) Excavation	1		m3	185,000	47	8,695	13	2,405	11,100
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	42,000	67	2,814	21	882	3,696
		Right Dike	m3	60,200	67	4,033	21	1,264	5,298
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	119,200	0	0	10	1,192	1,192
(5) Revetment(L.W.C)		Type-A	m2	39,700	284	11,275	346	13,736	25,011
		Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)		Type-A	m2	200	302	60	370	74	134
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	286	33,860	9,684	97,140	27,782	37,466
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	4	1,161,000	4,644	549,000	2,196	6,840
		Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	600	485	291	1,065	639	930
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	6,200	6,620	41,044	5,800	35,960	77,004
		Rehabili.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						82,541		86,130	168,671
3. Miscellaneous Works						13,619		14,212	27,831
Total of I						104,414		108,955	213,369
II. Compensation						0		7,000	7,000
III. Administration						0		11,018	11,018
IV. Physical Contingency						15,662		19,046	34,708
Total of I,II,III and IV						120,076		146,019	266,095
V. Enginnering Services						30,725		3,414	34,139
Grand Total						150,801		149,433	300,234

Table 2.19 (14/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-AMB
River: Ambayaoan, Tributary of Agno River
Stretch: AM444-AM451, L=8,500 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						5,690		4,465	10,155
2. Main Works									
(1) Excavation	1		m3	0	47	0	13	0	0
	2		m3	85,000	54	4,590	15	1,275	5,865
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	134,200	67	8,991	21	2,818	11,810
		Right Dike	m3	140,400	67	9,407	21	2,948	12,355
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	152,400	0	0	10	1,524	1,524
(5) Revetment(L.W.C)		Type-A	m2	15,900	284	4,516	346	5,501	10,017
		Type-B	m2	3,500	191	669	233	816	1,484
Revetment(H.W.C)		Type-A	m2	3,800	302	1,148	370	1,406	2,554
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	88	33,860	2,980	97,140	8,548	11,528
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	4	1,161,000	4,644	549,000	2,196	6,840
		Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	200	485	97	1,065	213	310
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	3,000	6,620	19,860	5,800	17,400	37,260
		Rehabili.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						56,901		44,646	101,546
3. Miscellaneous Works						9,389		7,367	16,755
Total of I						71,979		56,477	128,456
II. Compensation						0		3,000	3,000
III. Administration						0		6,573	6,573
IV. Physical Contingency						10,797		9,907	20,704
Total of I,II,III and IV						82,776		75,957	158,733
V. Enginnering Services						18,498		2,055	20,553
Grand Total						101,274		78,013	179,286

Table 2.19 (15/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

AGN-OTH
River: Other Tributaries of Agno River
Stretch: Dumloc, Sobol, Bayaoas and Olo Rivers

Work Items	Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction							
1. Preparatory Works				22,926		7,453	30,379
2. Main Works							
(1) Dumloc River, AG56							
L=1,700 m Embankment	m3	216,000	67	14,472	21	4,536	19,008
(2) Sobol River, AG65							
L=1,350 m Embankment	m3	223,000	67	14,941	21	4,683	19,624
(3) Bayaoas River, AG86							
L=2,900 m Embankment	m3	555,000	67	37,185	21	11,655	48,840
(4) Olo River, AG109							
L=5,200 m Embankment	m3	700,000	67	46,900	21	14,700	61,600
L=8,700 m Embankment	m3	1,505,000	67	100,835	21	31,605	132,440
L=3,200 m Embankment	m3	160,000	67	10,720	21	3,360	14,080
Demolishment Concrete	m3	480	485	233	1,065	511	744
Bridge Newly const.	m2	600	6,620	3,972	5,800	3,480	7,452
Total of Main Works				229,258		74,530	303,788
3. Miscellaneous Works				37,828		12,297	50,125
Total of I				290,011		94,281	384,292

Table 2.19 (16/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

ALE-PASS
River: Panto-Sinocalan, Allied River
Stretch: C001-C017, L=49,800 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					30,540		21,784	52,324
2. Main Works								
(1) Excavation	1	m3	1,925,000	47	90,475	13	25,025	115,500
	2	m3	0	54	0	15	0	0
(2) Dredging		m3	38,000	27	1,026	9	342	1,368
(3) Embankment	1 Left Dike	m3	618,400	67	41,433	21	12,986	54,419
	Right Dike	m3	618,400	67	41,433	21	12,986	54,419
Embankment	2 Left Dike	m3	0	104	0	32	0	0
	Right Dike	m3	0	104	0	32	0	0
(4) Sodding		m2	628,000	0	0	10	6,280	6,280
(5) Revetment(L.W.C)	Type-A	m2	73,000	284	20,732	346	25,258	45,990
	Type-B	m2	38,000	191	7,258	233	8,854	16,112
Revetment(H.W.C)	Type-A	m2	27,200	302	8,214	370	10,064	18,278
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	556	33,860	18,826	97,140	54,010	72,836
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	16	1,161,000	18,576	549,000	8,784	27,360
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment	Concrete	m3	4,590	485	2,226	1,065	4,888	7,115
	Metal	ton	0	1,970	0	320	0	0
(10)Bridge	Newly const.	m2	8,000	6,620	52,960	5,800	46,400	99,360
	Rehabilit.	m2	338	6,620	2,238	5,800	1,960	4,198
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works					305,397		217,838	523,235
3. Miscellaneous Works					50,390		35,943	86,334
Total of I					386,327		275,566	661,893
II. Compensation					0		9,000	9,000
III. Administration					0		33,545	33,545
IV. Physical Contingency					57,949		47,717	105,666
Total of I,II,III and IV					444,276		365,827	810,103
V. Enginnering Services					95,313		10,590	105,903
Grand Total					539,589		376,417	916,006

Table 2.19 (17/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

PAS-DAGS
River: Dagupan, Tributary of Panto-Sinocalan, Allied River
Stretch: P006-P010, L=27,600 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						21,869		11,780	33,649
2. Main Works									
(1) Excavation	1		m3	702,000	47	32,994	13	9,126	42,120
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	967,900	67	64,849	21	20,326	85,175
		Right Dike	m3	967,900	67	64,849	21	20,326	85,175
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	995,000	0	0	10	9,950	9,950
(5) Revetment(L.W.C)		Type-A	m2	30,400	284	8,634	346	10,518	19,152
		Type-B	m2	40,300	191	7,697	233	9,390	17,087
Revetment(H.W.C)		Type-A	m2	0	302	0	370	0	0
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	100	33,860	3,386	97,140	9,714	13,100
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	4	1,161,000	4,644	549,000	2,196	6,840
		Type-B	pc.	3	1,736,000	5,208	775,000	2,325	7,533
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	1,200	485	582	1,065	1,278	1,860
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	0	6,620	0	5,800	0	0
		Rehabili.	m2	3,905	6,620	25,851	5,800	22,649	48,500
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						218,695		117,798	336,493
3. Miscellaneous Works						36,085		19,437	55,521
Total of I						276,649		149,015	425,663
II. Compensation						0		4,000	4,000
III. Administration						0		21,483	21,483
IV. Physical Contingency						41,497		26,175	67,672
Total of I,II,III and IV						318,146		200,672	518,818
V. Engineering Services						61,296		6,811	68,106
Grand Total						379,441		207,483	586,925

Table 2.19 (18/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

PAS-INGS
River: Ingalera, Tributary of Panto-Sinocalan, Allied River
Stretch: P012-P015, L=37,500 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					19,024		12,727	31,751
2. Main Works								
(1) Excavation	1	m3	1,395,000	47	65,565	13	18,135	83,700
	2	m3	0	54	0	15	0	0
(2) Dredging		m3	0	27	0	9	0	0
(3) Embankment	1 Left Dike	m3	384,000	67	25,728	21	8,064	33,792
	Right Dike	m3	384,000	67	25,728	21	8,064	33,792
Embankment	2 Left Dike	m3	0	104	0	32	0	0
	Right Dike	m3	0	104	0	32	0	0
(4) Sodding		m2	520,000	0	0	10	5,200	5,200
(5) Revetment(L.W.C)	Type-A	m2	18,900	284	5,368	346	6,539	11,907
	Type-B	m2	124,200	191	23,722	233	28,939	52,661
Revetment(H.W.C)	Type-A	m2	0	302	0	370	0	0
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	242	33,860	8,194	97,140	23,508	31,702
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	8	1,161,000	9,288	549,000	4,392	13,680
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment	Concrete	m3	1,700	485	825	1,065	1,811	2,635
	Metal	ton	0	1,970	0	320	0	0
(10)Bridge	Newly const.	m2	3,900	6,620	25,818	5,800	22,620	48,438
	Rehabili.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works					190,235		127,271	317,507
3. Miscellaneous Works					31,389		21,000	52,389
Total of I					240,648		160,998	401,646
II. Compensation					0		4,000	4,000
III. Administration					0		20,282	20,282
IV. Physical Contingency					36,097		27,792	63,889
Total of I,II,III and IV					276,745		213,073	489,818
V. Enginnering Services					57,837		6,426	64,263
Grand Total					334,582		219,499	554,081

Table 2.19 (19/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

PAS-MACS
River: Macalong, Tributary of Panto-Sinocalan, Allied River
Stretch: P023.1-P024.2, L=22,000 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						3,268		2,336	5,605
2. Main Works									
(1) Excavation	1		m3	194,000	47	9,118	13	2,522	11,640
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	0	27	0	9	0	0
(3) Embankment	1	Left Dike	m3	35,500	67	2,379	21	746	3,124
		Right Dike	m3	35,500	67	2,379	21	746	3,124
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	64,000	0	0	10	640	640
(5) Revetment(L.W.C)		Type-A	m2	20,900	284	5,936	346	7,231	13,167
		Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)		Type-A	m2	0	302	0	370	0	0
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	54	33,860	1,828	97,140	5,246	7,074
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	8	1,161,000	9,288	549,000	4,392	13,680
		Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	470	485	228	1,065	501	729
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	38	6,620	252	5,800	220	472
		Rehabilit.	m2	193	6,620	1,278	5,800	1,119	2,397
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						32,684		23,362	56,047
3. Miscellaneous Works						5,393		3,855	9,248
Total of I						41,346		29,553	70,899
II. Compensation						0		5,000	5,000
III. Administration						0		3,795	3,795
IV. Physical Contingency						6,202		5,752	11,954
Total of I,II,III and IV						47,547		44,101	91,648
V. Enginnering Services						10,209		1,134	11,344
Grand Total						57,757		45,235	102,992

Table 2.19 (20/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

ALE-CAPS
River: Cayanga-Patalan, Allied River
Stretch: C001-C011, L=37,500 m

Work Items			Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction									
1. Preparatory Works						19,006		15,132	34,139
2. Main Works									
(1) Excavation	1		m3	1,254,000	47	58,938	13	16,302	75,240
	2		m3	0	54	0	15	0	0
(2) Dredging			m3	260,000	27	7,020	9	2,340	9,360
(3) Embankment	1	Left Dike	m3	288,700	67	19,343	21	6,063	25,406
		Right Dike	m3	288,700	67	19,343	21	6,063	25,406
Embankment	2	Left Dike	m3	0	104	0	32	0	0
		Right Dike	m3	0	104	0	32	0	0
(4) Sodding			m2	283,100	0	0	10	2,831	2,831
(5) Revetment(L.W.C)		Type-A	m2	75,200	284	21,357	346	26,019	47,376
		Type-B	m2	30,300	191	5,787	233	7,060	12,847
Revetment(H.W.C)		Type-A	m2	5,800	302	1,752	370	2,146	3,898
		Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)		Type-A	pc.	542	33,860	18,352	97,140	52,650	71,002
		Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)		Type-A	pc.	0	33,500	0	61,500	0	0
		Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way		Type-A	pc.	10	1,161,000	11,610	549,000	5,490	17,100
		Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate		Type-A	pc.	0	14,730,000	0	5,881,000	0	0
		Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment		Concrete	m3	1,700	485	825	1,065	1,811	2,635
		Metal	ton	0	1,970	0	320	0	0
(10)Bridge		Newly const.	m2	1,210	6,620	8,010	5,800	7,018	15,028
		Rehabilit.	m2	2,678	6,620	17,728	5,800	15,532	33,261
(11)Fixed Weir			pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works						190,065		151,324	341,389
3. Miscellaneous Works						31,361		24,969	56,329
Total of I						240,432		191,425	431,857
II. Compensation						0		9,000	9,000
III. Administration						0		22,043	22,043
IV. Physical Contingency						36,065		33,370	69,435
Total of I,II,III and IV						276,497		255,838	532,335
V. Enginnering Services						62,187		6,910	69,097
Grand Total						338,684		262,748	601,432

Table 2.19 (21/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

CAP-BUES
River: Bued, Tributary of Cayanga-Patalan, Allied River
Stretch: C003.1-C004.2, L=21,300 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					12,079		9,038	21,117
2. Main Works								
(1) Excavation	1	m3	183,800	47	8,639	13	2,389	11,028
	2	m3	188,000	54	10,152	15	2,820	12,972
(2) Dredging		m3	0	27	0	9	0	0
(3) Embankment	1 Left Dike	m3	33,000	67	2,211	21	693	2,904
	Right Dike	m3	33,000	67	2,211	21	693	2,904
Embankment	2 Left Dike	m3	23,700	104	2,465	32	758	3,223
	Right Dike	m3	51,100	104	5,314	32	1,635	6,950
(4) Sodding		m2	97,200	0	0	10	972	972
(5) Revetment(L.W.C)	Type-A	m2	39,700	284	11,275	346	13,736	25,011
	Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)	Type-A	m2	1,500	302	453	370	555	1,008
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	281	33,860	9,515	97,140	27,296	36,811
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	6	1,161,000	6,966	549,000	3,294	10,260
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment	Concrete	m3	300	485	146	1,065	320	465
	Metal	ton	0	1,970	0	320	0	0
(10)Bridge	Newly const.	m2	3,000	6,620	19,860	5,800	17,400	37,260
	Rehabili.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
(12)Closing Dike		m	2,000	20,790	41,580	8,910	17,820	59,400
Total of Main Works					120,786		90,382	211,168
3. Miscellaneous Works					19,930		14,913	34,843
Total of I					152,794		114,333	267,127
II. Compensation					0		9,000	9,000
III. Administration					0		13,806	13,806
IV. Physical Contingency					22,919		20,571	43,490
Total of I,II,III and IV					175,713		157,711	333,424
V. Engineering Services					38,466		4,274	42,740
Grand Total					214,179		161,985	376,164

Table 2.19 (22/22) COST ESTIMATE OF RIVER IMPROVEMENT WORKS (FINANCIAL COST)

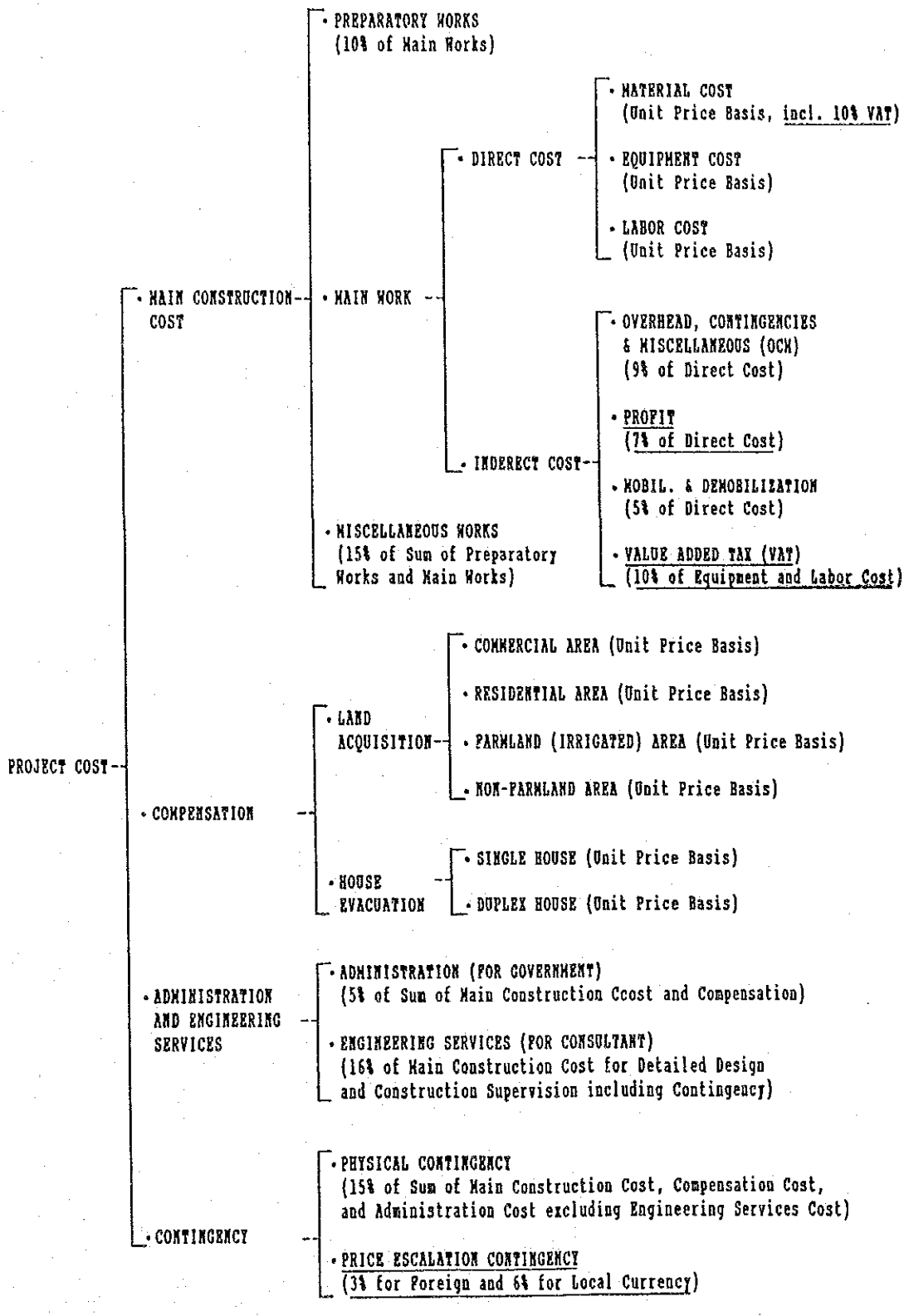
CAP-ALOS
River: Aloragat, Tributary of Cayanga-Patalan, Allied River
Stretch: C006.1-C008, L=19,000 m

Work Items		Unit	Quantity	F.C.Portion Unit Cost (peso)	F.C.Portion Amount (P.1000)	L.C.Portion Unit Cost (peso)	L.C.Portion Amount (P.1000)	Total (P.1000)
I Main Construction								
1. Preparatory Works					3,279		4,509	7,787
2. Main Works								
(1) Excavation	1	m3	216,000	47	10,152	13	2,808	12,960
	2	m3	0	54	0	15	0	0
(2) Dredging		m3	0	27	0	9	0	0
(3) Embankment	1 Left Dike	m3	0	67	0	21	0	0
	Right Dike	m3	0	67	0	21	0	0
Embankment	2 Left Dike	m3	0	104	0	32	0	0
	Right Dike	m3	0	104	0	32	0	0
(4) Sodding		m2	0	0	0	10	0	0
(5) Revetment(L.W.C)	Type-A	m2	40,800	284	11,587	346	14,117	25,704
	Type-B	m2	0	191	0	233	0	0
Revetment(H.W.C)	Type-A	m2	0	302	0	370	0	0
	Type-B	m2	0	239	0	291	0	0
(6) Groin (L.W.C)	Type-A	pc.	272	33,860	9,210	97,140	26,422	35,632
	Type-B	pc.	0	287,000	0	390,000	0	0
Groin (H.W.C)	Type-A	pc.	0	33,500	0	61,500	0	0
	Type-B	pc.	0	232,000	0	317,000	0	0
(7) Sluice Way	Type-A	pc.	0	1,161,000	0	549,000	0	0
	Type-B	pc.	0	1,736,000	0	775,000	0	0
(8) Water Gate	Type-A	pc.	0	14,730,000	0	5,881,000	0	0
	Type-B	pc.	0	31,174,000	0	11,172,000	0	0
(9) Demolishment	Concrete	m3	200	485	97	1,065	213	310
	Metal	ton	0	1,970	0	320	0	0
(10)Bridge	Newly const.	m2	263	6,620	1,741	5,800	1,525	3,266
	Rehabili.	m2	0	6,620	0	5,800	0	0
(11)Fixed Weir		pc.	0	44,490,000	0	36,403,000	0	0
Total of Main Works					32,787		45,085	77,872
3. Miscellaneous Works					5,410		7,439	12,849
Total of I					41,476		57,033	98,509
II. Compensation					0		2,000	2,000
III. Administration					0		15,076	15,076
IV. Physical Contingency					6,221		11,116	17,338
Total of I,II,III and IV					47,697		85,226	132,923
V. Enginnering Services					14,185		1,576	15,761
Grand Total					61,882		86,802	148,684

Table 2.20 QUANTITY AND COST OF COMPENSATION WORK

River/River Stretch	Land (ha)	House (Nos)	Lost (Milli. Pesos)
I. Agno River			
RM-AG045	1,290	1,370	158
AG045-AG122	7,489	750	120
AG122-AG282	2,232	900	76
AG282-AG307	941	190	21
AG282-AG309	1,010	100	16
AG309-AG351	1,860	190	30
AG351-AG405	2,438	250	39
AG405-AG473	2,940	150	30
Total	20,200	3,900	490
II. Tarlac River			
AG180-TA200	885	90	14
TA200-TA265	2,768	90	30
Total	3,653	180	44
III. Tributaries of Agno River			
Ambayaoan River	334	0	3
Viray-Dipalo River	651	0	7
Banila River	555	0	6
Camiling River	408	0	4
Total	1,948	0	20
IV. Allied River			
Cayang-Patalan River	850	0	9
Bued River	910	0	9
Aloragat River	206	0	2
Total	1,966	0	20
V. Panto-Sinocalan River			
Panto-Sinocalan River	880	0	9
Binalonan Floodway	68	60	4
Ingalera River	402	0	4
Dagupan River	445	0	4
Macalong River	495	0	5
Total	2,290	60	26
Grand Total	30,057	4,140	600

FIGURES



Note: For Financial Project Cost, all Items are included.
For Economic Project Cost, underlined items are excluded.

Fig. 2.1 CONSTITUTION OF PROJECT COST (CONTRACT SYSTEM)

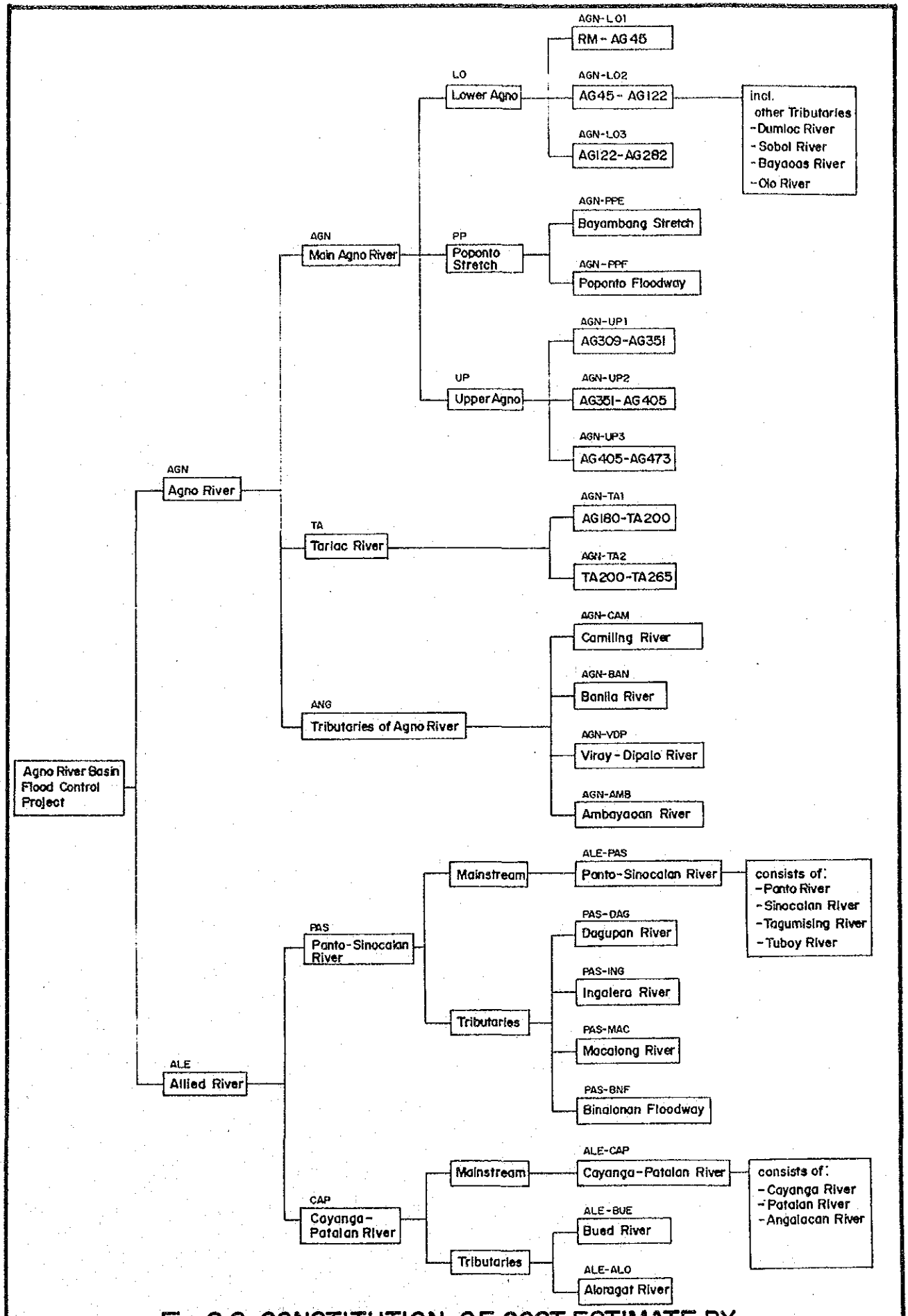


Fig. 2.2 CONSTITUTION OF COST ESTIMATE BY RIVER / RIVER STRETCHS

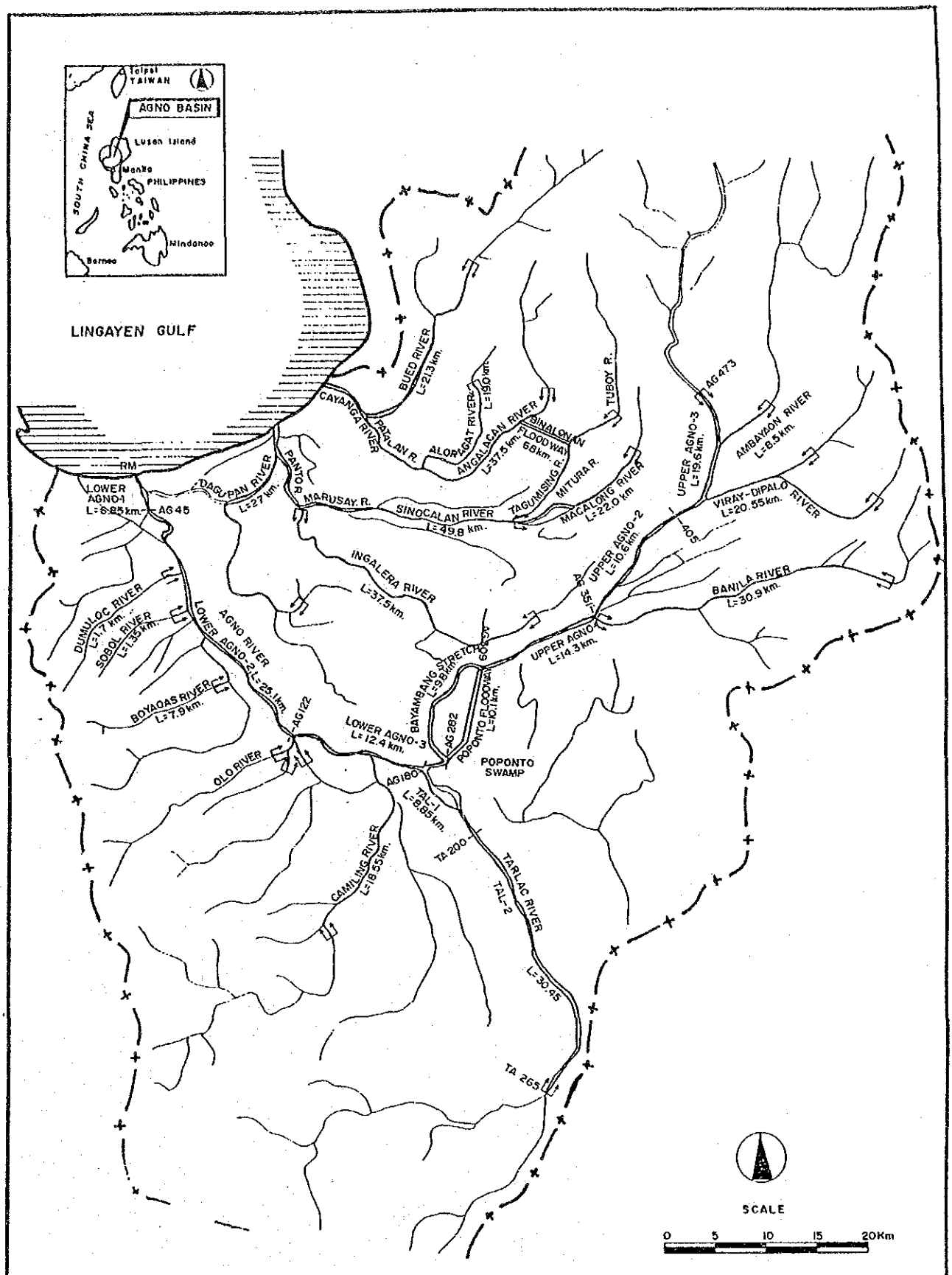


Fig.2.3 LOCATION OF RIVER/RIVER STRETCH OF RIVER IMPROVEMENT WORKS

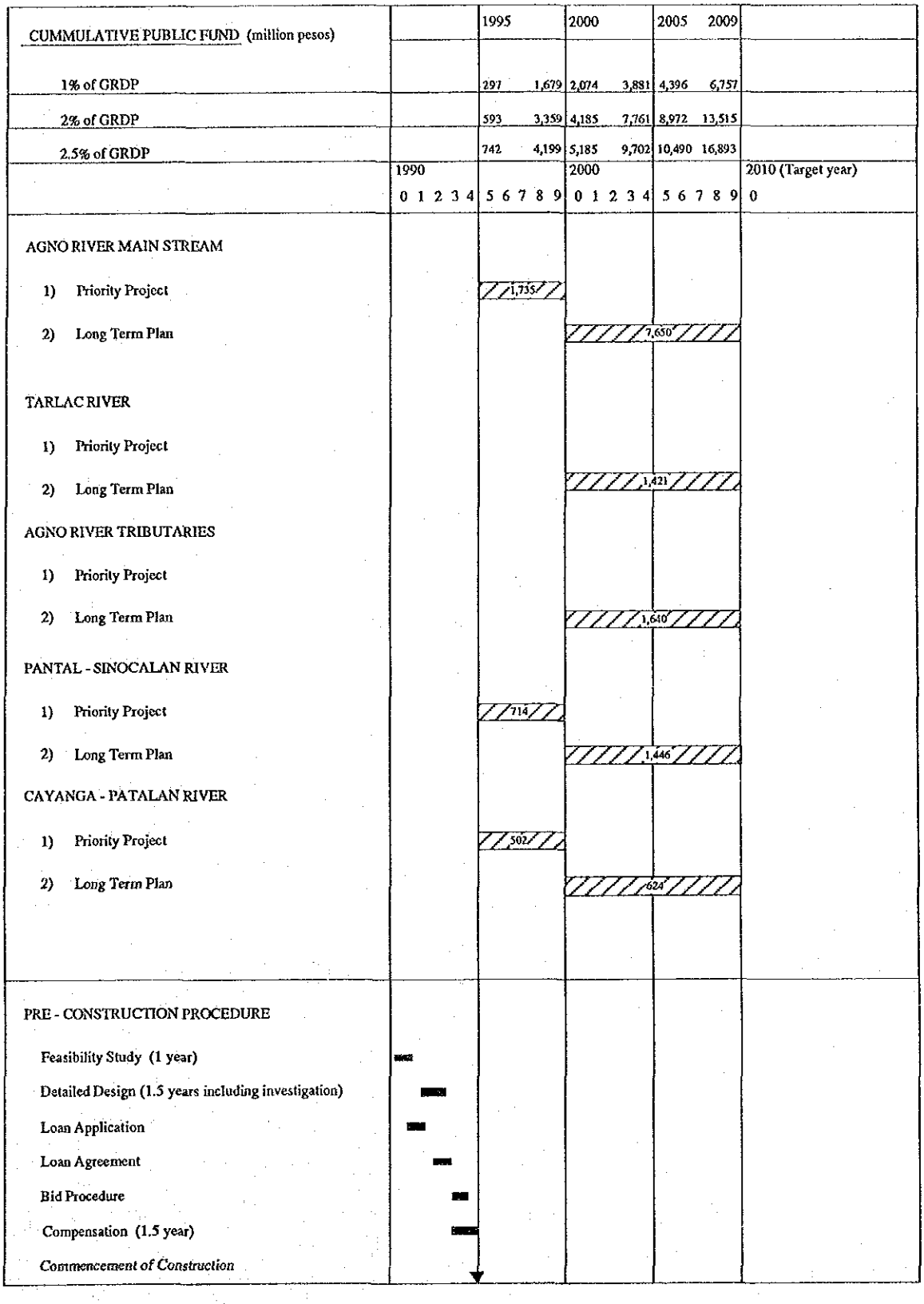


Fig. 3.1 IMPLEMENTATION PROGRAM OF LONG TERM PLAN FOR TERGET YEAR 2010

12. EI
ENVIRONMENTAL IMPACT ASSESSMENT

EI : ENVIRONMENTAL IMPACT ASSESSMENT

SUMMARY

(1) Methodology of Environmental Impact Assessment (EIA)

The Initial Environmental Examination (IEE) is conducted in the Master Plan stage to assess the objectives of environmental study. IEE is essentially an initial examination of the environmental effect potentials of the proposed project based mostly on the preliminary information which can be readily obtained. The IEE is thus a first approach of EIA by scooping.

A checklist method is applied as a basic tool of IEE in this environmental study, because it is one of the useful tools for initial identification of impacts and evaluation of their 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 from A to C for each project component with classification of whether positive or negative. The checklist items are selected taking into consideration the feature of the project and the guidelines prepared by GOP and the Asian Development Bank (ADB). (Refer to Table 3.1)

(2) Result of IEE for the Project

Agno River

The major components/schemes of flood control in the Agno River basin are San Roque dam, Moriones-Lower O'Donnell dam, river improvement and Poponto retarding basin. Among them, the schemes which are expected to cause relatively significant effects on the environment are San Roque dam and Moriones Lower-O'Donnell dam.

Primarily, resettlement issue is expected especially at the inundation area of Moriones-Lower O'Donnell dam. The agricultural lands in the proposed reservoir areas will also be difficult to acquire. Water quality deterioration may not be caused by the dams.

The river improvement works in the Agno River and Poponto retarding

basin may cause no crucial environmental effects, although several environmental impacts are expected.

Pantal-Sinocalan River

The major schemes of the Pantal-Sinocalan River flood control are the river improvement works and Binalonan floodway.

Although no crucial environmental issues are expected by the project, water quality deterioration in the downstream area of the Sinocalan river might be caused by the diversion of flood water from the Tuboy river to the Angalacan river through the Binalonan floodway.

Cayanga-Patalan River

The major schemes of the Cayanga-Patalan river flood control are the river improvement works and the Bued closing dike. However, the Bued closing dike is not planned to be constructed in the river, so it can be considered that the environmental impacts caused by the dike are similar to those of the river improvement works.

Several environmental impacts are expected by the project, but these may be not crucial ones. The significance of the possible impacts can be reduced by taking proper countermeasures.

(3) Conclusion of IEE for the Project

According to the EIA guideline of DPWH, the project shall be required to submit an EIA report, because the project includes two large scale dams and the project area is considered prime agricultural lands.

Among the proposed schemes of the project, San Roque dam and Moriones-Lower O'Donnell dam may have environmentally crucial impacts, such as resettlement problem and encroachment of agricultural lands. Thus, the most careful attention shall be regarded to those impacts.

As for the other schemes, no crucial environmental effects may be expected by the project. However, several low or medium level of significance impacts may be expected, so further environmental study shall be required to make clear the expected impacts, and to propose proper and possible countermeasures.

EI : ENVIRONMENTAL IMPACT ASSESSMENT

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ABBREVIATIONS

1. NAME OF PHILIPPINE GOVERNMENT AGENCIES

AFCS	Agno Flood Control System
BFAR	Bureau of Fisheries and Aquatic Resources
BSWM	Bureau of Soils and Water Management
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DPWH	Department of Public Works and Highways
EMB	Environmental Management Bureau
GOP	Government of the Philippines
LWUA	Local Water Utilities Administration
NEDA	National Economic Development Authority
NEPC	National Environmental Protection Council
NIA	National Irrigation Administration
NPCC	National Pollution Control Commission
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PENRO	Provincial Environment and Natural Resources Office

2. NAME OF JAPANESE GOVERNMENT AND OTHER OFFICIAL AGENCIES AND ORGANIZATION

GOJ	Government of Japan
JICA	Japan International Cooperation Agency
MOC	Ministry of Construction, Japan
ADB	Asian Development Bank

3. OTHERS

ECA	Environmentally Critical Area
ECC	Environmental Compliance Certificate
ECP	Environmentally Critical Project
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
IEE	Initial Environmental Examination
NSDW	National Standards for Drinking Water

4. MEASUREMENT UNITS

(Length)		(Weight)	
mm	millimeter(s)	gr(grs)	gramme(s)
cm	centimeter(s)	kg(kgs)	kilogramme(s)
m	meter(s)	ton(s)	ton(s),eq'vt to 1,000 kg
km	kilometer(s)		

(Area)		(Time)	
mm^2	square millimeter(s)	sec	second(s)
cm^2	square centimeter(s)	min	minute(s)
m^2	square meter(s)	hr(hrs)	hour(s)
km^2	square kilometer(s)	dy(dys)	day(s)
ha(has)	hectare(s)	mth(mths)	month(s)
		yr(yrs)	year(s)

(Volume)	
cm^3	cubic centimeter(s)
m^3	cubic meter(s)
ltr	liter(s)

1. BASELINE OF THE ENVIRONMENTAL STUDY

1.1 Objectives of the Environmental Study

The objectives of the Environmental Study in the Agno River Basin Flood Control Project in the Master Plan Stage are as follows;

(1) To identify impacts which are expected to cause effects on the environmenta,

(2) To evaluate the magnitude/significance of the impacts,and

(3) To determine whether the proposed projects need further environmental study, and if so, to point out the effects to be studied in the Feasibility Study Stage.

1.2 Guidelines for Environmental Impact Assessment (EIA) in the Philippines

1.2.1 Legal Framework of EIA

The EIA system in the Philippines has been established by the goverment, pursuant to the following Presidential Decrees and Proclamations;

- Presidential Decree No. 1151 (1977)
  THE PHILIPPINE ENVIRONMENTAL POLICY

- Presidential Decree No. 1586 (1978)
  ESTABLISHING AN ENVIRONMENTAL IMPACT STATEMENT SYSTEM INCLUDING OTHER ENVIRONMENTAL MANAGEMENT RELATED MEASURES AND FOR OTHER PURPOSES

- Proclamation No. 2146 (1981)
  PROCLAIMING CERTAIN AREAS AND TYPES OF PROJECTS AS ENVIRONMENTALY CRITICAL AND WITHIN THE SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT SYSTEM ESTABLISHED UNDER PRESIDENTIAL DECREE NO.1586

In accordance with these Presidential Decrees and Proclamations, projects planned by any governmental agency or private firm, which fall within the definition of Environmentally Critical Project (ECP), or which will be located within Environmentally Critical Area (ECA) shall be required to prepare an Environmental Impact Statement (EIS) in order to obtain Environmental Compliance Certificate (ECC) issued by the Environmental Management Bureau (EMB), formerly the National Environmental Protection Council (NEPC).

1.2.2 Guidelines for EIA of the Department of Public Works and Highways (DPWH)

Pursuant to the Presidential Decrees and Proclamations mentioned above, DPWH promulgated Ministry Order No. 72, Series of 1972, known as the DPWH Guideline for EIA. In principle, this guideline shall apply to projects planned by DPWH, which are categorized as ECP, or which will be located within ECA. Therefore, it can be used for the initial screening criteria of EIA for the proposed project. By referring to the definition of ECP and ECA of DPWH which are described below, it is concluded that the Project shall be required to prepare an EIS.

(1) ENVIRONMENTALLY CRITICAL PROJECT (ECP)

(a) Major dam;

A dam with a structure height of more than 15 meters and/or a storage volume exceeding 50 million cubic meters built across a watercourse to confine/impound/keep back or regulate flowing water,

(b) Major power plants, whether fossil-fueled, nuclear-fueled, hydroelectric, or geothermal;

(c) Major reclamation project;

Refers to any large scale activity which will involve the filling or draining of an area larger than one hectare along foreshore areas, marshes, swamps, lakes and rivers,

(d) Major roads and bridges;

Roads and bridges which will traverse a highly developed urban area, and significantly affect traffic flow,

(2) ENVIRONMENTALLY CRITICAL AREA (ECA)

(a) All areas declared by law as national parks, watershed reserves, wildlife preserves and sanctuaries;

(b) Areas set aside as aesthetic potential tourist spots;

(c) Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife;

(d) Areas of unique historic, archaeological or scientific interest;

(e) Areas which are traditionally occupied by cultural communities or tribes;

(f) Areas frequently visited and/or hard-hit by natural calamities;

(g) Areas with critical slopes;

(h) Areas classified as prime agricultural lands;

(i) Recharge areas of aquifers;

(j) Water bodies characterized by one or any combination of the following conditions;

tapped for domestic purposes, within the controlled and/or protected areas declared by appropriate authorities which support wildlife and fishery activities,

(k) Mangrove area characterized by one or any combination of the following conditions;

with primary pristine and dense young growth, adjoining mouth of major river systems, near or adjacent to traditional productive fry or fishing grounds, which act as natural buffers against shore erosion, strong winds and storm floods, on which people are dependent for livelihood.

(1) Coral reefs characterized by one or any combination of the following conditions;

with 50% and above live coralline cover, spawning and nursery grounds for fish, which act as natural breakwater of coastlines.

1.3 Study Area

The study area is composed of the Agno River basin and the Allied basins of the Cayanga-Bued Rivers and the Pantal-Marusay-Sinocalan Rivers, as shown in Fig. 1.1. The total drainage area is about 7,640 km^2, i.e., 5,860 km^2 for the Agno River basin and 1,780 km^2 for the other two Allied river basins.

2. DESCRIPTION OF THE ENVIRONMENT IN THE STUDY AREA

2.1. Physical Environment

2.1.1 Topography

The Study area consists of the following three topographic regions.

(1) the highly elevated north and northeastern portion which is occupied by the southern part of the Cordillera Central Mountains in the altitude from 70 m to over 2,900 m and with rather steep slopes (30^{o}-40^{o}),

(2) the low-lying central area mostly composed of plains ranging in altitude from 0 m to about 100m and comprised by the broad alluvial northern Central Luzon Plain, and

(3) the south and southwestern part made up by the Zambales Range, which is composed of mountains and hills ranging in altitude from 20 m to about 1,700 m.

Fig. 2.1 shows the slope conditions of the Study area.

2.1.2 Geology

The Southern Cordillera Mountains are mainly underlain by sedimentary rocks, metasediments, metavolcanics and intermediate to acid igneous intrusive rocks. The Central Luzon Plain is underlain by sediments, sedimentary rocks and volcanic rocks. The sediments which make up most of the plains are composed of Quarternary alluvial deposits of sand, gravel, silt and clay. And the Zambales Mountains are underlain mostly by intrusive rocks and partly by sedimentary and volcanic rocks.

2.1.3 Sedimentation and Erosion

Sedimentation in the study area come from both natural (erosion, landfall/slide, river bed/channel erosion) and anthropogenic (agriculture, deforestation, road construction, mining) sources. It is assumed that sediment

yield from the plains is negligible and that most of the sediments originate from the southern Cordillera and the Zambales mountains.

Fig. 2.2 shows the Soil Erosion Susceptibility map of the Agno River basin. Present siltation in the Pangasinan croplands is reportedly serious by the local officials and the staff of environmental regulatory agency.

2.1.4 Soil

Soil conditions in Benguet consist of undifferentiated mountain solids in rugged terrain and soils developed form shales and igneous rocks (andesite and basalt). Tarlac comes mainly from volcanic ejecta while Pangasinan lowland soils comprise mainly of recent alluvial deposits. There are 2 soil types in Pangasinan, i.e.,the San Manuel series which occurs mainly on the extensive alluvial plains, and the clay loam type.

2.1.5 Climate

The climate in the study area is characterized by two pronounced seasons; the dry season from November to April and the rainy season from May to October. Over 90% of all rainfall occurs in the rainy season. The annual rainfall varies from about 2,000 mm at the southeastern portion of the basin to over 4,000 mm in the northern mountainous region. About 5 to 10% of all typhoons (averaging about 20 per year) passing over the philippines usually affect the study area.

Prevailing winds are the result of topographic modifications of the prevalent Northeast and Southwest Monsoons. There are mountain ranges in north and northeast, and in south and southwest of the study area. Due to this topography, surface winds are channeled between these two mountain ranges thereby coming mostly from the southeast and northwest quadrants.

2.2 Land Resource

2.2.1 Land Capability

Land is classified according to its capability, which is defined as its suitability for crop cultivation or other uses as determined by its slope, chemical characteristics or fertility, erosion susceptibility and permeability. Fig. 2.3 shows the land capability of the Study area.

According to the map, 34% of the basin (as defined by NWRC) is composed of good cropland, 26% moderately good cropland and 2% fairly good cropland. The rest is classified as follows: 5% land of severe cropland limitation (suitable for pasture) due to steep slopes, severe erosion susceptibility and shallow soils; 30% is very steep, excessively eroded and best used as forest land; 1% is wetlands and suited for fishponds and wildlife conservation; and 2% is suitable for sand and gravel quarrying.

2.2.2 Land Use

Table 2.1, and Fig. 2.4 show the land use conditions in the study area. Cultivated areas (which make up 44% of the basin's total land area) form the biggest percentage of the land use, and followed by grasslands and plantations (40%), mossy, closed and open canopy forests (13%), built-up areas (2%) and fishponds (1%).

2.2.3 Mineral Resources

The Study Area is rich in metallic and non-metallic mineral resources. The Baguio Gold District located in Benguet is one of the richest and oldest mining areas in the country. There are 19 known gold deposits in Benguet and one in Pangasinan, and 15 copper deposits in Benguet and one in Pangasinan. Other mineral and non-mineral resources in the study area include iron, chromite, manganese, sulfur, asbestos, clay, silica, limestone and gemstones. Table 2.2 gives the estimated mineral reserves and annual production by type, quantity and location. Fig. 2.5 indicates their location.

2.3 Water Resources

2.3.1 Water Quality

In the Philippines, the classification of surface water is established as a basis for maintaining the quality of water bodies and to preserve their present and future usage. At present, the following designation was set for the major rivers in the study area. The classification and water quality criteria are shown in Table 2.3.

Agno River-Upper	Class A
Agno River-Lower	Class C
Bued River	Class D

(1) Upper Agno River

Table 2.4 shows the results of water quality in the Agno River. The water quality of Ambuklao and Binga reservoirs comply the water quality criteria of Class A (for source of water supply requiring complete treatment).

In the downstream of the Binga Dam, however, several water quality items are over the criteria of Class C (for the propagation of fish and other aquatic resources) and Class D (for irrigation). Considering, the following parameters, such as cyanide (Ambalanga River) turbidity and suspended solids (Ambalanga River, Albian Creek and Manaa Creek), and copper (Ambalanga River) do not comply the criteria of Class C and Class D. Those water quality deterioration are caused mainly by the discharging of tailing effluents from the operating mines in the basin.

(2) Lower Agno River

The Lower Agno river and Tarlac River have no major pollution problems. Although in need of watershed management programs to prevent soil erosion, those rivers are relatively pollution free except for organic contamination from the urban areas and piggery farms.

(3) Other River System

The water quality conditions of the Cayanga-Bued-Patalan River system are similar to those of the Agno River. Since the Bued River receives the mine tailings effluents of copper and gold mines, the concentration of solids and heavy metals (Cu, Zn, Pb, Mn, Ni, Cd, Ag and Hg) exceeded the Class C standards in 1979 to 1980.

The Sinocalan-Marusay-Pantal-Dagupan river system is a complex drainage system because of the interconnection between the Dagupan River estuary and the Agno River. Thus, sedimentation and water quality deterioration problems can be found in the system, e.g. the observable pollution of the Marusay and Dagupan Rivers and their tributaries by domestic solid wastes and sewage effluents. This poor water quality is likely to affect human health and aquatic resources.

2.3.2 Groundwater

According to the groundwater availability map in the study area, the mountainous areas in Benguet and the Zambales mountains have limited potential for groundwater since they are underlain with rocks with low to poor permeability. The alluvial plains however have moderate to extensive, highly productive aquifers. Groundwater is widely used for public and private water supply. It is reported by the Bureau of Soils and the National Hydraulic Research Center that the groundwater in the Basin have good physical-chemical and bacteriological quality, and are suitable for domestic and other purposes in general.

2.4 Ecological Environment

2.4.1 Vegetation

The Regional Land Use Map (Fig. 2.4) indicates roughly the existing type of vegetation cover in the study area. The steep slopes and high mountain areas in the southwestern, north and northeastern portions of the basin are covered by natural type vegetation. The forest lands, i.e., closed-and open-canopy forests