APPENDIX-X

Construction Plan and Cost Estimate

THE STUDY ON SABO AND FLOOD CONTROL
FOR WESTERN RIVER BASINS OF MOUNT PINATUBO
IN THE REPUBLIC OF THE PHILIPPINES

FINAL REPORT

SUPPORTING REPORT

APPENDIX X CONSTRUCTION PLAN AND COST ESTIMATE

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CHAPTER 1 CONSTRUCTION PLAN

1.1 General Description of the Works

This Chapter presents the construction plan for the priority projects which are Construction of the Bucao Bridge on the National Road No.7, and Construction of dikes for flood control in the Bucao and Sto. Tomas River basins. Those projects are situated geographically on the western-most part of Luzon Island in the Philippines. The locations of the Bucao Bridge, and the two river dikes of Bucao and Sto.Tomas are shown in Figure 1.1.1.

1.1.1 Bucao Bridge

The existing Bucao Bridge was constructed in 1939. After 64 years of service, the slab is being damaged severely. Moreover, due to the rising riverbed by lahar deposits, the existing bridge may have insufficient clearance against floods. Therefore, there is an absolute need for reconstruction.

Preliminary design of the Bucao Bridge for reconstruction is conducted and the results are as stated below.

(a) Hydrological Condition

1) Design discharge: 4,900 m^3/s (50-year probable flood)
2) Flood water level: EL. 13.50 m
3) Existing riverbed level in 2002: EL. 6.40 m
4) Estimated riverbed in 2052: EL. 10.16 m
5) Vertical clearance: 3.45 m

(b) Geological Condition

1) Bearing layer for abutment at Manila side: EL -10.0 m
2) Bearing layer for abutment at Iba side: EL -20.0 m
3) Bearing layer for piers: EL -20.0 m

(c) Bridge

1) Location: 15 m downstream side of existing bridge
2) Length: 321 m
3) Type: Steel plate girder
4) Span: 46 m + 2x50 m + 50 m + 72 m + 53 m
5) Width: 9.54 m (two lanes + two side walks)
6) Foundation type: Cast-in-place concrete pile

(d) Road

1) Approach road at Manila side: 280 m
2) Approach road at Iba side: 346 m
3) Width: 10.0 m (two lanes + two shoulders)

1.1.2 Bucao River Basin

Structural measures against flood / mudflow in the Bucao River Basin are the construction of dikes. One is downstream of the Bucao Bridge and the other is upstream of the same Bridge.

(1) Downstream of the Bucao Bridge

This reach from the Bucao Bridge to seashore does not have dike system on both banks at present. The construction of new dike is designed and the lengths are approx. 2.4 km for the right bank and 1.9 km for the left bank.

(2) Upstream of the Bucao Bridge

Construction of the dike for upstream of the Bucao Bridge is designed only on the right bank. The work consists of approx. 7.5 km dike heightening and approx. 0.2 km of strengthening of spur dike near the confluence of the Baquilan River.

1.1.3 Sto. Tomas River Basin

Structural measures for the Sto. Tomas River basin are also construction of dikes. One is downstream of the Maculcol Bridge and the other is upstream of the same bridge. In addition, construction of a diversion channel is also designed for the Gabor River because the existing flow will be totally blocked when the downstream dike on the right bank is constructed.

(1) Downstream of the Maculcol Bridge

This reach from the Maculcol Bridge to the seashore does not have dike system on the right bank at present. Hence, construction of new dike of approx. 2.0 km long is designed for the right bank. On the left bank, 1.4 km of strengthening of the existing dike is designed.

(2) Upstream of the Maculcol Bridge

Construction of dikes for upstream of the Maculcol Bridge is designed for the both banks. The works consist of approx. 3.1 km existing bank strengthening and 4.3 km heightening of existing dike on the right bank, and 9.4 km dike strengthening and 9.0 km dike heightening on the left bank.

(3) Diversion Channel for the Gabor River

The length of the diversion channel will be 1.7 km long and this will be constructed parallel to the proposed dike.

1.2 Basic Conditions

There are various factors and conditions for establishing the construction plan for the projects to be implemented. Such works are much affected by the natural factors particularly the hydrology and geology, and also by the availability of construction resources in and around the project area. The followings are the basic conditions to be adopted for formulating the construction plan.

1.2.1 Hydrology

(1) Rainfall

Heavy rains occur between May and October, which are commonly induced by southwest monsoon winds and tropical cyclones. Rainfall is minimal during the dry season from November to April due to reversal of monsoon wind direction. The monthly mean rainfall at Iba ranges from 4 mm in January to 1,057 mm in August with mean annual rainfall of 3,812 mm. When compared with the amount of rainfall on the western slope of Mount Pinatubo to the eastern slope, the western slope has far greater rainfall.

Monthly rainfall records representing to the Bucao River and the Sto. Tomas River are shown in Figure 1.2.1 "Location of Rainfall Gauge Station," Figure 1.2.2 "Monthly Rainfall in Iba," and Figure 1.2.3 "Monthly Rainfall in San Marcelino." From the records, period from May to October will generally be called as rainy season and from November to April will be called as dry season for this project.

(2) Runoff and Water Level

For construction of the Bucao Bridge in particular, information regarding runoff and water level of the Bucao River based on non uniform flow calculation is expressed in Figure1.2.4.

1.2.2 Geology

Investigation to determine the prevailing subsoil conditions required for the construction of Bucao Bridge as well as dikes on the Bucao River and Sto. Tomas River has been conducted using triple tube core barrel method and Standard Penetration Test (SPT). Subsoil profile at the Bucao Bridge is shown in Figure 1.2.5. Specific gravity test for the recent lahar deposits results generally ranged from 2.60 to 2.79, with low values ranging from 2.25 to 2.55. The surface deposits usually contain large amount of fines and normally cohesive in nature.

1.2.3 Construction Resources

Locally available construction resources will be used as much as practicable and thus the project becomes economical.

- Skilled and unskilled labors are available in the Philippines and in the Region 3.
- Construction equipment is available in the Philippines for rental or purchase.
- Maximum use of abundant lahar deposits on site.
- Construction materials, such as cement, steel reinforcement bar, and concrete aggregates are available in the Philippines and in the Region 3.
- Boulders for masonry and other works are available in the area.

1.2.4 Other Conditions

Taking into account the above, some other conditions will be applied for the construction.

(1) Annual Workable Days

Annual workable days for the earthworks is determined as 180 days since period from middle May to middle October is considered not practical to carry out due to occasional rainfalls. For concrete and other works, 240 days are workable days but the maintenance of access roads will be difficult and

therefore not much work will be carried out in the rainy seasons.

(2) Working Days and Hours

Working days and hours will be 26 days per month and 10 hours per day in principle but this will need to adjust for each activity.

(3) Access Road

The National Road No.7 from Manila to Lingayen via Iba will be the main access road for this project.

(4) Land for Temporary Work

Necessary space for temporary works, such as construction yard for temporary buildings and repair shops, stockyard and fabrication yard, temporary road, etc. will be provided.

(5) Contract

Construction works are assumed to be implemented by contract system.

1.3 Construction of Bucao Bridge

General view of the designed Bucao Bridge is shown in Figure 1.3.1. Taking the above basic conditions into consideration, general construction procedures will be:-

- Major works will be carried out only in dry seasons as examined at Section 1.2.1 Hydrology.
- Since the new bridge is designed to construct 15 m downstream and parallel to the existing bridge, no detour of National Road No. 7 will be provided.
- Avoiding disturbance of public transportation on the existing bridge, temporary roads will be built on the riverbed for construction purpose.

1.3.1 Temporary Works

(1) Temporary Access Road

Access roads from National Road No. 7 to the riverbed from both banks will be provided parallel to the designed alignment of abutments and piers.

(2) Site Preparation

(a) Removal or Shifting Service Lines

Obstacles such as existing power cables and posts will be shifted away from the space required for construction.

(b) Construction Yard

Proper size of land space is required for construction of temporary buildings, stockyard, fabrication yard, motor-pool, etc. for both Manila and Iba side of the bank.

(3) Temporary Buildings and Supplies

Temporary buildings such as offices and stores, and various supply systems, such as water, power and communication, will be installed on site.

(4) Concrete Plant

Since there is no ready-mixed concrete supply facilities existed in the area, concrete plant will be installed on the site. Considering the maximum volume of concrete to be placed at one time, 100 – 120 m^3 at footing concrete, capacity of 15 m^3/hr concrete batching and mixing plant will be erected.

(5) Cofferdams

Taking into account of the bridge design, hydrological and geological information, major works will only be carried out in the dry season. However, considering unexpected rain during the dry season, cofferdams for every pier may be required based on the following assumption:

Elevation of the existing ground at river flow center:	EL. 6.45 m
Base of footing concrete	EL. 3.45 m
Earth drill working level	EL. 6.45 m
Groundwater level	EL. 4.45 m
Water level of 2 year probable flood	EL. 8.70 m
Cofferdam crest level	EL. 9.20 m

At the stage of construction, above assumption should be reviewed and modified because the riverbed elevation and ground water level change considerably by every flood.

The cofferdams with steel sheet-pile as shown in Figure 1.3.2 or similar will be applied for this type of project.

1.3.2 Construction Method

(1) Substructure

Abutments and piers are numbered from left bank to right bank as shown in Figure 1.3.1.

(a) Pile Foundation

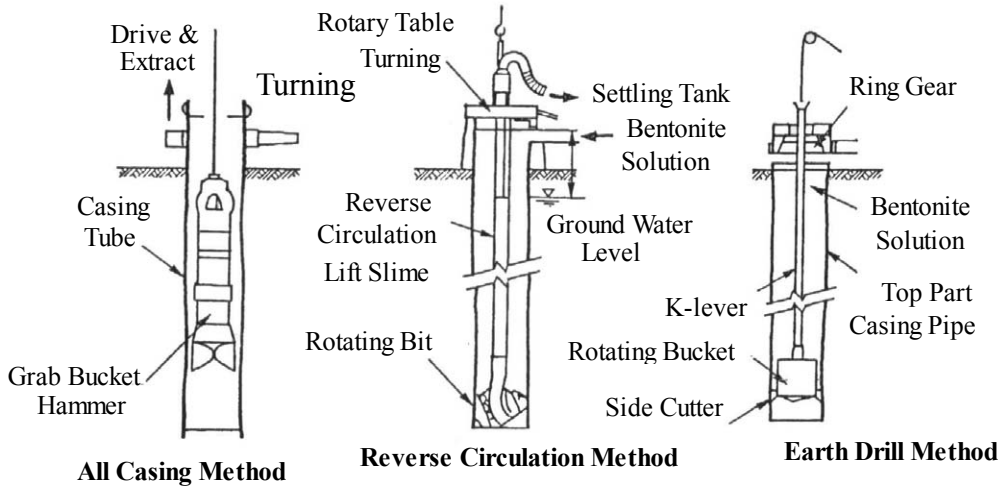
Large diameter of ψ1.2 m bored cast-in-place concrete pile without taper is designed for the foundation of piers and abutments. Following table shows the length and number of piles for each foundation.

Name of Foundation		Length (m)	Nos.	Total length (m)
Abutment	A 1	18	6	108
	A 2	28	6	168
Pier	P 1	22	6	132
	P 2	22	6	132
	P 3	22	6	132
	P 4	22	6	132
	P 5	22	6	132
Total			42	936

There are three different drilling methods in cast-in-place concrete piles.

- Earth drill method
- Reverse circulation method

- All casing method (Benoto pile method)



Considering the site conditions, availability of required equipment, speed and economy as well as the experiences in the Philippines, Earth drill method will be employed for this project.

Since the construction site is in the riverbed, water table is high. In addition, as the dominant subsoil is lahar (sand), some underground water flow is expected. Maintaining stability of the sidewall of drilled holes is a key issue. The following measures will be taken:

- Use steel pipe casing (a standpipe), approximately 10 m length.
- Keep water head in the casing 1.5 – 2.0 m higher than the ground water level.
- Use stabilization fluid with controlled specific gravity and viscosity. The mud fluid will provide thin mud films on the surface of sidewall and protect from water seeped into or out.

The most common stabilization agent is bentonite.

General procedure of Earth drill method and its illustrations are –

① Installation of standpipe by a vibrator

② Excavation by earth drilling bucket

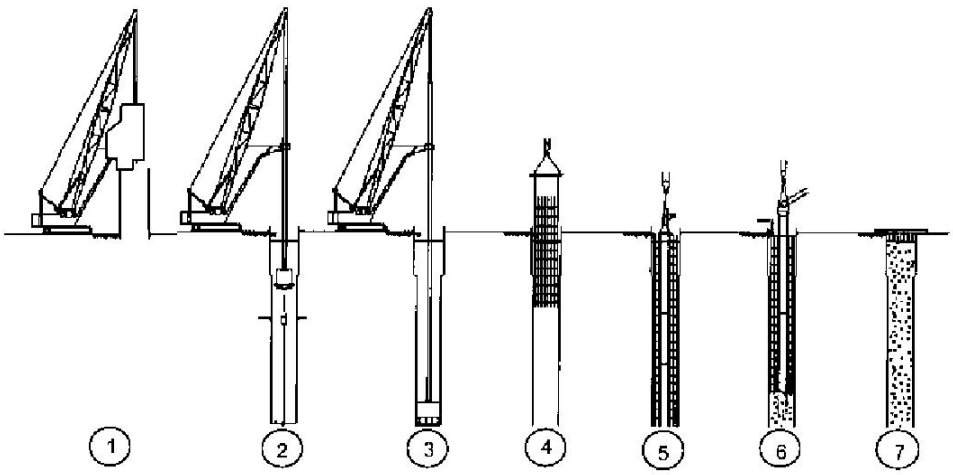
③ Removal of slime by bucket (1st treatment)

④ Installation of reinforcing steel bar cages

⑤ Removal of slime by air-lift or suction method (2nd treatment)

⑥ Placing concrete by tremie pipe

⑦ Curing



Two working groups will be established for efficient work through a day and night shift, a 24-hour working system. One group operates the earth drilling equipment for drilling works and the other group with a crane works for installation of a standpipe, installation of reinforcement steel cages and placing concrete. The earth drilling machine should be utilized without idling since this is the most critical work item to complete the project in time. It is estimated that excavation of one pile will take approximately 36 hours, one and a half day, on average and 9 – 12 days per foundation in calendar days. Once excavation is commenced, operation should be continued until completion of placing concrete to avoid a risk of failures in bored holes.

For the proper use of bentonite's function and for the environmental considerations, bentonite treatment plant will be provided on site.

For quality assurance, it is important to carry out proper supervision of the works and also to conduct the bearing tests for the cast-in-place piles because some activities are difficult to check if the works are carried out properly during construction, in particular the treatment of slime at the bottom of piles.

(b) Footing

This will generally become mass concrete, steady and proper concrete placement will be required to avoid for forming cold joints.

(c) Piers and Abutments

Piers are designed with two columns and abutments are with the reversed T types. Careful concrete placement will be required in particular because some anchors for superstructure will be embedded in the beam support.

(2) Superstructure

Since the height from the ground to the soffit of steel plate girder is approximately 10 m and mobile crane is accessible to erection site through a temporary road in dry seasons, the erection by truck crane with a bent method will be the most economical choice.

Extruder method can be used in the rainy seasons but this will normally require more time and space.

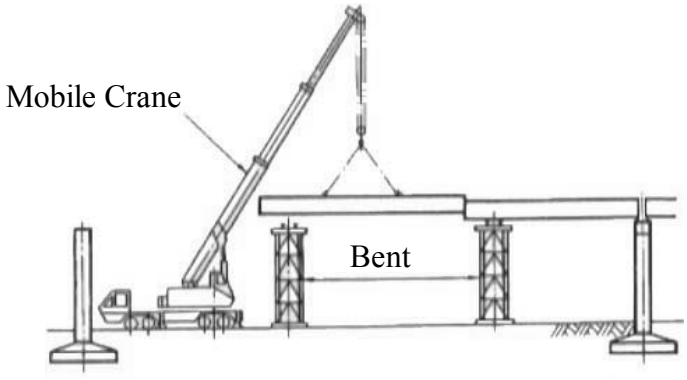
(a) Prefabrication

Steel plate girders will be transported to the site by trailers in about 10 m long piece. This will

be prefabricated to about 20 m in length before erection.

(b) Erection

The prefabricated steel plate girders will be lifted on to the top of bent by a hydraulic truck crane or crawler crane of 120 t capacity on the temporary road. The lifting capacity is determined on the assumption of: 12 ton block weight and 10 m working radius. The bent will be a steel support structure. An image of the erection method is as illustrated as below.



Steel material is designed with non-paint type and therefore no painting is required on site.

(c) Slab and Pavement

Sequence of placing concrete for the deck slab should be arranged to avoid making cracks over the piers due to change of moment and stress during construction.

(3) Approach Road

The construction of approach road will be carried out simultaneously with the construction of the bridge. Because of approx. 10 m high embankment is required, earlier start of embankment work is preferable for less settlement after completion of the project.

(4) Safety Control

Establish safety management code on site and provide safety ropes, hats, life belts to everyone who will go to higher position so as to protect their lives.

(5) Removal of Existing Bridge

The removal of existing bridge will be carried out only after the completion of the Bucao Bridge and after some period of its usage. Therefore, this work will be carried out separately in the following dry season.

1.3.3 Construction Schedule

The proposed construction time schedule for the Bucao Bridge is shown in Figure 1.3.3. Detailed construction schedule for the substructure and typical construction schedule for the bridge pier are also shown in Figure 1.3.3.

Right after the rainy season, construction of abutment A1, left bank - Manila side of the bridge - will be commenced because this foundation is located at the highest place and the designed pile length is the shortest.

Construction period of two years is considered appropriate for this type of bridge construction. However, full use of two dry seasons is the key for completing the project in time. Therefore, some preparatory

works have to be carried out in the rainy seasons and make ready to commence foundation pile drilling in full force from the beginning of dry season.

1.3.4 Construction Resources

(1) Construction plant and equipment

Major construction plant and equipment to be used for this project are listed in the following table.

Major Construction Plant and Equipment

No.	Name	Capacity	Unit	Remarks
1	Earth drill auger	ψ1.2 m, ℓ30 m	1	Drill cast-in-place pile
2	Mobile crane	120 t	1	Erection of girder
3	Mobile crane	50 t	1	General / piling, etc.
4	Backhoe	0.7 m^3	1	General / excavation, etc.
5	Dump truck	10 t	2	General / excavation, etc.
6	Bulldozer	21 t	1	General / road, etc.
7	Concrete plant	20 m^3/hr	1	Concrete production
8	Vibration hammer	46 – 60 kW	1	Piling
9	Generator	150 – 200 kVA	1	Piling
10	Bentonite plant	Mixer, tank, etc.	1	Bentonite treatment

1.4 Construction of Bucao River Dike

The locations of the Bucao River dikes are shown in Figure 1.4.1. Typical cross sections of the New Dike and Dike Heightening are shown in Figure 1.4.2.

The dike locations, types, lengths, and estimated embankment volumes for construction are summarized below. No rock excavation will be required in the works.

Location	Type	Length (m)	Embankment Volume (m^3)
Bucao Bridge abutment, left bank	New Dike	170	37,300
Downstream of Bucao Bridge, right bank	New Dike	2,350	351,700
Downstream of Bucao Bridge, left bank	New Dike	1,910	217,100
Upstream of Bucao Bridge, right bank	Dike Heightening	5,800	1,096,000
Upstream of Bucao Bridge, Baquilan area	Dike Heightening	1,650	93,200
	Dike Strengthening	200	8,000
Total		12,080	1,803,300

Staged implementation in order from the river mouth toward upstream is normally proposed for river improvement works, however the needs of river improvement depends on local factors; such as height of existing dikes with different degrees of overtopping threat, numbers of resident and values of properties to be protected from inundation. Therefore, one of the sequences for the construction, together with the dike locations, types, and lengths, will be as follows.

1) The Bucao Bridge abutment, left bank, and this part will be constructed at the time of bridge construction so that the abutment and approach road of the new bridge will be protected

2) Upstream of the Bucao Bridge, right bank

3) Downstream of the Bucao Bridge, right bank

4) Downstream of the Bucao Bridge, left bank

5) Upstream of the Bucao Bridge, Baquilan area, right bank

Taking into the basic conditions for construction, general procedures for the construction of the Bucao River dikes are expressed as follows:

1.4.1 Temporary Works

(1) Access Road

National Road No. 7 is the main access for construction. As a branch from Botolan town, there is road to Baquilan and this will be used for the construction, too. Otherwise needs of access to each site will be solved by construction or use of dikes being built. Considering the required intensive work volume, temporary roads on the riverbed as well as the other landside parallel to the dikes will also be required including necessary ramps to connect the crest of dike.

(2) Site Preparation

(a) Removal or Shifting Service Lines

Obstacles such as existing power cables and posts will be shifted away from the space required for the construction.

(b) Construction Yard

Proper size of land space is required for construction of temporary buildings, stockyard, motor-pool, etc.

(3) Temporary Buildings and Supplies

Temporary buildings and various supply systems, such as water, power and communication, will be provided on site for smooth implementation of the works.

1.4.2 Construction Method

Three types of dike are designed for the improvement of the Bucao River banks. One is the construction of new dike and the remains are heightening and strengthening of existing dikes. The new dike is designed for the riverbank section of no existing dike at present. The dike heightening is applied for the section of insufficient height of existing dikes and the dike strengthening is designed for the section where needs strengthening of existing dikes. Typical cross section of these three types of dike is shown in Figure 1.4.2 and Figure 1.4.3.

The works include embankment with lahar deposits to shape the dike, base concrete at the toe, gabion mattresses with filter cloth, grouted riprap for the riverside slope protection, sodding on borrow soil for landside slope protection, and gravel pavement on top of the dike in common. The removal of existing grouted riprap is required before commencement of embankment in the case of dike heightening. In the case of dike strengthening at existing super dike of 200 m at Baquilan, removal of the existing armor and construction of grouted riprap for both side of slopes and top of the dike are required.

An abundant lahar deposit near the construction site will be utilized as much as possible for the embankment.

In general, the construction works will be carried out by combination of earthmoving equipment such as wheel loaders, backhoe shovels, dump trucks, bulldozers, and vibration rollers. Considering the size of the project and hauling distances, motor scrapers can be used if its mobilization and maintenance are reasonably secured.

1.4.3 Construction Schedule

Construction time schedule for the Bucao River dikes is shown in Figure 1.4.4.

(1) Production Rate Study

Using conventional equipment available for the project, monthly production rate of each group is determined as follows:

Group	Name	Capacity	nos.	Monthly Production (m^3)
A	Tractor Shovel	2.1 m^3	1	19,100
	Dump Truck	12 t	4	
B	Backhoe Shovel	1.0 m^3	1	13,100
	Dump Truck	10 t	4	

The above table is provided based on the following assumptions and calculations.

(a) Group A

Loading Equipment: Tractor shovel (wheel), Bucket capacity: 2.1 m^3 (heaped) / Loading to 12 ton dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m^3 / Compacted weight at embankment: 2.2 ton/m^3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: 2.1 x 0.8 x 1.5 = 2.5 t / Loading time: 40 sec / Loading time required for 12 t dump truck: 12 / 2.5 = 4.8 times / 4.8 x 40 sec = 192 sec = 3.2 min / Working efficiency in loading hour: 0.9 / Production rate in embanked volume: 60 / 3.2 x 0.9 = 16.9 nos. truck / 16.9 x 12 = 203 t/hr / 203 / 2.2 = 92 m^3/hr / 10 x 0.8 x 92 = 736 m^3 per day / 736 x 26 = 19,100 m^3 per month / Hauling Equipment: Dump truck, Loading capacity : 12 t / Hauling Distance: 500 m / Hauling Cycle Time: Loading : 3.2 min / Hauling : 4 min / Unloading: 1 min / Returning: 4 min / Waiting: 1 min / Total: 13.2 min / Hauling times per hour: 60 / 13.2 = 4.5 times / Number of Dump Truck required: 16.9 / 4.5 = 3.75 → 4 nos. per Tractor shovel

(b) Group B

Loading Equipment: Backhoe shovel, Bucket capacity: 1.0 m^3 (heaped) / Loading to 10 t dump truck / Bucket factor: 0.9 / Loose weight at excavation: 1.5 t/m^3 / Compacted weight at embankment: 2.2 ton/m^3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: 1.0 x 0.9 x 1.5 = 1.35 t / Loading time: 30 sec / Loading time required for 10 t dump truck: 10 / 1.35 = 7.4 times / 7.4 x 30 sec = 222 sec = 3.7 min / Working efficiency in loading hour: 0.85 / Production rate in embanked volume: 60 / 3.7 x 0.85 = 13.8 nos. truck / 13.8 x 10 = 138 t/hr / 138 / 2.2 = 63 m^3/hr / 10 x 0.8 x 63 = 504 m^3 per day / 504 x 26 = 13,100 m^3 per month / Hauling Equipment: Dump truck, Loading capacity: 10 t / Hauling Distance: 500 m / Hauling Cycle Time: Loading : 3.7 min / Hauling : 4 min / Unloading: 1 min / Returning: 4 min / Waiting: 1 min / Total: 13.7 min / Hauling times per hour: 60 / 13.7 = 4.4 times / Number of Dump Truck required: 13.8 / 4.4 = 3.1 → 4 nos. per Backhoe shovel

(c) Group B - Soil

Loading Equipment: Backhoe shovel, Bucket capacity: 1.0 m3 (heaped) / Loading to 10 t dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: 1.0 x 0.8 x 1.5 = 1.2 t / Loading time: 35 sec / Loading time required for 10 t dump truck : 10 / 1.2 = 8.3 times / 8.3 x 35 sec = 291 sec = 4.8 min / Working efficiency in loading hour: 0.8 / Production rate in embanked volume: 60 / 4.8 x 0.8 = 10 nos. truck : 10 x 10 = 100 t/hr / 100 / 2.2 = 45 m3 / hr / 10 x 0.8 x 45 = 360 m3 per day / 360 x 26 = 9,360 m3 per month / Hauling Equipment: Dump truck, Loading capacity: 10 t / Hauling Distance: 20,000 m / Hauling Cycle Time: Loading : 4.8 min / Hauling : 30 min (Borrow area – 5, National read – 10, Site – 15) / Unloading: 1 min / Returning: 30 min / Waiting: 4.2 min / Total: 70 min / Hauling times per hour: 60 / 70 = 0.86 times / Number of Dump Truck required: 10 / 0.86 = 11.6 → 12 nos. per Backhoe shovel

(2) Construction Time Schedule

In the rainy seasons, more precisely from middle May to middle October, it is considered not practical to carry out any works even dike protection works because the maintenance of temporary roads for transporting construction materials as well as finishing the slope of embankment would be difficult. Construction period of four years (three dry seasons) will be appropriate for this type of construction, based on the required average monthly production of 100,000 m^3 in the embankment and this equals to 670 m in length. For relaxing the congested site condition, about three different dikes will be constructed simultaneously with monthly production from 30,000 to 60,000 m^3 of embankment at each dike, and this corresponds from 200 m to 300 m in length.

Therefore, depends on the required monthly embankment volume for each dikes, combination of Group A and Group B with necessary number of each set will be employed for the works.

1.4.4 Construction Resources

(1) Construction Plant and Equipment

Major construction plant and equipment with its approximate size and numbers to be used for this project are listed in the following table. Exact numbers of fleet will be determined with required individual work volume.

Major Construction Plant and Equipment

No.	Name	Size	Nos.	Remarks
Embankment				
1	Wheel loader	2.1 m^3 class	4	Excavation / loading
2	Backhoe shovel	1.0 m^3 class	2	Excavation / loading / trimming
3	Dump truck	10 - 12 ton class	20 - 30	Hauling / embankment
4	Bulldozer	28 ton class	3	Bulldozing / grading
5	Bulldozer	21 ton, swamp	2	Bulldozing / grading
6	Vibration roller	10 ton class	3	Compaction
7	Motor grader	3.1 m class	2	Grading
8	Water sprinkler	10 m^3 class	1	Watering
Other works: Borrow soil, minor excavation, etc.				
9	Backhoe shovel	0.7 m^3 class	2	Excavation / loading
10	Bulldozer	21 ton class	3	General purpose
11	Trailer	20 ton class	1	Transportation of Equipment
12	Dump truck	10 ton	20 - 30	Hauling
13	Motor grader	2.7 m	1	Grading
14	Backhoe shovel	0.3 m^3 class	3	Miscellaneous

1.5 Construction of the Sto. Tomas River Dike

The locations of the Sto. Tomas River dikes are shown in Figure 1.5.1. Typical cross sections of the New Dike, Dike Heightening, and Dike Strengthening, are shown in Figure 1.5.2, 1.5.3 and 1.5.4

The dike locations, types, lengths, and estimated embankment volumes for construction are summarized below. No rock excavation will be required in the works.

Location	Type	Length (m)	Embankment Volume (m^3)
D/s of Maculcol Bridge, right bank	New Dike	1,950	77,100
D/s & U/s of Maculcol Bridge, left bank	Strengthening	2,800	257,900 (excavation)
U/s of Maculcol Bridge, right bank	Dike Strengthening	3,100	35,800
	Dike Heightening	4,300	393,200
U/s of Maculcol Bridge, left bank	Dike Heightening	9,000	498,800
	Dike Strengthening	8,000	569,100
Total		29,150	1,831,900

Staged implementation in order from the river mouth toward upstream is normally proposed for river improvement works, however the needs of river improvement depends on local factors; such as height of existing dikes with different degrees of overtopping threat, numbers of resident and values of properties to be protected from inundation. Therefore, one of the sequences for the construction, together with the dike locations, types, and lengths, will be as follows.

1) Upstream of the Maculcol Bridge, right bank, up to Paete Hill, dike heightening of 4,300 m
2) Upstream of the Maculcol Bridge, left bank, up to Vega Hill, dike heightening of 9,000 m
3) Upstream of Vega Hill, left bank, dike strengthening of 8,000 m
4) Downstream of the Maculcol Bridge, right bank, new dike of 1,950 m together with a diversion channel of the Gabor River, 1,700 m

5) Upstream of the Maculcol Bridge, right bank, dike strengthening of 3,100 m

6) Downstream and upstream of the Maculcol Bridge, left bank, dike strengthening of 2,800 m

Taking into the basic conditions for construction, general procedures for the construction of Sto. Tomas River dikes are expressed as follows:

1.5.1 Temporary Works

(1) Access Road

National Road No. 7 is the main access for construction. Public road from San Marcelino to San Rafael is available for left bank upstream part of dike construction. Temporary roads from the National Road and other public road to access each site will be solved by construction or use of dikes being built. Considering the required intensive work volume, temporary roads on the riverbed at riverside as well as the other landside parallel to the dikes will also be required including necessary ramps to connect the crest of dike.

(2) Site Preparation

(a) Removal or Shifting Service Lines

Obstacles such as existing power cables and posts will be shifted away from the space required for the construction.

(b) Construction Yard

Proper size of land space is required for construction of temporary buildings, stockyard, motor-pool, etc. for both Manila and Iba side of the bank.

(3) Temporary Buildings and Supplies

Temporary buildings and various supply systems, such as water, power and communication, will be provided on site for smooth implementation of the works.

1.5.2 Construction Method

Three types of dike are designed for the improvement of the Sto. Tomas River banks. One is the construction of new dike and the remains are heightening and strengthening of existing dikes. In addition, a diversion channel of the Gabor River is also designed.

The new dike is designed for the section of no existing dike at present. The dike heightening is applied for the section of insufficient height of existing dikes and the dike strengthening is designed for the section where needs strengthening of existing dikes. Typical cross section of these three types of dike is shown in Figure 1.5.2, 1.5.3 and 1.5.4.

The works include embankment with lahar deposits to shape the dike, base concrete at the toe, gabion mattresses with filter cloth, grouted riprap for the riverside slope protection, sodding on borrow soil for landside slope protection, and gravel pavement on top of the dike. The removal of existing grouted riprap is required before commencement of embankment in the case of dike heightening where applicable.

An abundant lahar deposit near the construction site will be utilized as much as possible for the embankment.

In general, the construction works will be carried out by combination of earthmoving equipment such as

wheel loaders, backhoe shovels, dump trucks, bulldozers, and vibration rollers. Considering the size of the project and hauling distances, motor scrapers can be used if its mobilization and maintenance are reasonably secured.

1.5.3 Construction Schedule

Construction time schedule for the Sto. Tomas River dike is shown in Figure 1.5.5.

(1) Production Rate Study

Using conventional equipment available for the project, monthly production rate of each group is determined as follows:

Group	Name	Capacity	nos.	Monthly Production (m^3)
A	Tractor Shovel	2.1 m^3	1	19,100
	Dump Truck	12 t	4	
B	Backhoe Shovel	1.0 m^3	1	13,100
	Dump Truck	10 t	4	

The above table is provided based on the following assumptions and calculations.

(a) Group A

Loading Equipment: Tractor shovel (wheel), Bucket capacity: 2.1 m3 (heaped) / Loading to 12 ton dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: 2.1 x 0.8 x 1.5 = 2.5 t / Loading time: 40 sec / Loading time required for 12 t dump truck: 12 / 2.5 = 4.8 times / 4.8 x 40 sec = 192 sec = 3.2 min / Working efficiency in loading hour: 0.9 / Production rate in embanked volume: 60 / 3.2 x 0.9 = 16.9 nos. truck / 16.9 x 12 = 203 t/hr / 203 / 2.2 = 92 m3/hr / 10 x 0.8 x 92 = 736 m3 per day / 736 x 26 = 19,100 m3 per month / Hauling Equipment: Dump truck, Loading capacity : 12 t / Hauling Distance: 500 m / Hauling Cycle Time: Loading : 3.2 min / Hauling : 4 min / Unloading: 1 min / Returning: 4 min / Waiting: 1 min / Total: 13.2 min / Hauling times per hour: 60 / 13.2 = 4.5 times / Number of Dump Truck required: 16.9 / 4.5 = 3.75 → 4 nos. per Tractor shovel

(b) Group B

Loading Equipment: Backhoe shovel, Bucket capacity: 1.0 m3 (heaped) / Loading to 10 t dump truck / Bucket factor: 0.9 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: 1.0 x 0.9 x 1.5 = 1.35 t / Loading time: 30 sec / Loading time required for 10 t dump truck: 10 / 1.35 = 7.4 times / 7.4 x 30 sec = 222 sec = 3.7 min / Working efficiency in loading hour: 0.85 / Production rate in embanked volume: 60 / 3.7 x 0.85 = 13.8 nos. truck / 13.8 x 10 = 138 t/hr / 138 / 2.2 = 63 m3/hr / 10 x 0.8 x 63 = 504 m3 per day / 504 x 26 = 13,100 m3 per month / Hauling Equipment: Dump truck, Loading capacity: 10 t / Hauling Distance: 500 m / Hauling Cycle Time: Loading : 3.7 min / Hauling : 4 min / Unloading: 1 min / Returning: 4 min / Waiting: 1 min / Total: 13.7 min / Hauling times per hour: 60 / 13.7 = 4.4 times / Number of Dump Truck required: 13.8 / 4.4 = 3.1 → 4 nos. per Backhoe shovel

(c) Group B - Soil

Loading Equipment: Backhoe shovel, Bucket capacity: 1.0 m3 (heaped) / Loading to 10 t dump truck / Bucket factor: 0.8 / Loose weight at excavation: 1.5 t/m3 / Compacted weight at

embankment: 2.2 ton/m3 / Working hour per day: 10 hrs / Working days per month in dry seasons: 26 days / Production efficiency factor in working hour: 0.8 / Loading weight per bucket: 1.0 x 0.8 x 1.5 = 1.2 t / Loading time: 35 sec / Loading time required for 10 t dump truck : 10 / 1.2 = 8.3 times / 8.3 x 35 sec = 291 sec = 4.8 min / Working efficiency in loading hour: 0.8 / Production rate in embanked volume: 60 / 4.8 x 0.8 = 10 nos. truck : 10 x 10 = 100 t/hr / 100 / 2.2 = 45 m3 / hr / 10 x 0.8 x 45 = 360 m3 per day / 360 x 26 = 9,360 m3 per month / Hauling Equipment: Dump truck, Loading capacity: 10 t / Hauling Distance: 20,000 m / Hauling Cycle Time: Loading : 4.8 min / Hauling : 30 min (Borrow area – 5, National read – 10, Site – 15) / Unloading: 1 min / Returning: 30 min / Waiting: 4.2 min / Total: 70 min / Hauling times per hour: 60 / 70 = 0.86 times / Number of Dump Truck required: 10 / 0.86 = 11.6 → 12 nos. per Backhoe shovel

(2) Construction Time Schedule

In the rainy seasons, more precisely from middle May to middle October, it is considered not practical to carry out any works even dike protection works because the maintenance of temporary roads for transporting construction materials as well as finishing the slope of embankment would be difficult. Construction period of four years (three dry seasons) will be appropriate for this type of construction, based on the required average monthly production of 102,000 m^3 in the embankment and this equals to 1,620 m in length. For relaxing the congested site condition, about 3 to 6 different dikes will be constructed simultaneously with monthly production from 6,000 m^3 to 36,000 m^3 of embankment at each dike, and this corresponds from 360 m to 520 m in length.

Therefore, depends on the required monthly embankment volume for each dike, combination of Group A and Group B with necessary number of each set will be employed for the works.

1.5.4 Construction Resources

Major construction plant and equipment with its approx. size and numbers to be used for this project are listed in the following table. Exact numbers of fleet will be determined with required individual work volume.

Major Construction Plant and Equipment

No.	Name	Size	Nos.	Remarks
Embankment				
1	Wheel loader	2.1 m^3 class	4	Excavation / loading
2	Backhoe shovel	1.0 m^3 class	2	Excavation / loading / trimming
3	Dump truck	10 - 12 ton class	20 - 30	Hauling / embankment
4	Bulldozer	28 ton class	3	Bulldozing / grading
5	Bulldozer	21 ton, swamp	2	Bulldozing / grading
6	Vibration roller	10 ton class	3	Compaction
7	Motor grader	3.1 m class	2	Grading
8	Water sprinkler	10 m^3 class	1	Watering
Other works: Borrow soil, minor excavation, etc.				
9	Backhoe shovel	0.7 m^3 class	2	Excavation / loading
10	Bulldozer	21 ton class	3	General purpose
11	Trailer	20 ton class	1	Transportation of Equipment
12	Dump truck	10 ton	20 - 30	Hauling
13	Motor grader	2.7 m	1	Grading
14	Backhoe shovel	0.3 m^3 class	3	Miscellaneous

CHAPTER 2 MAINTENANCE AND ADMINISTRATION

2.1 General Description of the Works

This chapter makes proposals on the maintenance and administration after the completion of structural measures and they are:

- For Bucao River:
  - Dike heightening / revetment
  - Bridge reconstruction
- For Sto.Tomas River
  - Dike heightening / revetment

2.1.1 Extent of the Works

Maintenance work in this chapter will be defined as periodical patrol for checking the condition of structures and repair works if it comes necessary. And administration means the necessary support for carrying out the maintenance operation.

2.1.2 Remedial Works

No significant maintenance work will be required at the Bucao Bridge because the main member of the bridge will be made with non-paint type steel plate girder.

With regards to the dikes of the Bucao River and Sto. Tomas River, it is assumed that three locations will suffer damages of partial breakdowns of the dike from floods every year. Presumed magnitude of each damage required for maintenance operation is as follows:

- length of damage 300 m
- lost of embankment material 50,000 m^3
- removal of damaged protection 900 m^3
- base concrete 150 m^3
- gabion mattress 540 m^3
- grouted riprap 900 m^3
- gravel pavement 300 m^3
- et cetera

2.2 Present Status

(1) Existing Organization

There are five organizations which have been involved with the river basin management and they are Regional Office (III), District Office in Zambales, PMO-MPR, PMO-MPE, Provincial Office of Zambales. Survey results on present status of each office are as follows. District Office at Olongapo City is not included because it will not be involved any of the maintenance works.

Annual Budget of Different Offices

For Year 2002 (in Million Pesos)

Name of Office	Personnel	Equipment	Project	Total
Regional Office (III)	37.25	-	211.80	-
District Office	54.49	-	11.69	-
PMO-MPR	9.27	-	6.50	-
PMO-MPE	12.97	5.46	1,697.15	1,715.58
Provincial Eng. Office	13.12	15.29	0.00	28.41
Total	127.10	-	1,927.14	-

Note: Budget in Project means on-going project's total amount.

Numbers of Personnel at Different Offices (Year 2002)

Name of Office	Engineer	Technician	Others.	Total
Regional Office (III)	49	36	48	133
District Office	28	93	65	186
PMO-MPR	26	39	21	86
PMO-MPE	32	22	30	84
Provincial Eng. Office	23	61	36	120
Total	158	251	200	609

Major Equipment Owned by Different Offices (Year 2002)

Name of Office	Bulldozers	Dump trucks	Others	Total
Regional Office (III)	5	0	33	38
District Office	0	3	24	27
PMO-MPR	26	0	30	56
PMO-MPE	0	0	11	11
Provincial Eng. Office	5	42	151	198
Total	36	45	249	330

Notes: Bulldozers at Regional Office are 24 ton but non-operational, need major repair. One of the Dump trucks at District Office is non-operational. Bulldozers at PMO-MPR are 24 – 26 ton class. Others at PMO-MPE are mostly small cars like pick-ups. Provincial Office's equipment is rather small size, in case of dump truck; their tonnage varies from 15 – 4 ton. Many motor cycles are included in the others.

2.3 Maintenance Works

Required maintenance works will be as follows:

2.3.1 Patrol and Inspection

Through the patrol and inspection, any irregularities or defects of the bridge and dikes are to be detected so that the irregularities and defects can be rectified before they come worse and impair the functions or safety of those structures.

Through the patrol and inspection, places or facilities to be maintained or repaired shall be identified. And the notice to a maintenance and repair section shall be made without delay. When large-scale maintenance and/or repair works are required, action programs should be arranged in order to avoid seriously negative effect on the functions of the structures. In a rainy season, an intensified patrol and

inspection shall be programmed by DPWH. If any irregularities or defects are found in the structures, repair works shall be immediately undertaken to prevent expansion or progression of the irregularities or defects.

Frequency (timing) and objectives of patrol/inspection are described as follows:

Frequency / Objectives of Patrol and Inspection

No.	Patrol / Inspection	Frequency	Objectives
1	Regular Inspection	Once a month (Once a week during rainy season	To find out the followings: - Irregularities of structures - Maintenance manner of structures
2	Semi-Annual Inspection (End of rainy season)	November, every year	To find out changes in structures To plan the maintenance activity program for the coming dry season
3	Semi-Annual Inspection (Before rainy season)	April, every year	To inspect the results of maintenance activities done before rainy season To prepare required material / equipment for urgent remedial repair works during rainy season
4	Special Inspection	During typhoon	To observe / inspect the conditions of rivers and structures during the flood To take immediate actions for urgent remedial measures to repair structures To observe / inspect the flood damages if any

Required arrangements for the respective inspection are as follows:

List of Manpower / Instrument / Material for Inspections

No.	Items	Regular Inspection	Semiannual (Nov)	Semiannual (April)	Special Inspection
1	Manpower				
	1) Civil Engineer	o	o	o	o
	2) Mechanician	o	o	o	o
	3) Survey crew		o	o	
2	Instruments / Material				
	1) 4WD vehicle (1 unit)	o	o	o	o
	2) Poles / Measuring tape	o	o	o	o
	3) Lubricant	o	o	o	o
	4) Survey instrument		o	o	
	5) Painting tools / materials		o	o	
	6) Sand-bags / Bamboo poles				o

2.3.2 Maintenance Work

(1) The Bucao Bridge:

The proposed bridge length is 321 m long and made of non-paint steel plate girder. The approach road for the bridge is 280 m at Manila side and 346 m at Iba side, and its width is 10.0 m.

For maintenance of the bridge, the following aspects should be taken into account at regular and special inspection.

(a) Surface condition of pavement including approach roads.

(b) Surroundings of abutments and piers

(c) Slopes of approach roads

(d) Condition of bridge bearing and support

(e) Handrails

(2) Dikes:

Dike embankment was constructed on the both banks of Bucao River and Sto. Tomas river. The total length of Bucao dikes is 12,080 m. The length of Sto. Tomas dikes is 30,850 m in total including 1,700 m diversion channel.

Typical cross sections of each dike are presented in the chapter 1 of this appendix . The top width of the dikes was designed as 8 m consisting of 5 m gravel pavement and 1.5 m shoulder on both sides. Gabion mattress, base concrete and grouted riprap are the parts of revetment and sodding on borrow soil with drain ditch on the landside as slope protection.

For maintenance of dikes, the following aspects should be taken into account at the time of monthly regular inspection and special inspection during the typhoon / flooding:

(a) Gully erosion / sodding on the slope

(b) Seepage from the riverside to landside

(c) Settlement of dike

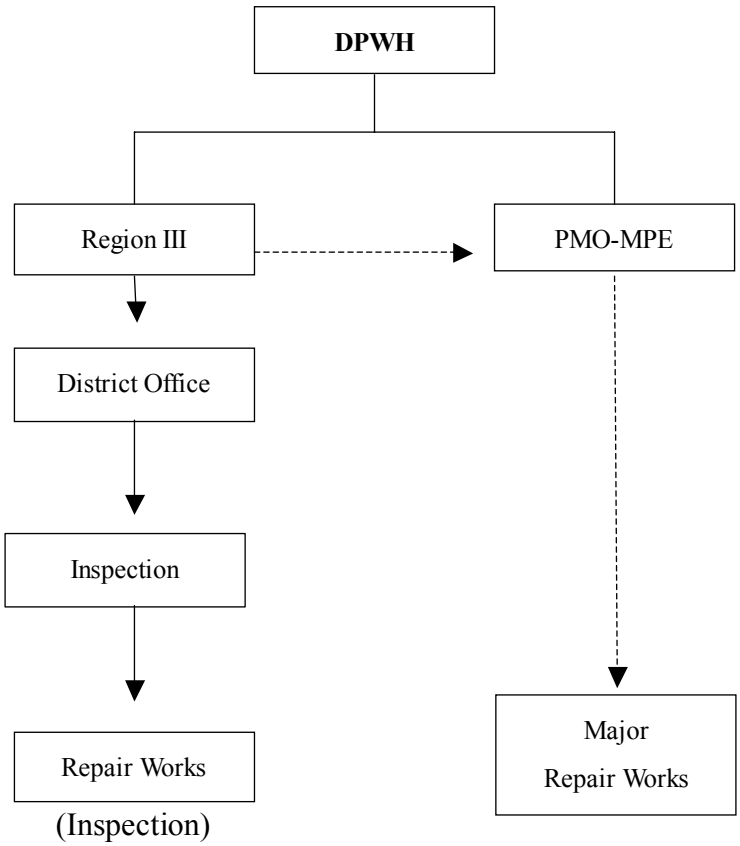
(d) Crown shape of dike surface

2.4 Organization and Function

(1) Proposed Organization

According to the nature of works, it is suggested that PMO-MPE and the District Office would be required to carry out the maintenance works. Initially because of the location and familiarity of the works, all the works would be managed by the District Office in Zambales, in particular the regular inspection of the structures and following remedial works. However, District Office will report to PMO-MPE about the inspection results together with expected remedial works, and ask PMO-MPE to execute major works which considered beyond the capacity of the District Office.

Proposed Organization for Maintenance Works



Note: Dotted line means the case when such repairs work is considered beyond District Office's capability, the work will be carried out by PMO.

(2) Manpower

In the maintenance of the structure, the District Office and / or PMO-MPE will be required capable to provide following staff when this work comes necessary.

Numbers of personnel:

Engineer	10
Technician	15
Administration	5
Total	30

(3) Instrument and Material

For supporting required regular inspection, cars and instruments with necessary consumables should be arranged for the District Office.

(4) Equipment

The District Office will maintain following equipment through procurement and repair for the maintenance works, all the time.

List of Equipment to be held by the District Office

No.	Name	Size / Capacity	Unit	Remarks
1	Backhoe shovel	0.7 m^3 class	1	
2	Backhoe shovel	0.3 m^3 class	1	
3	Dump truck	10 ton class	6	
4	Bulldozer	21 ton class	1	
5	Bulldozer	13 ton, swamp	1	
6	Motor grader	2.7 m class	1	
7	Vibration roller	8 ton class	1	
8	Truck crane	15 ton class	1	
9	Low-bed Trailer	20 ton class	1	
10	Concrete mixer	0.3 m^3 class	1	

Equipment will be used for 400 working hours every year; based on 4 months per year, 20 days per month, 5 hours per day.

(5) Materials

Following materials will be required for the maintenance operation.

- lost of embankment material 150,000 m^3
- base concrete 450 m^3
- gabion mattress 1,620 m^3
- grouted riprap 2,700 m^3
- gravel pavement 900 m^3

2.5 Schedule and Budget

Expected maintenance schedule with budget is shown in Figure 2.5.1

CHAPTER 3 COST ESTIMATE

3.1 Constitution of Project Cost

The project cost is estimated for major sectors, i.e. (1) Sabo and flood control structure measures (2) Non-structure measures and (3) Community-based disaster prevention measures, which are subdivided into as follows:

(1) Sabo and flood control structure measures

i) Bucao River Basin

ii) Sto. Tomas River Basin

(2) Non-structure measures

i) Flood/ Madflow Warning System

ii) Evacuation System

(3) Community-based disaster prevention measures

i) Community Based Forest Management

ii) Agriculture Development on Lahar Area

iii) Community Road Rehabilitation

iv) Establishment of Aeta Assistance Station

The project cost of each sub-item consists of the following components:

(1) Construction Cost

(2) Land Acquisition and Compensation

(3) Administration and Engineering Services Cost

(4) Contingency

i) Physical Contingency

ii) Price Contingency

3.2 Conditions and Method of Cost Estimate

(1) Construction Cost

The construction cost is basically estimated by unit price basis which multiply the work quantity and the unit price.

The unit prices of construction works of the sabo and flood control structure are determined in reference to prevailing unit prices which are collected from the ongoing similar projects in Pampanga and Pangasinan provinces. Unit prices of five contract packages of the Pinatubo Hazard Urgent Mitigation Project, Phase II and two contract packages of Agno River Flood Control Project, Phase II are referred. As the price level of the ongoing similar projects is the year of 2001 mostly and that of this study is September 2002, unit prices represented from those projects are adjusted by price inflation rates for one year. Annual inflation rates of 2% for foreign currency portion and 4% for local currency portion are applied, considering the recent inflation trend (details refer to Appendix I). Table 3.2.1.shows applied

unit prices, which is expressed in Philippine Peso and divided into local currency portion and foreign currency portion according to the following composition presented by NEDA.

	Local portion	Foreign portion
(1) Material		
a. Cement, Fuel& Lubricant	30%	70%
b. Aggregate & Lumber	60%	40%
c. Steel	20%	80%
d. Others	50%	50%
(2) Machinery & Equipment Rental	30%	70%
(3) Labor	100%	0%
(4) Indirect costs	100%	0%

While, the cost of general item including miscellaneous items is estimated by lump sum basis which is assumed to be 10% of the sum of construction cost estimated by the unit price basis. Data obtained from the ongoing similar project shows 8% in average for the general item as presented in Table 3.2.2. As for the unit price of non-structure and community based disaster prevention measures, it is discussed in each related section of 3.4 and 3.5.

(2) Land Acquisition and Compensation Cost

The cost estimate for the land acquisition and compensation is based on the cost data obtained from Bureau of Internal Revenue for the zonal valuation of land and village wise information gathered in the field. Data obtained from the field is applied for this study as shown in Table 3.2.3.

(3) Administration and Engineering Cost

Administration and engineering cost to be required for the project implementation is estimated by lump sum basis which is assumed at 3% of the construction cost for the government administration, at 6% of the construction cost for the detail design and 10% for construction supervision as the engineering services cost, which are basis on the DPWH standard.

(4) Contingency

Price contingency until the completion of the project is estimated by annual inflation rates of 4% for local currency and 2% for foreign currency. For the physical contingency, 10 % of construction cost for each item is applied.

3.3 Project Cost for Sabo and Flood Control Structure

The construction cost based on the feasibility design is estimated at P1,035 million for the Bucao River basin including P341 million for the cost of Bucao Bridge replacement and P.1,192 million for the Sto. Tomas River basin, of which detailed breakdowns are shown in Table 3.3.1 for the Bucao River basin and Table 3.3.2 for the Sto. Tomas River basin, respectively. From tables the construction cost of each structure is summarized as follows:

Construction Cost for Each Structure

No.	Description	Amount (P1,000)
1	Bucao River Basin	
(1)	Dike construction	690,624
(2)	Maintenance road	2,790
(3)	Bucao bridge replacement	341,086
	Total (1)	1,034, 500
2	Sto. Tomas River Basin	
(1)	Dike construction	1,125,598
(2)	Diversion channel	63,539
(3)	Maintenance road	2,991
	Total (2)	1,192,128
	Grand Total (1 to 2)	2,226,628

Based on the field investigation and the unit price given in Table 3.2.3, the cost of land acquisition and compensation is estimated at P82.9 million in totals of which summary is given in Table 3.3.3.

Detail calculation for the cost of land acquisition and compensation is presented in the report of Resettlement Plan prepared for this study.

Based on the construction cost, the government administration cost, engineering services cost and contingency are calculated as a lump sum basis. Thus, the project cost is estimated at P1,678 million for the Bucao River basin and at P1,960 million for the Sto. Tomas River basin, as shown in Table 3.3.4 and 3.3.5, respectively, which are summarized as follows:

Project Cost

(Unit: 1,000 Pesos)

No.	**Description**	**LC**	**FC**	**Total**
1.	Construction cost of civil works			
	Bucao River basin	551,281	483,219	1,034,500
	Sto. Tomas River basin	687,044	505,085	1,192,128
2.	Land acquisition & compensation	44,878	0	44,878
	Bucao River basin	44,878	0	44,878
	Sto. Tomas River basin	37,988	0	37,988
3.	Administration			
	Bucao River basin	31,035	0	31,035
	Sto. Tomas River basin	35,764	0	35,764
4	Engineering service cost			
	Bucao River basin	88,205	77,315	165,520
	Sto. Tomas River basin	109,927	80,814	190,741
5	**Sub Total**			
	Bucao River basin	**715,399**	**560,534**	**1,275,933**
	Sto. Tomas River basin	**870,723**	**585,899**	**1,456,621**
6	Price contingency			
	Bucao River basin	182,428	67,101	249,529
	Sto. Tomas River basin	245,391	79,459	324,850
7	Physical contingency			
	Bucao River basin	89,783	62,763	152,546
	Sto. Tomas River basin	111,611	66,536	178,147
8	**Total**			
	Bucao River basin	**987,609**	**690,399**	**1,678,008**
	Sto. Tomas River basin	**1,227,726**	**731,894**	**1,959,619**
9	**Grand Total**	**2,215,335**	**1,422,293**	**3,637,627**

Assuming an annual progress of construction works from the construction schedule discussed in the foregoing chapter 1, disbursement schedule of project cost is produced as shown in Table 3.3.6 for the Bucao River basin and Table 3.3.7 for the Sto. Tomas River basin. The tables show that if the replacement of Bucao Bridge is expected to commence in the year of 2005 and the construction works of both river basins are expected to commence in the year of 2007, the annual disbursement is indicated as follows:

Annual Disbursement

(Unit: Million Pesos)

Project	Currency	2004	2005	2006	2007	2008	2009	2010
Bucao	LC	0	65	136	230	191	198	167
	FC	0	45	99	189	124	127	105
	Total	0	110	235	419	315	325	272
Sto. Tomas	LC	0	0	62	258	327	340	240
	FC	0	0	19	147	208	212	146
	Total	0	0	81	405	535	552	386
Total	LC	0	65	198	488	518	538	407
	FC	0	45	118	336	332	339	251
	Total	0	110	316	824	850	877	658

3.4 Project Cost for Non-Structure Measure

(1) Flood/Mudflow Monitoring & Warning System

The flood/mudflow monitoring & warning system consists of (i) 11 stations of observatory system, (ii) 4 sites of monitoring system and (iii) 35 warning posts, of which cost is estimated for the purchase cost and installation cost of equipment. Major equipment to be required for the system includes the following equipment:

Observatory system:	Rainfall gauge
	Water level gauge
	Cellular phone system
	Power supply unit
Monitoring system:	Computer with soft ware
	Cellular phone system
	UPS
Warning post :	Panzer mast
	Siren
	Power supply unit

Based on the prevailing market price of the above equipment, supply and installation cost is estimated at P33,559 thousand in totals, of which breakdown is listed in Table 3.4.1.

For implementation of the project, government administration cost and engineering services cost is estimated at P1,007 thousand and P40,035 thousand, respectively. As shown in Table 3.4.2, thus, total project cost is estimated at P82,061 thousand including 10% of contingency . The detailed calculation of the estimate is presented in the supporting report: Appendix VIII. The project cost is summarized as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Supply and installation cost	33,559
2	Administration cost	1,007
3	Engineering service cost	40,035
	Sub total	74,601
4	Contingency	7,460
	Total	82,061

(2) Evacuation Center

As discussed in the supporting report: Appendix VIII, thirty six existing schools will be renovated and sixty evacuation centers are scheduled to construct newly dividing into three stages.

Referring to the prevailing price of building construction and land acquisition collected from the district office and similar projects as shown in Table 3.4.3, the construction and renovation cost is estimated at P1,366 million. Table 3.4.4 shows the construction cost summary for the evacuation center.

Based on the construction cost, the project cost is estimated at P1,788 million including the government administration cost, engineering services cost and contingency as shown as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Construction and renovation cost	1,366,300
2	Administration cost	40,989
3	Engineering service cost	218,608
	Sub total	1,625,897
4	Contingency	162,590
	Total	1,788,487

The detailed calculation of the estimate is described in the supporting report: Appendix VIII.

3.5 Project Cost for Community Based Disaster Prevention and Social Development

(1) Community Based Forest Management

For the cost estimate of the community-based forest management, unit prices per hectare of forest development were collected from the Forest Sector Project and provincial office. Table 3.5.1 shows the eleven kinds of collected unit prices.

Unit prices obtained from the Forest Sector Project is based on the MC2000-19, which is the guideline governing the updating of cost estimates and intensification of plantation maintenance and protection activities for the project in the forest sector. The unit price of provincial office is obtained from the ongoing project.

Referring to the collected unit prices, the plantation cost is estimated at P460 million for forest tree and at P116 million for agro-forestry as shown in Table 3.5.2.

The project cost is given as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Plantation cost	576,895
2	Administration cost	17,307
3	Engineering service cost	92,303
	Sub total	686,505
4	Contingency	68,651
	Total	755,156

(2) Agriculture Development

Unit prices of land development in Lahar areas, production cost per hectare for seasonal and perennials crops and production cost of mango per hectare are summarized in Table 3.5.3, Table 3.5.4 and Table 3.5.5, respectively, of which detail analysis of unit prices is referred to the report of Agriculture Development Research for Lahar Area.

Estimated construction cost for 1,726 hectares of seven areas is shown in Table 3.5.6.

The project cost is estimated at P701 million as follows:

(Unit: 1,000 Pesos)

No.	Description	Amount
1	Development cost	535,257
2	Administration cost	16,058
3	Engineering service cost	85,641
	Sub total	636,956
4	Contingency	63,696
	Total	700,652

(3) Community Road Rehabilitation

As described in the supporting report: Appendix VII, the community road network is planned to establish three routes as follows:

A line: Along the Bucao River with the length of 48.1 km

B line: Along the Santa Fe River with the length of 14.9 km

C line: Along the Sto. Tomas River, Mapanuepe Lake and Marella River with the length of 44.9 km

Construction works of the above road lines are composed of as follows:

	A line	B line	C line
i) New road construction (km)	26.06	4.64	23.49
ii) Improvement of existing road (km)	22.04	10.26	21.41
iii) Related structures construction			
- Bridge (no)	5	2	2
- Spillway (no)	9	5	10
- Retaining wall (m)	0	0	2900

To estimate the construction cost of the above, referring to the prevailing unit prices of DPWH, unit

prices to be applied are set as follows:

		Applied	Collected
i)	New road construction	: P4,200 /m	3,640 (DPWH) 5,777 (Agno II)
ii)	Improvement of existing road,		
-	Road width, less than 3 m	: P3,800 (90% of i))	
-	Road width, more than 3 m	: P3,400 (80% of i))	
iii)	Bridge	: P232,000 /m	190,000~280,000 (DPWH)

The construction cost of community road is estimated at P1,149 million of which breakdown is given in Table 3.5.7.

Based on the estimated construction cost, the project cost including government administration cost, engineering services cost and contingency is estimated at P1,821 million for the full development scheme as follows:

Construction Cost for Community Road Rehabilitation (Unit: 1,000 Pesos)

No.	Description	Amount
1	Construction cost	1,149,038
2	Administration and engineering service cost	344,711
3	Physical contingency	149,374
	Sub total	1,643,124
4	Price Escalation	178,036
Total		1,821,160

(4) Establishment of Aeta Assistance Station

Unit prices shown in Table 3.5.8 can be applied for the cost estimate of building construction, land preparation, land acquisition and so on for the Aeta Assistance Station as well as the evacuation center construction.

Estimated detailed cost is calculated in Appendix IX and cost summary is shown as follows:

Cost for Establishment of the Aeta Assistance Station (Unit: 1,000 Pesos)

No.	Description	Amount
1	Construction cost	
	(1) School of upland entrepreneurship	1,135,000.00
	(2) Ancestral land protection development and Management	4,941,606.40
	(3) Aeta cultural heritage	200,000.00
	(4) Aeta health nutrition and livelihood program	983,200.50
	Sub total (1)	7,259,806.90
2	Administration cost	1,074,905.60
3	Engineering service cost	362,990.35
	Sub total (1 to 3)	8,697,702.85
4	Contingency	869,770.29
	Total (1 to 4)	9,567,473.14

3.6 Overall Project Cost

Based on the project plan discussed in the foregoing chapters, overall project cost is estimated at P7,433 million of which breakdown is given in Table 3.6.1.

Tables

Table 3.2.1 Unit Price of Construction Works

(Unit: Peso)

No.	Description	Unit	Pinatubo Hazerd Urgent Mitigation Project, Phase II										Agno River Flood Control Project, Phase II				Represated Unit Price (Average)	Rasio of LC & FC		Escalated Unit Price		
			P-1		P-3		P-4		P-5		P-6		P-III		P-IV			LC	FC	LC	FC	Total
			Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price	Ref. No.	Unit price						
1	**Dike and channel works**																					
(1)	Demolition of Existing Revetment	m^3									101(1)	1,339.40					1,339	53.36%	46.64%	743.32	637.16	1,380.48
(2)	Clearing & Grabbing, t=20cm	m^2	100(1)	7.31	100(1)	12.23	100(1)	7.03	100(1)	18.10	100(1)	10.74					11	52.87%	47.33%	9.075	7.965	17.04
(3)	Backfilling	m^3	103(7)	109.94			103(7)	24.00									67	52.39%	47.61%	36.51	32.53	69.04
(4)	Excavation	m^3			1701(2)	59.71	102(2)	39.00	1701(2)	61.54	1701(2)	52.95					53	56.24%	43.77%	31	23.66	54.66
(5)	Embankment (Lahar Material)	m^3	104(1)a	131.54	1704(1)	76.30	104(1)a	105.00	1704(1)	113.14	1704(1)	76.77					101	53.51%	46.49%	56.21	47.89	104.10
(6)	Base Concrete	m^3			405(6)	2,820.00	405(6)	2,798.00			405(6)	2,170.59					2,596	64.62%	35.38%	1744.58	936.89	2,681.47
(7)	Wet Stone Masonry, t= 30cm	m^3					504(5)	1,993.00									1,993	54.96%	45.04%	1139.08	915.68	2,054.76
(8)	Covering Borrow Soil, t=50cm	m^3	104(1)b	566.90			104(1)c	248.00									407	55.94%	44.05%	236.79	182.86	419.65
(9)	Gabion Mattress, 0.3x2x6m	m^3	509(C)	2,551.75			509(b)	2,211.00	509(2)	2,052.27	509(2)	1,592.87					2,102	67.18%	32.82%	1468.7	703.59	2,172.29
(10)	Filter Cloth, t= 10mm	m^2	SPL-510D	113.56	SPL-510E	89.59	SPL-510c	95.00	SPL-510C	124.31	SPL-510D	104.51					105	64.30%	35.70%	70.22	38.23	108.45
(11)	Gravel Pavement, t=20cm	m^3	300(2)	862.07	300(1)	452.55	300(2)	607.00	300(1)	961.31	300(2)	767.72					730	58.73%	41.28%	445.91	307.34	753.25
(12)	Sodding	m^2	610	80.92	610	60.74	610	53.00	610	48.88	610	30.44					55	66.88%	33.13%	38.25	18.58	56.83
(13)	Leveling Concrete	m^3			405(6)	2,820.00	405(6)	2,798.00			405(6)	2,170.59					2,596	64.16%	35.84%	1665.54	930.46	2,596.00
(14)	Structure Concrete	m^3	405(1)	3,833.59	405(1)	3,340.00	405(1)	2,985.00			405(1)	3,344.49					3,376	62.25%	37.75%	2101.49	1274.51	3,376.00
(15)	Reinforcing steel bar	ton	404	37,120.00	404	23,000.00	404	23,000.00			404	27,930.00					27,763	47.19%	52.79%	13107.64	14655.81	27,763.00
2	**Bridge and Road works**																					
	Road																					
(1)	Clearing & Grabbing, t=20cm	m^2					100(1)	7.03					2.1.1	9.40	cw2.2.2	6.64	8	45.22%	54.79%	3.76	4.47	8.23
(2)	Backfilling	m^3					103(7)	55.00					3.2.1.2	61.00	cw2.5	158.99	92	49.24%	50.76%	47.12	47.63	94.75
(3)	Excavation	m^3					102(5)	56.00	103(2)	154.19	103(2)	114.92	2.1.10.1	137.03	cw2.3.4	139.14	120	50.78%	49.23%	63.37	60.26	123.63
(4)	Embankment (Lahar Material)	m^3					104(1)a	105.00					2.1.3	268.08			187	43.17%	56.84%	83.96	108.41	192.37
(5)	Base Concrete	m^3					405(6)	2,798.00	405(6)	4,381.74	405(6)	2,170.59	2.1.10.3	3,221.02			3,143	67.25%	33.53%	2198.08	1075.05	3,273.13
(6)	Wet Stone Masonry, t=30cm	m^3					504(5)	1,993.00					2.1.7	1,845.97			1,919	65.82%	34.20%	1313.51	669.33	1,982.84
(7)	Covering Borrow Soil, t=50cm	m^3					104(1)c	248.00					2.1.3	268.08	cw6.2.3	695.02	404	51.51%	48.49%	216.42	199.82	416.24
(8)	Gravel Pavement, t=20cm	m^3					300(2)	607.00					2.2.4	486.60	cw6.2.5	752.25	615	54.40%	45.60%	347.94	286.05	633.99
(9)	Sodding	m^2					610	53.00					2.1.8	35.12	cw2.6	73.61	54	57.78%	42.21%	32.45	23.25	55.70
	Superstructure																					
(1)	Steel plate girder	ton													cw8.6.3&4	164,089.81	164,090	38.46%	61.54%	65638.17	102995.91	168,634.08
(2)	Deck slab	m^2													cw10.4(10	8,578.25	8,578	62.25%	37.75%	5553.22	3303.13	8,856.35
	Substructure																					
(1)	Concrete	m^3					405(1)B	5,268.06	405(1)	4,795.56	405(1)	4,220.17			cw3.7(1)	6,356.51	5,160	71.04%	28.96%	3812.29	1524.22	5,336.51
(2)	Reinforcing steel bar	ton					404	23,000.00	404	31,690.00	404	27,360.00			cw3.6(3)	38,857.16	30,227	45.56%	54.44%	14322.59	16784.38	31,106.97
(3)	Cast in place pile, 1.2m Dia.	m					400(16)	33,966.20							cw4.5	44,276.78	39,121	46.03%	53.97%	18726.06	21537.47	40,263.53
	Removal of existing bridge																					
	7m x 35m	m					S2-B	15,186									15,186	53.36%	46.64%	8427.7	7224.1	15,651.80

Note;

1.Source of data

(1) **Pinatubo Hazard Urgent Mitigation Project, Phase II**
- Package 1 : Rehabilitation and Improvement of the Southwest Corner of the Megadike
- Package 3 : Improvement of Baluyot Channel
- Package 4 : Tail Dike, Evacuation Roads and Gugu Channelization
- Package 5 : Dredging in the Delta Area/Pilot Channel Dredging & Third River
- Package 6 : Downstream Channel Improvement Passing Sasmuan

(2) **Agno River Flood Control Project, Phase II**
- Package III : Social Development for Poponto Retarding Basin
- Package IV : Hector Mendoza Bridge

2. Cost of cast in place pile of P-4 includs cost of test and permanebt casing piles.

3. Annual inflation rate appliy : LC = 4%
FC = 2%

Table 3.2.2 Salient Features of Contract Price Obtained from Three Projects

(Unit: Peso)

No.	Description	Time of Bidding	Total Contract Price (P)	Foreign Portion	Local Portion	Amount of Part A (P)	Amount of Part B (P)	General Item /Total A &	% of Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)=(7)+(8)	(10)=((9)/(4)
1	Pinatubo hazard								
	Package I	10-00	456,471,942			8,845,562	2,109,606	10,955,168	2.4%
	Package III	5-01	233,303,765			7,881,268	1,240,661	9,121,928	3.9%
	Package IV	3-01	419,062,732			17,689,502	8,002,648	25,692,150	6.1%
	Package V	5-01	900,245,064			15,274,495	43,155,517	58,430,011	6.5%
	Package VI	5-01	345,430,948			10,249,672	11,471,900	21,721,572	6.3%
	Average % of General Item for Pinatubo project								5.0%
2	Agno I	11-97	1,121,078,114	68%	32%			129,588,188	11.6%
	F.C(P)		762,213,715	68%				86,662,852	
	L.C(P)		322,408,068		29%			32,668,654	
	VAT(P)		36,456,331		3%			10,256,682	
3	Agno II								
	Package III	12-01	496,940,728	1%	99%			33,954,590	6.8%
	F.C(P)		5,511,412	1%				5,511,413	
	L.C(P)		446,735,769		90%			25,838,965	
	VAT(P)		44,693,546		9%			2,604,212	
	Package IV	1-02	726,231,750	56%	44%			58,475,808	8.1%
	F.C(P)		408,371,682	56%				26,618,312	
	L.C(P)		296,473,407		41%			28,427,998	
	VAT(P)		21,386,661		3%			3,429,499	
	Average % of General Item for Agno project								7.4%
	Average % of General Item for the above three project								8.0%

Note;

1. Data of Item 1 are taken from the Monthly Progress Report (No.33).
2. Item 2 and Item 3 are taken from the Contractor's priced Bill of Quantities.
3. Contract prices of Item 1 do not show the foreign and local currency portion and also VAT.
4. General Item of Item 2 and 3 is not divided into Part A and B.

Table 3.2.3 Unit Price for Land Acquisition

No.	Municipality	Barangay	Selling / Buying Rate (Peso/m^2)
1	Botolan	Porac (Residential)	200 - 400
		Carael (Commercial)	750
		San. Juan (Residential)	100 - 150
2	San Marcelino	San Rafael (Residential)	100 - 200
		Rabanes (Agricultural)	200 - 300
		Mangricmot (Agricultural)	100 - 150
3	San Narciso	Alusius (Residential)	150 - 200
		Paite (Residential)	200
		San Pascual (Residential)	200 - 400

Source: Table 8.1.1 of the report of Resettlement Plan, Appendix XI

Table 3.3.1 Construction Cost of Bucao River Basin

(Unit: Peso)

No.	Description	Unit	Work Quantity	Unit Price			Amount			1. Equipment		2. Labor				3. Material										4. VAT		5. Overhead	
				LC	FC	Total	LC	FC	Total			a. Skilled labor		b. Unskilled labor		a. Cement		b. Aggregate		c. Steel		d. Lumber		e. Others					
1	**Dike construction**																												
1.1	**Left bank**																												
	i) New dike																												
	General Item	%	10%				4,549,062	3,340,024	7,889,086	0.1000	1,950,477	0.1000	381,961	0.1000	409,389	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	3,591,697	0.1000	273,871	0.1000	1,281,691
	Clearing & Grabbing	m2	100,500	9.08	7.97	17.04	912,038	800,483	1,712,520	0.6151	1,053,371	0.0630	107,889	0.0437	74,837	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	142,995	0.0720	123,301	0.1227	210,126
	Backfilling	m3	6,300	36.51	32.53	69.04	230,013	204,939	434,952	0.6801	295,811	0.0175	7,612	0.0709	30,838	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	33,404	0.1547	67,287
	Excavation	m3	32,700	31.00	23.66	54.66	1,013,700	773,682	1,787,382	0.5103	912,101	0.0754	134,769	0.0332	59,341	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	287,411	0.0619	110,639	0.1584	283,121
	Embankment (Lahar Material)	m3	254,400	51.00	43.00	94.00	12,974,400	10,939,200	23,913,600	0.5812	13,898,584	0.0429	1,025,893	0.0363	868,064	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	2,776,369	0.0660	1,578,298	0.1575	3,766,392
	Base Concrete	m3	1,100	1,744.58	936.89	2,681.47	1,919,038	1,030,579	2,949,617	0.0131	38,640	0.0109	32,151	0.1089	321,213	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	2,033,171	0.0133	39,230	0.1645	485,212
	Wet Stone Masonry	m3	9,400	1,139.08	915.68	2,054.76	10,707,352	8,607,392	19,314,744	0.0026	50,218	0.0841	1,624,370	0.0664	1,282,499	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	12,892,592	0.0153	295,516	0.1641	3,169,549
	Covering Borrow Soil	m3	31,700	236.79	182.86	419.65	7,506,243	5,796,662	13,302,905	0.1874	2,492,964	0.0015	19,954	0.0085	113,075	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	8,230,507	0.0197	262,067	0.1642	2,184,337
	Gabion Mattress	m3	4,200	1,468.70	703.59	2,172.29	6,168,540	2,955,078	9,123,618	0.0423	385,929	0.0673	614,019	0.0968	883,166	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	5,447,712	0.0206	187,947	0.1759	1,604,844
	Filter Cloth	m2	13,900	70.22	38.23	108.45	976,058	531,397	1,507,455	0.0080	12,060	0.0418	63,012	0.0688	103,713	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	1,059,439	0.0119	17,939	0.1667	251,293
	Gravel Pavement	m3	2,900	445.91	307.34	753.25	1,293,139	891,286	2,184,425	0.0953	208,176	0.0223	48,713	0.0124	27,087	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	1,511,622	0.0130	28,398	0.1650	360,430
	Sodding	m2	46,800	38.25	18.58	56.83	1,790,100	869,544	2,659,644	0.0590	156,919	0.0531	141,227	0.1241	330,062	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	1,535,147	0.0233	61,970	0.1633	434,320
	Sub total (1.1)						**50,039,683**	**36,740,266**	**86,779,948**		**21,455,251**		**4,201,569**		**4,503,284**		**0**		**0**		**0**		**0**		**39,508,662**		**3,012,578**		**14,098,603**
1.2	**Right bank**																												
	i) New dike																												
	General Item	%	10%				5,719,557	4,238,120	9,957,677	0.1000	2,609,155	0.1000	474,880	0.1000	505,182	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	4,395,516	0.1000	358,514	0.1000	1,614,430
	Clearing & Grabbing	m2	126,600	9.08	7.97	17.04	1,148,895	1,008,369	2,157,264	0.6151	1,326,933	0.0630	135,908	0.0437	94,272	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	180,132	0.0720	155,323	0.1227	264,696
	Backfilling	m3	7,000	36.51	32.53	69.04	255,570	227,710	483,280	0.6801	328,679	0.0175	8,457	0.0709	34,265	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	37,116	0.1547	74,763
	Excavation	m3	36,900	31.00	23.66	54.66	1,143,900	873,054	2,016,954	0.5103	1,029,252	0.0754	152,078	0.0332	66,963	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	324,326	0.0619	124,849	0.1584	319,486
	Embankment (Lahar Material)	m3	351,700	51.00	43.00	94.00	17,936,700	15,123,100	33,059,800	0.5812	19,214,356	0.0429	1,418,265	0.0363	1,200,071	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	3,838,243	0.0660	2,181,947	0.1575	5,206,919
	Base Concrete	m3	1,300	1744.58	936.89	2681.47	2,267,954	1,217,957	3,485,911	0.0131	45,665	0.0109	37,996	0.1089	379,616	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	2,402,838	0.0133	46,363	0.1645	573,432
	Wet Stone Masonry	m3	11,400	1139.08	915.68	2054.76	12,985,512	10,438,752	23,424,264	0.0026	60,903	0.0841	1,969,981	0.0664	1,555,371	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	15,635,696	0.0153	358,391	0.1641	3,843,922
	Covering Borrow Soil	m3	40,700	236.79	182.86	419.65	9,637,353	7,442,402	17,079,755	0.1874	3,200,746	0.0015	25,620	0.0085	145,178	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	10,567,244	0.0197	336,471	0.1642	2,804,496
	Gabion Mattress	m3	4,700	1468.70	703.59	2172.29	6,902,890	3,306,873	10,209,763	0.0423	431,873	0.0673	687,117	0.0968	988,305	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	6,096,249	0.0206	210,321	0.1759	1,795,897
	Filter Cloth	m2	15,600	70.22	38.23	108.45	1,095,432	596,388	1,691,820	0.0080	13,535	0.0418	70,718	0.0688	116,397	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	1,189,011	0.0119	20,133	0.1667	282,026
	Gravel Pavement	m3	3,200	445.91	307.34	753.25	1,426,912	983,488	2,410,400	0.0953	229,711	0.0223	53,752	0.0124	29,889	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	1,667,997	0.0130	31,335	0.1650	397,716
	Sodding	m2	62,600	38.25	18.58	56.83	2,394,450	1,163,108	3,557,558	0.0590	209,896	0.0531	188,906	0.1241	441,493	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	2,053,422	0.0233	82,891	0.1633	580,949
	Sub total (i)						**62,915,125**	**46,619,321**	**109,534,446**		**28,700,703**		**5,223,679**		**5,557,001**		**0**		**0**		**0**		**0**		**48,350,675**		**3,943,654**		**17,758,733**
	ii) Dike heightening																												
	General Item	%	10%				23,794,707	18,108,299	41,903,007	0.1000	12,566,357	0.1000	2,002,599	0.1000	1,906,478	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	17,012,548	0.1000	1,630,880	0.1000	6,784,145
	Demolition of Existing Revetment	m3	28,300	743.32	637.16	1380.48	21,035,956	18,031,628	39,067,584	0.5234	20,447,973	0.0468	1,828,363	0.0084	328,168	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.2039	7,965,880	0.0540	2,109,650	0.1635	6,387,550
	Clearing & Grabbing	m2	471,500	9.08	7.97	17.04	4,278,863	3,755,498	8,034,360	0.6151	4,941,935	0.0630	506,165	0.0437	351,102	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	670,869	0.0720	578,474	0.1227	985,816
	Backfilling	m3	22,100	36.51	32.53	69.04	806,871	718,913	1,525,784	0.6801	1,037,686	0.0175	26,701	0.0709	108,178	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	117,180	0.1547	236,039
	Excavation	m3	156,400	31.00	23.66	54.66	4,848,400	3,700,424	8,548,824	0.5103	4,362,465	0.0754	644,581	0.0332	283,821	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	1,374,651	0.0619	529,172	0.1584	1,354,134
	Embankment (Lahar Material)	m3	1,189,200	62.33	52.56	114.89	74,126,800	62,499,067	136,625,867	0.5812	79,406,954	0.0429	5,861,250	0.0363	4,959,519	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	15,862,263	0.0660	9,017,307	0.1575	21,518,574
	Base Concrete	m3	3,900	1744.58	936.89	2681.47	6,803,862	3,653,871	10,457,733	0.0131	136,996	0.0109	113,989	0.1089	1,138,847	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	7,208,515	0.0133	139,088	0.1645	1,720,297
	Wet Stone Masonry	m3	44,300	1139.08	915.68	2054.76	50,461,244	40,564,624	91,025,868	0.0026	236,667	0.0841	7,655,275	0.0664	6,044,118	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	60,759,767	0.0153	1,392,696	0.1641	14,937,345
	Covering Borrow Soil	m3	154,600	236.79	182.86	419.65	36,607,734	28,270,156	64,877,890	0.1874	12,158,117	0.0015	97,317	0.0085	551,462	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	40,139,951	0.0197	1,278,094	0.1642	10,652,950
	Gabion Mattress	m3	14,800	1468.70	703.59	2172.29	21,736,760	10,413,132	32,149,892	0.0423	1,359,940	0.0673	2,163,688	0.0968	3,112,110	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	19,196,701	0.0206	662,288	0.1759	5,655,166
	Filter Cloth	m2	49,200	70.22	38.23	108.45	3,454,824	1,880,916	5,335,740	0.0080	42,686	0.0418	223,034	0.0688	367,099	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	3,749,958	0.0119	63,495	0.1667	889,468
	Gravel Pavement	m3	9,900	445.91	307.34	753.25	4,414,509	3,042,666	7,457,175	0.0953	710,669	0.0223	166,295	0.0124	92,469	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	5,160,365	0.0130	96,943	0.1650	1,230,434
	Sodding	m2	245,000	38.25	18.58	56.83	9,371,250	4,552,100	13,923,350	0.0590	821,478	0.0531	739,330	0.1241	1,727,888	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	8,036,558	0.0233	324,414	0.1633	2,273,683
	Sub total (ii)						**261,741,780**	**199,191,294**	**460,933,073**		**138,229,922**		**22,028,587**		**20,971,257**		**0**		**0**		**0**		**0**		**187,138,025**	0.0000	**17,939,682**		**74,625,600**
	iii Spur dike																												
	General Item	%	10%				1,910,688	1,123,550	3,034,238	0.1000	144,167	0.1000	87,657	0.1000	290,902	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	1,959,910	0.1000	52,065	0.1000	499,537
	Demolition of Existing Revetment	m3	400	743.32	637.16	1380.48	297,328	254,864	552,192	0.5234	289,017	0.0468	25,843	0.0084	4,638	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.2039	112,592	0.0540	29,818	0.1635	90,283
	Clearing & Grabbing	m2	7,400	9.08	7.97	17.04	67,155	58,941	126,096	0.6151	77,562	0.0630	7,944	0.0437	5,510	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	10,529	0.0720	9,079	0.1227	15,472
	Backfilling	m3	1,200	36.51	32.53	69.04	43,812	39,036	82,848	0.6801	56,345	0.0175	1,450	0.0709	5,874	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	6,363	0.1547	12,817
	Excavation	m3	7,600	31.00	23.66	54.66	235,600	179,816	415,416	0.5103	211,987	0.0754	31,322	0.0332	13,792	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	66,799	0.0619	25,714	0.1584	65,802
	Embankment (Lahar Material)	m3	8000	51.00	43.00	94.00	408,000	344,000	752,000	0.5812	437,062	0.0429	32,261	0.0363	27,298	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	87,307	0.0660	49,632	0.1575	118,440
	Base Concrete	m3	8,000	1744.58	936.89	2681.47	13,956,640	7,495,120	21,451,760	0.0131	281,018	0.0109	233,824	0.1089	2,336,097	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	14,786,698	0.0133	285,308	0.1645	3,528,815
	Wet Stone Masonry	m3	2,400	1139.08	915.68	2054.76	2,733,792	2,197,632	4,931,424	0.0026	12,822	0.0841	414,733	0.0664	327,447	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	3,291,726	0.0153	75,451	0.1641	809,247
	Covering Borrow Soil	m3	0	236.79	182.86	419.65	0	0	0	0.1874	0	0.0015	0	0.0085	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	0	0.0197	0	0.1642	0
	Gabion Mattress	m3	800	1468.70	703.59	2172.29	1,174,960	562,872	1,737,832	0.0423	73,510	0.0673	116,956	0.0968	168,222	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5971	1,037,659	0.0206	35,799	0.1759	305,685
	Filter Cloth	m2	2,700	70.22	38.23	108.45	189,594	103,221	292,815	0.0080	2,343	0.0418	12,240	0.0688	20,146	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.7028	205,790	0.0119	3,484	0.1667	48,812
	Gravel Pavement	m3	0	445.91	307.34	753.25	0	0	0	0.0953	0	0.0223	0	0.0124	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	0	0.0130	0	0.1650	0
	Sodding	m2	0	38.25	18.58	56.83	0	0	0	0.0590	0	0.0531	0	0.1241	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	0	0.0233	0	0.1633	0
	Sub total (iii)						**21,017,569**	**12,359,052**	**33,376,621**		**1,585,832**		**964,230**		**3,199,925**		**0**		**0**		**0**		**0**		**21,559,011**		**572,714**		**5,494,909**
	Sub total (1.2)						**345,674,474**	**258,169,667**	**603,844,141**		**168,516,457**		**28,216,495**		**29,728,184**		**0**		**0**		**0**		**0**		**257,047,711**		**22,456,050**		**97,879,242**
	Total (1)						**395,714,156**	**294,909,933**	**690,624,089**		**189,971,708**		**32,418,064**		**34,231,468**		**0**		**0**		**0**		**0**		**296,556,374**		**25,468,628**		**111,977,846**
2	**Diversion channel of swampy area**																												
2.1	**Open channel**																												
	General Item	%	10%				2,022,708	1,558,428	3,581,136	0.1000	413,111	0.1000	156,281	0.1000	146,383	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	2,208,713	0.1000	71,433	0.1000	585,213
	Clearing & Grabbing	m^2	25,700	9.08	7.97	17.04	233,228	204,701	437,928	0.6151	269,370	0.0630	27,589	0.0437	19,137	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	36,567	0.0720	31,531	0.1227	53,734
	Backfilling	m^3	0	36.51	32.53	69.04	0	0	0	0.6801	0	0.0175	0	0.0709	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	0	0.1547	0
	Excavation	m^3	21,400	31.00	23.66	54.66	663,400	506,324	1,169,724	0.5103	596,910	0.0754	88,197	0.0332	38,835	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	188,092	0.0619	72,406	0.1584	185,284
	Embankment (Borrow Soil)	m^3	39,700	236.79	182.86	419.65	9,400,563	7,259,542	16,660,105	0.1874	3,122,104	0.0015	24,990	0.0085	141,611	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	10,307,607	0.0197	328,204	0.1642	2,735,589
	Wet Stone Masonry	m^3	7,700	1139.08	915.68	2054.76	8,770,916	7,050,736	15,821,652	0.0026	41,136	0.0841	1,330,601	0.0664	1,050,558	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	10,560,953	0.0153	242,071	0.1641	2,596,333
	Sodding	m^2	30,300	38.25	18.58	56.83	1,158,975	562,974	1,721,949	0.0590	101,595	0.0531	91,435	0.1241	213,694	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	993,909	0.0233	40,121	0.1633	281,194
	Sub total (2.1)						**22,249,790**	**17,142,704**	**39,392,494**		**4,544,226**		**1,719,095**		**1,610,218**		**0**		**0**		**0**		**0**		**24,295,840**		**785,767**		**6,437,348**
2.2	**Box culvert**																												
	General Item	%	10%				474,814	369,086	843,899	0.1000	110,361	0.1000	25,710	0.1000	67,002	0.1000	5,083	0.1000	1,921	0.1000	171,322	0.1000	0	0.1000	302,308	0.1000	20,300	0.1000	139,892
	Clearing & Grabbing	m^2	3,400	9.08	7.97	17.04	30,855	27,081	57,936	0.6151	35,636	0.0630	3,650	0.0437	2,532	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	4,838	0.0720	4,171	0.1227	7,109
	Backfilling	m^3	9,900	36.51	32.53	69.04	361,449	322,047	683,496	0.6801	464,846	0.0175	11,961	0.0709	48,460	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	52,492	0.1547	105,737
	Excavation	m^3	13,200	31.00	23.66	54.66	409,200	312,312	721,512	0.5103	368,188	0.0754	54,402	0.0332	23,954	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	116,019	0.0619	44,662	0.1584	114,288
	Embankment (Borrow Soil)	m^3	0	236.79	182.86	419.65	0	0	0	0.1874	0	0.0015	0	0.0085	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	0	0.0197	0	0.1642	0
	Wet Stone Masonry	m^3	0	1139.08	915.68	2054.76	0	0	0	0.0026	0	0.0841	0	0.0664	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	0	0.0153	0	0.1641	0
	Sodding	m^2	0	38.25	18.58	56.83	0	0	0	0.0590	0	0.0531	0	0.1241	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	0	0.0233	0	0.1633	0
	Leveling Concrete	m^3	100	1665.54	930.46	2596.00	166,554	93,046	259,600	0.0088	2,284	0.0193	5,010	0.1464	38,005	0.1958	50,830	0.0740	19,210	0.0000	0	0.0000	0	0.3712	96,364	0.0174	4,517	0.1671	43,379
	Concrete	m^3	1,200	2101.49	1274.51	3376.00	2,521,788	1,529,412	4,051,200	0.0446	180,684	0.0208	84,265	0.0606	245,503	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6926	2,805,861	0.0126	51,045	0.1688	683,843
	Reinforcing steel bar	ton	96	13107.19	14655.81	27763.00	1,258,290	1,406,958	2,665,248	0.0195	51,972	0.0367	97,815	0.1169	311,567	0.0000	0	0.0000	0	0.6428	1,713,221	0.0000	0	0.0000	0	0.0173	46,109	0.1668	444,563
	Sub total (2.2)						**5,222,950**	**4,059,941**	**9,282,891**		**1,213,971**		**282,813**		**737,024**		**55,913**		**21,131**		**1,884,544**		**0**		**3,325,390**		**223,296**		**1,538,810**
	Total (2)						**27,472,740**	**21,202,645**	**48,675,385**		**5,758,197**		**2,001,908**		**2,347,242**		**55,913**		**21,131**		**1,884,544**		**0**		**27,621,230**		**1,009,063**		**7,976,158**
3	**Maintenance road to Bucao bridge**																												
	General Item	%	10%				142,548	111,132	253,680	0.1000	84,559	0.1000	9,491	0.1000	10,097	0.1000	0	0.1000	0	0.1000	0	0.1000	0	0.1000	98,378	0.1000	10,402	0.1000	40,751
	Clearing & Grabbing	m^2	1,400	9.08	7.97	17.04	12,705	11,151	23,856	0.6151	14,674	0.0630	1,503	0.0437	1,043	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0835	1,992	0.0720	1,718	0.1227	2,927
	Backfilling	m^3	120	36.51	32.53	69.04	4,381	3,904	8,285	0.6801	5,634	0.0175	145	0.0709	587	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0768	636	0.1547	1,282
	Excavation	m^3	220	31.00	23.66	54.66	6,820	5,205	12,025	0.5103	6,136	0.0754	907	0.0332	399	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1608	1,934	0.0619	744	0.1584	1,905
	Embankment (Lahar Material)	m^3	12,440	51.00	43.00	94.00	634,440	534,920	1,169,360	0.5812	679,632	0.0429	50,166	0.0363	42,448	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.1161	135,763	0.0660	77,178	0.1575	184,174
	Base Concrete	m^3	30	1744.58	936.89	2681.47	52,337	28,107	80,444	0.0131	1,054	0.0109	877	0.1089	8,760	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6893	55,450	0.0133	1,070	0.1645	13,233
	Wet Stone Masonry	m^3	180	1139.08	915.68	2054.76	205,034	164,822	369,857	0.0026	962	0.0841	31,105	0.0664	24,558	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6675	246,879	0.0153	5,659	0.1641	60,694
	Covering Borrow Soil	m^3	1,530	236.79	182.86	419.65	362,289	279,776	642,065	0.1874	120,323	0.0015	963	0.0085	5,458	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	397,245	0.0197	12,649	0.1642	105,427
	Gravel Pavement	m^3	130	445.91	307.34	753.25	57,968	39,954	97,923	0.0953	9,332	0.0223	2,184	0.0124	1,214	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	67,762	0.0130	1,273	0.1650	16,157
	Sodding	m^2	2,340	38.25	18.58	56.83	89,505	43,477	132,982	0.0590	7,846	0.0531	7,061	0.1241	16,503	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.5772	76,757	0.0233	3,098	0.1633	21,716
	Total (3)						**1,568,028**	**1,222,448**	**2,790,476**		**930,152**		**104,401**		**111,068**		**0**		**0**		**0**		**0**		**1,082,161**		**114,427**		**448,266**
4	**Bucao bridge replacement**																												
4.1	General Item	%	10%				13,999,888	17,007,888	31,007,776	0.1000	6,527,649	0.1000	3,858,454	0.1000	1,698,576	0.1000	0	0.1000	0	0.1000	8,047,397	0.1000	0	0.1000	4,366,852	0.1000	1,118,867	0.1000	5,389,981
4.2	Superstructure																												
	Steel plate girder	ton	1,000	65888.33	105415.67	171304.00	65,888,328	105,415,672	171,304,000	0.1981	33,935,322	0.2119	36,299,318	0.0512	8,770,765	0.0000	0	0.0000	0	0.3107	53,224,153	0.0000	0	0.0050	856,520	0.0410	7,023,464	0.1821	31,194,458
	Deck slab	m^2	3,062	6224.80	3775.20	10000.00	19,060,338	11,559,662	30,620,000	0.0446	1,365,652	0.0208	636,896	0.0606	1,855,572	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0	0.6926	21,207,412	0.0126	385,812	0.1688	5,168,656
	Sub total (4.2)						84,948,665	116,975,335	201,924,000		35,300,974		36,936,214		10,626,337		0		0		53,224,153		0		22,063,932		7,409,276		36,363,114
4.3	Substructure																												
	Concrete	m^3	1,420	9574.77	3903.23	13478.00	13,596,175	5,542,585	19,138,760	0.0446	853,589	0.0208	398,086	0.0606	1,159,809	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6926	13,255,505	0.0126	241,148	0.1688	3,230,623
	Reinforcing steel bar	ton	142	22186.38	26509.62	48696.00	3,150,467	3,764,365	6,914,832	0.0195	134,839	0.0367	253,774	0.1169	808,344	0.0000	0	0.0000	0	0.6428	4,444,854	0.0000	0	0.0000	0	0.0173	119,627	0.1668	1,153,394
	Cast in place pile	m	936	32196.11	37755.89	69952.00	30,135,557	35,339,515	65,475,072	0.3730	24,422,202	0.0100	654,751	0.0647	4,236,237	0.0000	0	0.0000	0	0.3483	22,804,968	0.0000	0	0.0000	0	0.0448	2,933,283	0.1592	10,423,631
	Sub total (4.3)						46,882,198	44,646,466	91,528,664		25,410,630		1,306,611		6,204,390		0		0		27,249,822		0		13,255,505		3,294,058		14,807,648
4.4	Approach road																												
	Embankment	m^3	88,000	38.00	49.00	87.00	3,344,000	4,312,000	7,656,000	0.1874	1,434,734	0.0015	11,484	0.0085	65,076	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6187	4,736,767	0.0197	150,823	0.1642	1,257,115
	Pavement	m^2	4,200	473.28	396.72	870.00	1,987,776	1,666,224	3,654,000	0.0953	348,226	0.0223	81,484	0.0124	45,310	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.6920	2,528,568	0.0130	47,502	0.1650	602,910
	Sub total (4.4)						5,331,776	5,978,224	11,310,000		1,782,961		92,968		110,386		0		0		0		0		7,265,335		198,325		1,860,025
4.5	Removal of existing bridge	m	350	8103.55	7082.45	15186.00	2,836,244	2,478,856	5,315,100	0.5234	2,781,923	0.0468	248,747	0.0084	44,647	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.2039	1,083,749	0.0540	287,015	0.1635	869,019
	Total (4)						**153,998,772**	**187,086,769**	**341,085,540**		**71,804,137**		**42,442,994**		**18,684,335**		**0**		**0**		**88,521,372**		**0**		**48,035,373**		**12,307,542**		**59,289,787**
	Grand Total (1 to 4)						**578,753,695**	**504,421,794**	**1,083,175,490**		**268,464,195**		**76,967,367**		**55,374,113**		**55,913**		**21,131**		**90,405,915**		**0**		**373,295,138**		**38,899,661**		**179,692,057**
	Ratio of LC and FC						53%	47%	100%																				

Note: Item 2 (Diversion channel of swampy area) is not included in the priority project.

Table 3.3.2 Construction Cost of Sto. Tomas River Basin

(Unit: Peso)

No.	Description	Unit	Work Quantity	Unit Price			Amount			1. Equipment		2. Labor				3. Material										4. VAT		5. Overhead	
				LC	FC	Total	LC	FC	Total			a. Skilled labor		b. Unskilled labor		a. Cement		b. Aggregate		c. Steel		d. Lumber		e. Others					
1	**Dike construction**																												
1.1	**Left bank**																												
	i) Dike strengthening																												
	General Item	%	10%				17,250,812	12,796,779	30,047,591	0.1	8,600,273.71	0.1	985,626.43	0.1	1,102,600.53	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	13,442,560.70	0.1	1,061,203.36	0.1	4,849,457.94
	Demolition of Existing Revetment	m3	10,900	743.32	637.16	1,380.48	8,102,188	6,945,044	15,047,232	0.5234	7875721.229	0.047	704210.4576	0.008	126396.7488	0	0	0	0	0	0	0	0	0.2	3009446.4	0.05	812550.528	0.164	2460222.432
	Clearing & Grabbing	m2	612,100	9.08	7.97	17.04	5,554,808	4,875,377	10,430,184	0.6151	6415606.178	0.063	657101.592	0.044	455799.0408	0	0	0	0	0	0	0	0	0.08	870920.364	0.07	750973.248	0.123	1279783.577
	Backfilling	m3	8,300	36.51	32.53	69.04	303,033	269,999	573,032	0.6801	389719.0632	0.018	10028.06	0.071	40627.9688	0	0	0	0	0	0	0	0	0	0	0.08	44008.8576	0.155	88648.0504
	Excavation	m3	403,400	31.00	23.66	54.66	12,505,400	9,544,444	22,049,844	0.5103	11252035.39	0.075	1662558.238	0.033	732054.8208	0	0	0	0	0	0	0	0	0.16	3545614.915	0.06	1364885.344	0.158	3492695.29
	Embankment (Lahar Material)	m3	569,100	56.21	47.89	104.10	31,989,111	27,254,199	59,243,310	0.5812	34432211.77	0.043	2541537.999	0.036	2150532.153	0	0	0	0	0	0	0	0	0.12	6878148.291	0.07	3910058.46	0.158	9330821.325
	Base Concrete	m3	1,500	1,744.58	936.89	2,681.47	2,616,870	1,405,335	4,022,205	0.0131	52690.8855	0.011	43842.0345	0.109	438018.1245	0	0	0	0	0	0	0	0	0.69	2772505.907	0.01	53495.3265	0.165	661652.7225
	Wet Stone Masonry	m3	8,200	1,139.08	915.68	2,054.76	9,340,456	7,508,576	16,849,032	0.0026	43807.4832	0.084	1417003.591	0.066	1118775.725	0	0	0	0	0	0	0	0	0.67	11246728.86	0.02	257790.1896	0.164	2764926.151
	Covering Borrow Soil	m3	283,800	236.79	182.86	419.65	67,201,002	51,895,668	119,096,670	0.1874	22318715.96	0.002	178645.005	0.009	1012321.695	0	0	0	0	0	0	0	0	0.62	73685109.73	0.02	2346204.399	0.164	19555673.21
	Gabion Mattress	m3	5,600	1,468.70	703.59	2,172.29	8,224,720	3,940,104	12,164,824	0.0423	514572.0552	0.067	818692.6552	0.097	1177554.963	0	0	0	0	0	0	0	0	0.6	7263616.41	0.02	250595.3744	0.176	2139792.542
	Filter Cloth	m2	18,500	70.22	38.23	108.45	1,299,070	707,255	2,006,325	0.008	16050.6	0.042	83864.385	0.069	138035.16	0	0	0	0	0	0	0	0	0.7	1410045.21	0.01	23875.2675	0.167	334454.3775
	Gravel Pavement	m3	14,300	445.91	307.34	753.25	6,376,513	4,394,962	10,771,475	0.0953	1026521.568	0.022	240203.8925	0.012	133566.29	0	0	0	0	0	0	0	0	0.69	7453860.7	0.01	140029.175	0.165	1777293.375
	Sodding	m2	496,600	38.25	18.58	56.83	18,994,950	9,226,828	28,221,778	0.059	1665084.902	0.053	1498576.412	0.124	3502322.65	0	0	0	0	0	0	0	0	0.58	16289610.26	0.02	657567.4274	0.163	4608616.347
	Sub total (i)						**189,758,933**	**140,764,570**	**330,523,502**		**94,603,011**		**10,841,891**		**12,128,606**		**0**		**0**		**0**		**0**		**147,868,168**		**11,673,237**		**53,344,037**
	ii) Dike heightening																												
	General Item	%	10%				21,350,638	15,724,113	37,074,751	0.1	8600273.709	0.1	1,777,528.83	0.1	1,730,750.03	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	17,367,450.50	0.1	1,220,144.45	0.1	6,054,079.84
	Demolition of Existing Revetment	m3	37,200	743.32	637.16	1,380.48	27,651,504	23,702,352	51,353,856	0.5234	26878608.23	0.047	2403360.461	0.008	431372.3904	0	0	0	0	0	0	0	0	0.2	10270771.2	0.05	2773108.224	0.164	8396355.456
	Clearing & Grabbing	m2	414,500	9.08	7.97	17.04	3,761,588	3,301,493	7,063,080	0.6151	4344500.508	0.063	444974.04	0.044	308656.596	0	0	0	0	0	0	0	0	0.08	589767.18	0.07	508541.76	0.123	866639.916
	Backfilling	m3	26,700	36.51	32.53	69.04	974,817	868,551	1,843,368	0.6801	1253674.577	0.018	32258.94	0.071	130694.7912	0	0	0	0	0	0	0	0	0	0	0.08	141570.6624	0.155	285169.0296
	Excavation	m3	316,700	31.00	23.66	54.66	9,817,700	7,493,122	17,310,822	0.5103	8833712.467	0.075	1305235.979	0.033	574719.2904	0	0	0	0	0	0	0	0	0.16	2783580.178	0.06	1071539.882	0.158	2742034.205
	Embankment (Lahar Material)	m3	498,800	56.21	47.89	104.10	28,037,548	23,887,532	51,925,080	0.5812	30178856.5	0.043	2227585.932	0.036	1884880.404	0	0	0	0	0	0	0	0	0.12	6028501.788	0.07	3427055.28	0.158	8178200.1
	Base Concrete	m3	4,700	1,744.58	936.89	2,681.47	8,199,526	4,403,383	12,602,909	0.0131	165098.1079	0.011	137371.7081	0.109	1372456.79	0	0	0	0	0	0	0	0	0.69	8687185.174	0.01	167618.6897	0.165	2073178.531
	Wet Stone Masonry	m3	41,500	1,139.08	915.68	2,054.76	47,271,820	38,000,720	85,272,540	0.0026	221708.604	0.084	7171420.614	0.066	5662096.656	0	0	0	0	0	0	0	0	0.67	56919420.45	0.02	1304669.862	0.164	13993223.81
	Covering Borrow Soil	m3	173,800	236.79	182.86	419.65	41,154,102	31,781,068	72,935,170	0.1874	13668050.86	0.002	109402.755	0.009	619948.945	0	0	0	0	0	0	0	0	0.62	45124989.68	0.02	1436822.849	0.164	11975954.91
	Gabion Mattress	m3	17,900	1,468.70	703.59	2,172.29	26,289,730	12,594,261	38,883,991	0.0423	1644792.819	0.067	2616892.594	0.097	3763970.329	0	0	0	0	0	0	0	0	0.6	23217631.03	0.02	801010.2146	0.176	6839694.017
	Filter Cloth	m2	59,400	70.22	38.23	108.45	4,171,068	2,270,862	6,441,930	0.008	51535.44	0.042	269272.674	0.069	443204.784	0	0	0	0	0	0	0	0	0.7	4527388.404	0.01	76658.967	0.167	1073869.731
	Gravel Pavement	m3	11,900	445.91	307.34	753.25	5,306,329	3,657,346	8,963,675	0.0953	854238.2275	0.022	199889.9525	0.012	111149.57	0	0	0	0	0	0	0	0	0.69	6202863.1	0.01	116527.775	0.165	1479006.375
	Sodding	m2	284,200	38.25	18.58	56.83	10,870,650	5,280,436	16,151,086	0.059	952914.074	0.053	857622.6666	0.124	2004349.773	0	0	0	0	0	0	0	0	0.58	9322406.839	0.02	376320.3038	0.163	2637472.344
	Sub total (ii)						**234,857,020**	**172,965,238**	**407,822,258**	**3.3178**	**89047690.41**	**0.527**	**17775288.32**	**0.678**	**17307500.32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**173674505**	**0.45**	**12201444.47**	**1.921**	**60540798.43**
	Sub total (1.1)						**424,615,952**	**313,729,808**	**738,345,760**	**3.3178**	**183650701.2**	**0.527**	**28617179.07**	**0.678**	**29436106.19**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**321542672.8**	**0.45**	**23874681.43**	**1.921**	**113884835.8**
1.2	**Right bank**																												
	i) New dike																												
	General Item	%	10%				2,852,774	1,996,621	4,849,395	0.1	8600273.709	0.1	240,972.02	0.1	274,289.06	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	2,474,257.01	0.1	143,510.60	0.1	794,890.68
	Demolition of Existing Revetment	m3	0	743.32	637.16	1,380.48	0	0	0	0.5234	0	0.047	0	0.008	0	0	0	0	0	0	0	0	0	0.2	0	0.05	0	0.164	0
	Clearing & Grabbing	m2	61,200	9.08	7.97	17.04	555,390	487,458	1,042,848	0.6151	641455.8048	0.063	65699.424	0.044	45572.4576	0	0	0	0	0	0	0	0	0.08	87077.808	0.07	75085.056	0.123	127957.4496
	Backfilling	m3	5,800	36.51	32.53	69.04	211,758	188,674	400,432	0.6801	272333.8032	0.018	7007.56	0.071	28390.6288	0	0	0	0	0	0	0	0	0	0	0.08	30753.1776	0.155	61946.8304
	Excavation	m3	49,300	31.00	23.66	54.66	1,528,300	1,166,438	2,694,738	0.5103	1375124.801	0.075	203183.2452	0.033	89465.3016	0	0	0	0	0	0	0	0	0.16	433313.8704	0.06	166804.2822	0.158	426846.4992
	Embankment (Lahar Material)	m3	77,100	56.21	47.89	104.10	4,333,791	3,692,319	8,026,110	0.5812	4664775.132	0.043	344320.119	0.036	291347.793	0	0	0	0	0	0	0	0	0.12	931831.371	0.07	529723.26	0.158	1264112.325
	Base Concrete	m3	1,100	1,744.58	936.89	2,681.47	1,919,038	1,030,579	2,949,617	0.0131	38639.9827	0.011	32150.8253	0.109	321213.2913	0	0	0	0	0	0	0	0	0.69	2033170.998	0.01	39229.9061	0.165	485211.9965
	Wet Stone Masonry	m3	5,800	1,139.08	915.68	2,054.76	6,606,664	5,310,944	11,917,608	0.0026	30985.7808	0.084	1002270.833	0.066	791329.1712	0	0	0	0	0	0	0	0	0.67	7955003.34	0.02	182339.4024	0.164	1955679.473
	Covering Borrow Soil	m3	19,800	236.79	182.86	419.65	4,688,442	3,620,628	8,309,070	0.1874	1557119.718	0.002	12463.605	0.009	70627.095	0	0	0	0	0	0	0	0	0.62	5140821.609	0.02	163688.679	0.164	1364349.294
	Gabion Mattress	m3	3,900	1,468.70	703.59	2,172.29	5,727,930	2,744,001	8,471,931	0.0423	358362.6813	0.067	570160.9563	0.097	820082.9208	0	0	0	0	0	0	0	0	0.6	5058590	0.02	174521.7786	0.176	1490212.663
	Filter Cloth	m2	12,900	70.22	38.23	108.45	905,838	493,167	1,399,005	0.008	11192.04	0.042	58478.409	0.069	96251.544	0	0	0	0	0	0	0	0	0.7	983220.714	0.01	16648.1595	0.167	233214.1335
	Gravel Pavement	m3	2,600	445.91	307.34	753.25	1,159,366	799,084	1,958,450	0.0953	186640.285	0.022	43673.435	0.012	24284.78	0	0	0	0	0	0	0	0	0.69	1355247.4	0.01	25459.85	0.165	323144.25
	Sodding	m2	23,300	38.25	18.58	56.83	891,225	432,914	1,324,139	0.059	78124.201	0.053	70311.7809	0.124	164325.6499	0	0	0	0	0	0	0	0	0.58	764293.0308	0.02	30852.4387	0.163	216231.8987
	Sub total (i)						**31,380,516**	**21,962,827**	**53,343,343**		**9214754.23**		**2409720.193**		**2742890.633**		**0**		**0**		**0**		**0**		**24742570.14**		**1435105.99**		**7948906.813**
	ii) Dike strengthening							53,343,343																					
	General Item	%	10%				6,135,812	4,444,726	10,580,537	0.1	2,299,847.03	0.1	523,035.50	0.1	496,136.51	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	5,192,005.56	0.1	323,491.18	0.1	1,737,837.93
	Demolition of Existing Revetment	m3	15,200	743.32	637.16	1,380.48	11,298,464	9,684,832	20,983,296	0.5234	10982657.13	0.047	982018.2528	0.008	176259.6864	0	0	0	0	0	0	0	0	0.2	4196659.2	0.05	1133097.984	0.164	3430768.896
	Clearing & Grabbing	m2	100,600	9.08	7.97	17.04	912,945	801,279	1,714,224	0.6151	1054419.182	0.063	107996.112	0.044	74911.5888	0	0	0	0	0	0	0	0	0.08	143137.704	0.07	123424.128	0.123	210335.2848
	Backfilling	m3	9,200	36.51	32.53	69.04	335,892	299,276	635,168	0.6801	431977.7568	0.018	11115.44	0.071	45033.4112	0	0	0	0	0	0	0	0	0	0	0.08	48780.9024	0.155	98260.4896
	Excavation	m3	123,000	31.00	23.66	54.66	3,813,000	2,910,180	6,723,180	0.5103	3430838.754	0.075	506927.772	0.033	223209.576	0	0	0	0	0	0	0	0	0.16	1081087.344	0.06	416164.842	0.158	1064951.712
	Embankment (Lahar Material)	m3	35,800	56.21	47.89	104.10	2,012,318	1,714,462	3,726,780	0.5812	2166004.536	0.043	159878.862	0.036	135282.114	0	0	0	0	0	0	0	0	0.12	432679.158	0.07	245967.48	0.158	586967.85
	Base Concrete	m3	1,700	1,744.58	936.89	2,681.47	2,965,786	1,592,713	4,558,499	0.0131	59716.3369	0.011	49687.6391	0.109	496420.5411	0	0	0	0	0	0	0	0	0.69	3142173.361	0.01	60628.0367	0.165	749873.0855
	Wet Stone Masonry	m3	12,200	1,139.08	915.68	2,054.76	13,896,776	11,171,296	25,068,072	0.0026	65176.9872	0.084	2108224.855	0.066	1664519.981	0	0	0	0	0	0	0	0	0.67	16732938.06	0.02	383541.5016	0.164	4113670.615
	Covering Borrow Soil	m3	47,000	236.79	182.86	419.65	11,129,130	8,594,420	19,723,550	0.1874	3696193.27	0.002	29585.325	0.009	167650.175	0	0	0	0	0	0	0	0	0.62	12202960.39	0.02	388553.935	0.164	3238606.91
	Gabion Mattress	m3	6,200	1,468.70	703.59	2,172.29	9,105,940	4,362,258	13,468,198	0.0423	569704.7754	0.067	906409.7254	0.097	1303721.566	0	0	0	0	0	0	0	0	0.6	8041861.026	0.02	277444.8788	0.176	2369056.028
	Filter Cloth	m2	20,500	70.22	38.23	108.45	1,439,510	783,715	2,223,225	0.008	17785.8	0.042	92930.805	0.069	152957.88	0	0	0	0	0	0	0	0	0.7	1562482.53	0.01	26456.3775	0.167	370611.6075
	Gravel Pavement	m3	4,100	445.91	307.34	753.25	1,828,231	1,260,094	3,088,325	0.0953	294317.3725	0.022	68869.6475	0.012	38295.23	0	0	0	0	0	0	0	0	0.69	2137120.9	0.01	40148.225	0.165	509573.625
	Sodding	m2	68,500	38.25	18.58	56.83	2,620,125	1,272,730	3,892,855	0.059	229678.445	0.053	206710.6005	0.124	483103.3055	0	0	0	0	0	0	0	0	0.58	2246955.906	0.02	90703.5215	0.163	635703.2215
	Sub total (ii)						**67,493,929**	**48,891,981**	**116,385,909**		**183,958,504**		**28,894,201**		**30,083,535**		**0**		**0**		**0**		**0**		**324,553,922**		**23,996,237**		**114,736,771**
	iii Dike heightening																												
	General Item	%	10%				11,363,033	8,411,823	19,774,856	0.1	5,272,752.23	0.1	871,864.84	0.1	886,615.63	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	8,823,094.98	0.1	693,606.73	0.1	3,218,145.57
	Demolition of Existing Revetment	m3	16,300	743.32	637.16	1,380.48	12,116,116	10,385,708	22,501,824	0.5234	11777454.68	0.047	1053085.363	0.008	189015.3216	0	0	0	0	0	0	0	0	0.2	4500364.8	0.05	1215098.496	0.164	3679048.224
	Clearing & Grabbing	m2	236,900	9.08	7.97	17.04	2,149,868	1,886,909	4,036,776	0.6151	2483020.918	0.063	254316.888	0.044	176407.1112	0	0	0	0	0	0	0	0	0.08	337070.796	0.07	290647.872	0.123	495312.4152
	Backfilling	m3	12,800	36.51	32.53	69.04	467,328	416,384	883,712	0.6801	601012.5312	0.018	15464.96	0.071	62655.1808	0	0	0	0	0	0	0	0	0	0	0.08	67869.0816	0.155	136710.2464
	Excavation	m3	131,900	31.00	23.66	54.66	4,088,900	3,120,754	7,209,654	0.5103	3679086.436	0.075	543607.9116	0.033	239360.5128	0	0	0	0	0	0	0	0	0.16	1159312.363	0.06	446277.5826	0.158	1142009.194
	Embankment (Lahar Material)	m3	393,200	56.21	47.89	104.10	22,101,772	18,830,348	40,932,120	0.5812	23789748.14	0.043	1755987.948	0.036	1485835.956	0	0	0	0	0	0	0	0	0.12	4752219.132	0.07	2701519.92	0.158	6446808.9
	Base Concrete	m3	2,300	1,744.58	936.89	2,681.47	4,012,534	2,154,847	6,167,381	0.0131	80792.6911	0.011	67224.4529	0.109	671627.7909	0	0	0	0	0	0	0	0	0.69	4251175.723	0.01	82026.1673	0.165	1014534.175
	Wet Stone Masonry	m3	17,000	1,139.08	915.68	2,054.76	19,364,360	15,566,560	34,930,920	0.0026	90820.392	0.084	2937690.372	0.066	2319413.088	0	0	0	0	0	0	0	0	0.67	23316389.1	0.02	534443.076	0.164	5732163.972
	Covering Borrow Soil	m3	106,800	236.79	182.86	419.65	25,289,172	19,529,448	44,818,620	0.1874	8399009.388	0.002	67227.93	0.009	380958.27	0	0	0	0	0	0	0	0	0.62	27729280.19	0.02	882926.814	0.164	7359217.404
	Gabion Mattress	m3	8,600	1,468.70	703.59	2,172.29	12,630,820	6,050,874	18,681,694	0.0423	790235.6562	0.067	1257278.006	0.097	1808387.979	0	0	0	0	0	0	0	0	0.6	11154839.49	0.02	384842.8964	0.176	3286109.975
	Filter Cloth	m2	28,400	70.22	38.23	108.45	1,994,248	1,085,732	3,079,980	0.008	24639.84	0.042	128743.164	0.069	211902.624	0	0	0	0	0	0	0	0	0.7	2164609.944	0.01	36651.762	0.167	513432.666
	Gravel Pavement	m3	5,700	445.91	307.34	753.25	2,541,687	1,751,838	4,293,525	0.0953	409172.9325	0.022	95745.6075	0.012	53239.71	0	0	0	0	0	0	0	0	0.69	2971119.3	0.01	55815.825	0.165	708431.625
	Sodding	m2	179,700	38.25	18.58	56.83	6,873,525	3,338,826	10,212,351	0.059	602528.709	0.053	542275.8381	0.124	1267352.759	0	0	0	0	0	0	0	0	0.58	5894568.997	0.02	237947.7783	0.163	1667676.918
	Sub total (iii)						**124,993,362**	**92,530,050**	**217,523,413**	**3.3178**	**52727522.32**	**0.527**	**8718648.442**	**0.678**	**8866156.304**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**88230949.84**	**0.45**	**6936067.271**	**1.921**	**32181455.71**
	Sub total (1.2)						**223,867,807**	**163,384,857**	**387,252,665**	**3.3178**	**245900780.4**	**0.527**	**40022570.09**	**0.678**	**41692582.08**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**437527441.7**	**0.45**	**32367410.65**	**1.921**	**154867133.4**
	Total (1)						**648,483,760**	**477,114,665**	**1,125,598,425**	**6.6356**	**429551481.6**	**1.053**	**68639749.15**	**1.357**	**71128688.28**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10.2**	**759070114.5**	**0.9**	**56242092.07**	**3.841**	**268751969.2**
2	**Diversion channel of the Gabor River**																												
2.1	**Open channel**																												
	General Item	%	10%				3,352,269	2,424,024	5,776,293	0.1	849,249.29	0.1	292,858.08	0.1	324,398.84	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	3,217,349.39	0.1	146,500.63	0.1	945,936.87
	Demolition of Existing Revetment	m3	0	743.32	637.16	1,380.48	0	0	0	0.5234	0	0.047	0	0.008	0	0	0	0	0	0	0	0	0	0.2	0	0.05	0	0.164	0
	Clearing & Grabbing	m2	30,700	9.08	7.97	17.04	278,603	244,526	523,128	0.6151	321776.0328	0.063	32957.064	0.044	22860.6936	0	0	0	0	0	0	0	0	0.08	43681.188	0.07	37665.216	0.123	64187.8056
	Backfilling	m3	34,300	36.51	32.53	69.04	1,252,293	1,115,779	2,368,072	0.6801	1610525.767	0.018	41441.26	0.071	167896.3048	0	0	0	0	0	0	0	0	0	0	0.08	181867.9296	0.155	366340.7384
	Excavation	m3	125,200	31.00	23.66	54.66	3,881,200	2,962,232	6,843,432	0.5103	3492203.35	0.075	515994.7728	0.033	227201.9424	0	0	0	0	0	0	0	0	0.16	1100423.866	0.06	423608.4408	0.158	1083999.629
	Embankment (Lahar Material)	m3	0	56.21	47.89	104.10	0	0	0	0.5812	0	0.043	0	0.036	0	0	0	0	0	0	0	0	0	0.12	0	0.07	0	0.158	0
	Base Concrete	m3	1,900	1,744.58	936.89	2,681.47	3,314,702	1,780,091	5,094,793	0.0131	66741.7883	0.011	55533.2437	0.109	554822.9577	0	0	0	0	0	0	0	0	0.69	3511840.815	0.01	67760.7469	0.165	838093.4485
	Wet Stone Masonry	m3	10,500	1,139.08	915.68	2,054.76	11,960,340	9,614,640	21,574,980	0.0026	56094.948	0.084	1814455.818	0.066	1432578.672	0	0	0	0	0	0	0	0	0.67	14401299.15	0.02	330097.194	0.164	3540454.218
	Covering Borrow Soil	m3	33,600	236.79	182.86	419.65	7,956,144	6,144,096	14,100,240	0.1874	2642384.976	0.002	21150.36	0.009	119852.04	0	0	0	0	0	0	0	0	0.62	8723818.488	0.02	277774.728	0.164	2315259.408
	Gabion Mattress	m3	2,300	1,468.70	703.59	2,172.29	3,378,010	1,618,257	4,996,267	0.0423	211342.0941	0.067	336248.7691	0.097	483638.6456	0	0	0	0	0	0	0	0	0.6	2983271.026	0.02	102923.1002	0.176	878843.3653
	Filter Cloth	m2	7,600	70.22	38.23	108.45	533,672	290,548	824,220	0.008	6593.76	0.042	34452.396	0.069	56706.336	0	0	0	0	0	0	0	0	0.7	579261.816	0.01	9808.218	0.167	137397.474
	Gravel Pavement	m3	0	445.91	307.34	753.25	0	0	0	0.0953	0	0.022	0	0.012	0	0	0	0	0	0	0	0	0	0.69	0	0.01	0	0.165	0
	Sodding	m2	25,300	38.25	18.58	56.83	967,725	470,074	1,437,799	0.059	84830.141	0.053	76347.1269	0.124	178430.8559	0	0	0	0	0	0	0	0	0.58	829897.5828	0.02	33500.7167	0.163	234792.5767
	Sub total (2)						**36,874,957**	**26,664,267**	**63,539,224**	**3.3178**	**8492492.857**	**0.527**	**2928580.811**	**0.678**	**3243988.448**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5.11**	**32173493.93**	**0.45**	**1465006.29**	**1.921**	**9459368.663**
3	**Maintenance road to Maculcol bridge**																												
	General Item	%	10%				153,175	118,708	271,883	0.1	44,059,920.50	0.1	7,185,473.12	0.1	7,469,212.53	0.1	0.00	0.1	0.00	0.1	0.00	0.1	0.00	0.1	79,461,044.71	0.1	5,802,280.87	0.1	27,952,420.48
	Clearing & Grabbing	m^2	1,560	9.08	7.97	17.04	14,157	12,425	26,582	0.6151	16350.83424	0.063	1674.6912	0.044	1161.65088	0	0	0	0	0	0	0	0	0.08	2219.6304	0.07	1913.9328	0.123	3261.66048
	Backfilling	m^3	170	36.51	32.53	69.04	6,207	5,530	11,737	0.6801	7982.19768	0.018	205.394	0.071	832.13912	0	0	0	0	0	0	0	0	0	0	0.08	901.38624	0.155	1815.68296
	Excavation	m^3	290	31.00	23.66	54.66	8,990	6,861	15,851	0.5103	8088.96942	0.075	1195.19556	0.033	526.26648	0	0	0	0	0	0	0	0	0.16	2548.90512	0.06	981.20166	0.158	2510.86176
	Embankment (Lahar Material)	m^3	10,710	56.21	47.89	104.10	602,009	512,902	1,114,911	0.5812	647986.2732	0.043	47829.6819	0.036	40471.2693	0	0	0	0	0	0	0	0	0.12	129441.1671	0.07	73584.126	0.158	175598.4825
	Base Concrete	m^3	40	1,744.58	936.89	2,681.47	69,783	37,476	107,259	0.0131	1405.09028	0.011	1169.12092	0.109	11680.48332	0	0	0	0	0	0	0	0	0.69	73933.49084	0.01	1426.54204	0.165	17644.0726
	Wet Stone Masonry	m^3	180	1,139.08	915.68	2,054.76	205,034	164,822	369,857	0.0026	961.62768	0.084	31104.95688	0.066	24558.49152	0	0	0	0	0	0	0	0	0.67	246879.414	0.02	5658.80904	0.164	60693.50088
	Covering Borrow Soil	m^3	1,870	236.79	182.86	419.65	442,797	341,948	784,746	0.1874	147061.3067	0.002	1177.11825	0.009	6670.33675	0	0	0	0	0	0	0	0	0.62	485522.0409	0.02	15459.48635	0.164	128855.2111
	Gravel Pavement	m^3	180	445.91	307.34	753.25	80,264	55,321	135,585	0.0953	12921.2505	0.022	3023.5455	0.012	1681.254	0	0	0	0	0	0	0	0	0.69	93824.82	0.01	1762.605	0.165	22371.525
	Sodding	m^2	2,680	38.25	18.58	56.83	102,510	49,794	152,304	0.059	8985.9596	0.053	8087.36364	0.124	18900.97604	0	0	0	0	0	0	0	0	0.58	87910.09968	0.02	3548.69252	0.163	24871.30852
	Total (3)						**1,684,927**	**1,305,789**	**2,990,715**	**2.7441**	**851743.5093**	**0.371**	**95467.06785**	**0.504**	**106482.8674**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3.61**	**1122279.568**	**0.36**	**105236.7817**	**1.414**	**437622.3058**
	Grand Total (1 to 3)						**687,043,644**	**505,084,720**	**1,192,128,364**	**13**	**438,895,718**	**2**	**71,663,797**	**3**	**74,479,160**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**792,365,888**	**2**	**57,812,335**	**7**	**278,648,960**
	Ratio of LC and FC						58%	42%	100%																				

Table 3.3.3 Summary of Cost for Land Acquisition and Compensation

(Unit: Peso)

Description	Bucao R.B	Sto. Tomas River Basin				Total
	Botolan	S. Marcelino	S. Felipe	S. Narciso	Sub total	
1 Land	34,807,300.00	4,750,000.00	1,125,000.00	4,735,944.00	10,610,944.00	45,418,244.00
2 House	3,264,402.70	2,184,177.02	9,109.16	407,077.26	2,600,363.44	5,864,766.14
3 Structure						
(1) Business establishments	973,657.79				0.00	973,657.79
(2) Rest house	150,719.43	6,599.49	1,115.41	2,974.42	10,689.32	161,408.75
(3) Kitchen	1,161.88	3,392.69			3,392.69	4,554.57
(4) Toilet	36,111.32	7,319.86			7,319.86	43,431.18
(5) Storage	27,885.19				0.00	27,885.19
(6) Deepwell	15,000.00	30,000.00	15,000.00		45,000.00	60,000.00
(7) Pigpens	16,173.42	27,885.18		6,692.44	34,577.62	50,751.04
Sub total (3)	1,220,709.03	75,197.22	16,115.41	9,666.86	100,979.49	1,321,688.52
4 Trees	5,234,602.38	7,046,580.13	201,330.86	3,422,624.63	10,670,535.62	15,905,138.00
5 Disturbance compensation	351,000.00	472,500.00	13,500.00	229,500.00	715,500.00	1,066,500.00
Total (1 to 5)	44,878,014.11	14,528,454.37	1,365,055.43	8,804,812.75	24,698,322.55	69,576,336.66
6 Additional Land &	0.00	13,289,890.00	0.00	0.00	13,289,890.00	13,289,890.00
House compensation(*1)						
7 Total (1 to 6)	44,878,014.11	27,818,344.37	1,365,055.43	8,804,812.75	37,988,212.55	82,866,226.66

Source: The report of Resettlement Plan in the appendix XI

Note: (*1) Additional compensation at Barangay San Rafael of 23 families, which newly resettled after February 2003.

Table 3.3.4 Project Cost of Bucao River Basin

(Unit: x1000 Peso)

(Unit: x 1000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	395,714	294,910	690,624																
	(2) Maintenance road	1,568	1,222	2,790																
	Sub total ((1) to (2))	**397,282**	**296,132**	**693,414**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**59,592**	**44,420**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
	(3) Bucao bridge replacement																			
	i) General item	14,000	17,008	31,008	0	0	0	0	11,200	13,606	1,400	1,701	1,400	1,701	0	0	0	0	0	0
	ii) Super structure	84,949	116,975	201,924	0	0	0	0	0	0	25,485	35,093	59,464	81,883	0	0	0	0	0	0
	iii) Substructure	46,882	44,646	91,529	0	0	0	0	14,065	13,394	32,817	31,252	0	0	0	0	0	0	0	0
	iv) Approach road	5,332	5,978	11,310	0	0	0	0	0	0	0	0	5,332	5,978	0	0	0	0	0	0
	v) Removal of existing bridge	2,836	2,479	5,315	0	0	0	0	0	0	0	0	2,836	2,479	0	0	0	0	0	0
	Sub total (1)	**551,281**	**483,219**	**1,034,500**	**0**	**0**	**0**	**0**	**25,265**	**27,000**	**59,702**	**68,046**	**128,625**	**136,460**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
2	Land acquisition and compensation cost	44,878	0	44,878	0	0	0	0	8,976	0	22,439	0	13,463	0	0	0	0	0	0	0
3	Administration cost	31,035	0	31,035	0	0	0	0	4,655	0	6,207	0	7,759	0	4,655	0	4,655	0	3,104	0
4	Engineering services cost	88,205	77,315	165,520	0	0	0	0	13,231	11,597	17,641	15,463	22,051	19,329	13,231	11,597	13,231	11,597	8,821	7,732
	Sub total (1 to 4)	**715,399**	**560,534**	**1,275,933**	**0**	**0**	**0**	**0**	**52,126**	**38,597**	**105,989**	**83,509**	**171,898**	**155,789**	**137,071**	**100,437**	**137,071**	**100,437**	**111,245**	**81,765**
5	Price contingency	**182,428**	**67,101**	**249,529**	0	0	0	0	6,509	2,362	18,003	6,884	37,242	16,215	36,367	12,671	43,305	14,934	41,001	14,036
6	Physical contingenc 10%	**89,783**	**62,763**	**152,546**	0	0	0	0	5,863	4,096	12,399	9,039	20,914	17,200	17,344	11,311	18,038	11,537	15,225	9,580
	Total (1 to 6)	**987,609**	**690,399**	**1,678,008**	**0**	**0**	**0**	**0**	**64,498**	**45,056**	**136,391**	**99,432**	**230,054**	**189,204**	**190,782**	**124,419**	**198,413**	**126,907**	**167,470**	**105,380**

Table 3.3.5 Project Cost of Sto. Tomas River Basin

(Unit: x1,000 Peso) (Unit: x 1,000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	648,484	477,115	1,125,598																
	(2) Diversion channel of the Gabor Rive	36,875	26,664	63,539																
	(3) Maintenance road	1,685	1,306	2,991																
	Sub total (1)	**687,044**	**505,085**	**1,192,128**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**137,409**	**101,017**	**206,113**	**151,526**	**206,113**	**151,526**	**137,409**	**101,017**
2	Land acquisition and compensation cost	37,988	0	37,988	0	0	0	0	0	0	18,994	0	18,994	0	0	0	0	0	0	0
3	Administration cost	35,764	0	35,764	0	0	0	0	0	0	7,153	0	8,941	0	7,153	0	7,153	0	5,365	0
4	Engineering services cost	109,927	80,814	190,741	0	0	0	0	0	0	21,985	16,163	27,482	20,204	21,985	16,163	21,985	16,163	16,489	12,122
	Sub total (1 to 4)	**870,723**	**585,899**	**1,456,621**	**0**	**0**	**0**	**0**	**0**	**0**	**48,132**	**16,163**	**192,826**	**121,221**	**235,251**	**167,688**	**235,251**	**167,688**	**159,262**	**113,139**
5	Price contingency	**245,391**	**79,459**	**324,850**	0	0	0	0	0	0	8,176	1,332	41,776	12,617	62,417	21,156	74,323	24,933	58,699	19,421
6	Physical contingency : 10%	**111,611**	**66,536**	**178,147**	0	0	0	0	0	0	5,631	1,750	23,460	13,384	29,767	18,884	30,957	19,262	21,796	13,256
	Total (1 to 6)	**1,227,726**	**731,894**	**1,959,619**	**0**	**0**	**0**	**0**	**0**	**0**	**61,939**	**19,245**	**258,062**	**147,221**	**327,435**	**207,729**	**340,532**	**211,883**	**239,758**	**145,817**

Table 3.3.6 Disbursement Schedule of Bucao River Basin

(Unit: x 1000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	395,714	294,910	690,624																
	(2) Maintenance road	1,568	1,222	2,790																
	Sub total ((1) to (2))	**397,282**	**296,132**	**693,414**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**59,592**	**44,420**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
	(Annual progress rate)												0.15	0.15	0.3	0.3	0.3	0.3	0.25	0.25
	(3) Bucao bridge replacement																			
	i) General item	14,000	17,008	31,008	0	0	0	0	11,200	13,606	1,400	1,701	1,400	1,701	0	0	0	0	0	0
	(Annual progress rate)								0.8	0.8	0.1	0.1	0.1	0.1						
	ii) Super structure	84,949	116,975	201,924	0	0	0	0	0	0	25,485	35,093	59,464	81,883	0	0	0	0	0	0
	(Annual progress rate)										0.3	0.3	0.7	0.7						
	iii) Substructure	46,882	44,646	91,529	0	0	0	0	14,065	13,394	32,817	31,252	0	0	0	0	0	0	0	0
	(Annual progress rate)								0.3	0.3	0.7	0.7								
	iv) Approach road	5,332	5,978	11,310	0	0	0	0	0	0	0	0	5,332	5,978	0	0	0	0	0	0
	(Annual progress rate)												1	1						
	v) Removal of existing bridge	2,836	2,479	5,315	0	0	0	0	0	0	0	0	2,836	2,479	0	0	0	0	0	0
	(Annual progress rate)												1	1						
	Sub total (1)	**551,281**	**483,219**	**1,034,500**	**0**	**0**	**0**	**0**	**25,265**	**27,000**	**59,702**	**68,046**	**128,625**	**136,460**	**119,185**	**88,840**	**119,185**	**88,840**	**99,321**	**74,033**
2	Land acquisition and compensation cost	44,878	0	44,878	0	0	0	0	8,976	0	22,439	0	13,463	0	0	0	0	0	0	0
	(Annual progress rate)								0.2		0.5		0.3							
3	Administration cost	31,035	0	31,035	0	0	0	0	4,655	0	6,207	0	7,759	0	4,655	0	4,655	0	3,104	0
	(Annual progress rate)								0.15		0.2		0.25		0.15		0.15		0.1	
4	Engineering services cost	88,205	77,315	165,520	0	0	0	0	13,231	11,597	17,641	15,463	22,051	19,329	13,231	11,597	13,231	11,597	8,821	7,732
	(Annual progress rate)								0.15	0.15	0.2	0.2	0.25	0.25	0.15	0.15	0.15	0.15	0.1	0.1
	Sub total (1 to 4)	**715,399**	**560,534**	**1,275,933**	**0**	**0**	**0**	**0**	**52,126**	**38,597**	**105,989**	**83,509**	**171,898**	**155,789**	**137,071**	**100,437**	**137,071**	**100,437**	**111,245**	**81,765**
5	Price contingency	**182,428**	**67,101**	**249,529**	0	0	0	0	6,509	2,362	18,003	6,884	37,242	16,215	36,367	12,671	43,305	14,934	41,001	14,036
	LC : 4% FC: 2%				0.0400	0.0200	0.0816	0.0404	0.1249	0.0612	0.1699	0.0824	0.2167	0.1041	0.2653	0.1262	0.3159	0.1487	0.3686	0.1717
6	Physical contingency : 10%	**89782.67**	**62763.44**	**152546.11**	0	0	0	0	5,863	4,096	12,399	9,039	20,914	17,200	17,344	11,311	18,038	11,537	15,225	9,580
	Total (1 to 6)	**987,609**	**690,399**	**1,678,008**	**0**	**0**	**0**	**0**	**64,498**	**45,056**	**136,391**	**99,432**	**230,054**	**189,204**	**190,782**	**124,419**	**198,413**	**126,907**	**167,470**	**105,380**
				1,678,008																

Table 3.3.7 Disbursement Schedule of Sto. Tomas River Basin

(Unit: x 1,000 Peso)

No.	Description	LC	FC	Total	2003		2004		2005		2006		2007		2008		2009		2010	
					LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC	FC
1	Construction Cost																			
	(1) Dike Construction	648,484	477,115	1,125,598																
	(2) Diversion channel of the Gabor Riv	36,875	26,664	63,539																
	(3) Maintenance road	1,685	1,306	2,991																
	Sub total (1)	**687,044**	**505,085**	**1,192,128**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**137,409**	**101,017**	**206,113**	**151,526**	**206,113**	**151,526**	**137,409**	**101,017**
	(Annual progress rate)												0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.2
2	Land acquisition and compensation co	37,988	0	37,988	0	0	0	0	0	0	18,994	0	18,994	0	0	0	0	0	0	0
	(Annual progress rate)										0.5		0.5							
3	Administration cost	35,764	0	35,764	0	0	0	0	0	0	7,153	0	8,941	0	7,153	0	7,153	0	5,365	0
	(Annual progress rate)										0.2		0.25		0.2		0.2		0.15	
4	Engineering services cost	109,927	80,814	190,741	0	0	0	0	0	0	21,985	16,163	27,482	20,204	21,985	16,163	21,985	16,163	16,489	12,122
	(Annual progress rate)										0.2	0.2	0.25	0.25	0.2	0.2	0.2	0.2	0.15	0.15
	Sub total (1 to 4)	**870,723**	**585,899**	**1,456,621**	**0**	**0**	**0**	**0**	**0**	**0**	**48,132**	**16,163**	**192,826**	**121,221**	**235,251**	**167,688**	**235,251**	**167,688**	**159,262**	**113,139**
5	Price contingency	**245,391**	**79,459**	**324,850**	0	0	0	0	0	0	8,176	1,332	41,776	12,617	62,417	21,156	74,323	24,933	58,699	19,421
	LC : 4% FC: 2%				0.0400	0.0200	0.0816	0.0404	0.1249	0.0612	0.1699	0.0824	0.2167	0.1041	0.2653	0.1262	0.3159	0.1487	0.3686	0.1717
6	Physical contingency : 10%	**111,611**	**66,536**	**178147.24**	0	0	0	0	0	0	5,631	1,750	23,460	13,384	29,767	18,884	30,957	19,262	21,796	13,256
	Total (1 to 6)	**1,227,726**	**731,894**	**1,959,619**	**0**	**0**	**0**	**0**	**0**	**0**	**61,939**	**19,245**	**258,062**	**147,221**	**327,435**	**207,729**	**340,532**	**211,883**	**239,758**	**145,817**

Table 3.4.1 Summary of Supply and Installation Cost for Flood/Mudflow Monitoring & Warning System

(Unit : Peso)

No.	Description	Unit	Quantity	Amount
1	Observatory system (11 stations)			
	(1) Equipment purchase cost	lot	1	10,081,883
	(2) Installation cost	%	15%	1,512,282
	Sub total (1)			11,594,166
2	Monitoring system (4 sites)			
	(1) Equipment purchase cost	lot	1	7,022,595
	(2) Installation cost	%	10%	702,259
	(3) Vehicle for maintenance	no	1	1,856,540
	Sub total (2)			9,581,395
3	Warning post (35 posts)			
	(1) Equipment purchase cost	lot	1	11,257,595
	(2) Installation cost	%	10%	1,125,759
	Sub total (3)			12,383,354
	Total (1 to 3)			33,558,915
	Equivalent in JPY, P1.0 = JPY	2.37		79,534,627

Table 3.4.2 Project Cost for Flood/Mudflow Monitoring & Warning System

(Unit : Thousand Peso)

No.	Description	Amount
1	Supply and installation cost for Flood/Mudflow Monitoring & Warning System	33,559
2	Government administration cost 3%	1,007
3	Engineering service cost	
	(i) Remuneration, 35M/M x JPY2,500,000	36,920
	(ii) Direct cost, 20% of (i)	3,116
	Sub total (3)	40,035
	Sub total (1 to 3)	74,601
4	Contingency 10%	7,460
	Total (1 to 4)	82,061

Table 3.4.3 Unit Price for Evacuation Center Construction

No.	Description	Unit	Quantity	Total Cost (P)	Unit Price
(1)	(2)	(3)	(4)	(5)	(6)=(5)/(4)
Local Base (Obtained from Provincial Office)					
1	One family dwelling				
	IA : Reinforced concrete, steel truss, concrete/masonry wall	m^2			7,370
	IA : Reinforced concrete, steel truss, concrete hollow block wall	m^2			6,530
	IA : Reinforced concrete, 1st wood truss, concrete hollow block wall	m^2			5,040
2	School building				
	IA : Reinforced concrete, steel truss, concrete/masonry wall	m^2			6,340
	IA : Reinforced concrete, steel truss, concrete hollow block wall	m^2			5,940
	IA : Reinforced concrete, 1st wood truss, concrete hollow block wall	m^2			4,960
3	Condominium, Hotel, Bank, Hospital, Office				
	IA : Reinforced concrete, steel truss, concrete/masonry wall	m^2			7,810
	IA : Reinforced concrete, steel truss, concrete hollow block wall	m^2			6,530
	IA : Reinforced concrete, 1st wood truss, concrete hollow block wall	m^2			5,600
Local Base (Obtained from Agno II Project)					
1	Provincial road paved with 3.05m wide concrete, W=10.1m	m	6,660	55,124,779	8,277
2	Barangay road paved with gravel , W=5m	m	12,092	69,860,618	5,777
3	Mound dike (Embankment)	m^2	113,000	53,480,197	473
4	Evacuation center building : Reinforced concrete, 2 floor	m^2	25,300	270,516,025	10,692
	Foundation pile works	m^2	11,725	16,212,520	1,383
	Evacuation center building without foundation pile	m^2	13,575	136,449,410	10,052
	Evacuation center building with foundation pile	m^2	11,725	134,066,614	11,434
JICA Base (Obtained from Vietnam project)					
1	Training center building : Reinforced concrete, 3 floor with foundation pile	m2	1,598	127,763,713	79,952

Unit Price for Land Acquisition (Prevailing market price)

No.	Municipality	Barangay	Selling / Buying Rate (Peso/m2)
1	Botolan	Porac (Residential)	200 - 400
		Carael (Commercial)	750
		San. Juan (Residential)	100 - 150
2	San Marcelino	San Rafael (Residential)	100 - 200
		Rabanes (Agricultural)	200 - 300
		Mangricmot (Agricultural)	100 - 150
3	San Narciso	Alusius (Residential)	150 - 200
		Paite (Residential)	200
		San Pascual (Residential)	200 - 400

(Source: Table 8.1.1 of the report of Resettlement Plan, Appendix XI)

Table 3.4.4 Summary of Construction Cost of Schools for Evacuation

(Unit : Thousand Peso)

No.	Description	Number of School	Amount
1	Renovation of existing school	35	178,700
2	New construction		
	(1) Initial stage	10	143,700
	(2) Middle term stage	22	442,500
	(3) Long term stage	28	601,400
	Sub total (2)	60	1,187,600
	Total (1 to 2)	95	1,366,300

Note: 1. Land acquisition cost is included in the above construction cost.

Table 3.5.1 Unit Price for Forest Management

(Unit : Peso/Hectare)

No.	Description	Standard Unit Price Estimated by Forest Sector Project										Provincial Office	
		Forest tree (Gmelina, Mangium, Eucalyptus, Falcata)		Agroforestry : (a) Agroforest tree & (b) Other tree				Silvopasture				"Adopt Mountain Project" (Botolan)	
		spacing 5 x 2	4 x 4	(a)10x10 (b) 2x2	(a) 6x6 (b) 6x6	(a) 4x4	3x3 (Coffee)	Grass & Legume		Grass & Hedgerow		Total Cost	Per ha
								w/o fence	w/ fence	w/o fence	w/ fence		
A	Operation Cost												
1	Nursery operation	3,639.36	2,395.54	9,639.36	9,577.16	2,395.54	3,874.57	8,059.70	8,059.70	8,509.70	8,509.70	1,468,400.00	8,157.78
2	Plantation Establishment	4,875.00	3,121.88	6,372.76	5,507.95	3,785.63	6,442.22	7,040.75	7,040.75	7,032.33	7,246.72	1,337,580.00	7,431.00
3	Maintenance & protection	18,107.31	12,186.67	17,885.61	14,211.54	16,591.96	24,312.79	10,168.43	10,678.43	13,894.13	15,765.44	713,142.50	3,961.90
4	Infrastructure	1,043.83	1,043.83	1,043.83	1,043.83	1,043.83	1,043.83	113.33	113.33	113.33	113.33	242,000.00	1,344.44
5	Establishment of live fence								2,699.98				
	Sub total (A)	27,665.50	18,747.92	34,941.56	30,340.48	23,816.96	35,673.41	25,382.21	28,592.19	29,549.49	31,635.19	3,761,122.50	20,895.13
B	Project Management	2,213.24	1,499.83	2,795.32	2,427.24	1,905.36	2,853.87	2,030.58	2,287.38	2,363.96	2,530.82	450,000.00	2,500.00
	(8% of A)												
	Grand Total (A + B)	29,878.74	20,247.75	37,736.88	32,767.72	25,722.32	38,527.28	27,412.79	30,879.57	31,913.45	34,166.01	4,211,122.50	23,395.13

Note;

1 Standard Unit Price Estimated by Forest Sector Project is based on the MC2000-19 which is the guidelines governing the updating of cost estimates and intensification of plantation maintenance and protection activities for the project in the forestry sector.

2 Cost of establishment of live fence for Grass and Hedgerow is included in the cost of Item 2 and Item 3.

3 Adopt Mountain Project is scheduled to carry out under the provincial office from 2003 to 2007.

4 Plants of Adopt Mountain Project are Mahogany, Gmelina, Eucalyptus and fruit trees including Mango and Cashew.

Table 3.5.2 Plantation Cost for Forest Management

Unit: Pesos

No.	Description	Quantity (ha)	Unit Price	Amount
1	Tree plantation	18,370	25,064	460,425,680
2	Agro-forestry			
	(1) Mango	1,470	31,701	46,600,470
	(2) Cashew	1,102	31,701	34,934,502
	(3) Corn	1,102	31,701	34,934,502
	Total (2)			116,469,474
	Grand Total (1 to 2)			576,895,154

Table 3.5.3 Summary of Unit Prices of Land Development for Agriculture in Lahar Areas

Unit: Pesos/ha

Item	Description	Option		
		A	B	C
1	Development areas with no plants			
	(1) Land development	16,500	10,500	7,500
	(2) Soil improvement	5,200	2,700	1,500
	(3) Fertilizer provision	9,980	7,480	6,000
	(4) Water supply	59,500	41,500	30,500
	(5) Cropping pattern	27,542	12,476	13,956
	Total	**118,722**	**74,656**	**59,456**
2	Development areas with pioneer plants			
	(1) Land development	14,000	9,500	6500
	(2) Soil improvement	5,200	2,700	1,700
	(3) Fertilizer provision	9,980	7,480	4,000
	(4) Water supply	59,500	41,500	30,500
	(5) Cropping pattern	27,542	12,476	12,476
	Total	**116,222**	**73,656**	**55,176**
3	Development for cultivated areas			
	(1) Land development	1,500	1,500	1,500
	(2) Soil improvement	3,500	6,300	6,300
	(3) Fertilizer provision	9,980	13,840	17,720
	(4) Water supply	500	500	500
	(5) Cropping pattern	27,542	39,587	33,292
	Total	**43,022**	**61,727**	**59,312**

Table 3.5.4 Production Cost of Seasonal and Perennial Crops per Hectare

Unit: Pesos/ha

Item	Description	Labor cost	Material cost	Tool & Equipment cost	Total
A	Seasonal and medium term				
1	Rice - direct seeded	5,750	14,206	0	19,956
2	Corn	10,925	16,048	0	26,973
3	Sweet potato	11,325	22,416	0	33,741
4	Mungbean	12,200	5,366	0	17,566
5	Peanut	14,825	7,790	0	22,615
6	Watermelon	12,250	15,792	0	28,042
7	Squash	13,350	17,706	0	31,056
8	Tomato	19,675	29,754	0	49,429
9	Garlic	27,750	60,250	0	88,000
10	Onion	43,750	35,306	0	79,056
11	Cassava	20,600	13,920	0	34,520
12	Gabi	10,125	10,800	0	20,925
B	Perennials				
13	Banana				
	1 year	21,150	34,060	6,200	61,410
	2 year	7,750	12,580	0	20,330
	3 year	7,750	12,580	0	20,330
	4 year	7,750	37,699	0	45,449
	5 year	7,750	62,818	0	70,568
	Total	52,150	159,737	6,200	218,087
14	Pineapple				
	1 year	40,500	23,800	6,600	70,900
	2 year	42,250	9,810	0	52,060
	3 year	6,250	1,010	0	7,260
	4 year	40,500	8,800	0	49,300
	5 year	46,750	9,810	0	56,560
	6 year	6,250	1,010	0	7,260
	Total	182,500	54,240	6,600	243,340
15	Papaya				
	1 year	19,475	49,600	5,700	74,775
	2 year	24,500	11,980	0	36,480
	3 year	24,500	11,980	0	36,480
	4 year	24,500	11,980	0	36,480
	5 year	24,500	11,980	0	36,480
	Total	117,475	97,520	5,700	220,695