November 12, 2009

DPWH recent COMPLETED AND ON-GOING MAJOR FLOOD CONTROL PROJECTS

Laoag River Basin Flood Control & Sabo Project, JBIC (2008)

Agno & Allied Urgent Rehabilitation Projects, Phase I (Completed)

Agno River Flood Control Project, Phase II-A & Phase II-B, JBIC, (2009)

Restoration/Rehabilitation of Waterways in the Pinatubo Pilot Areas (2006)

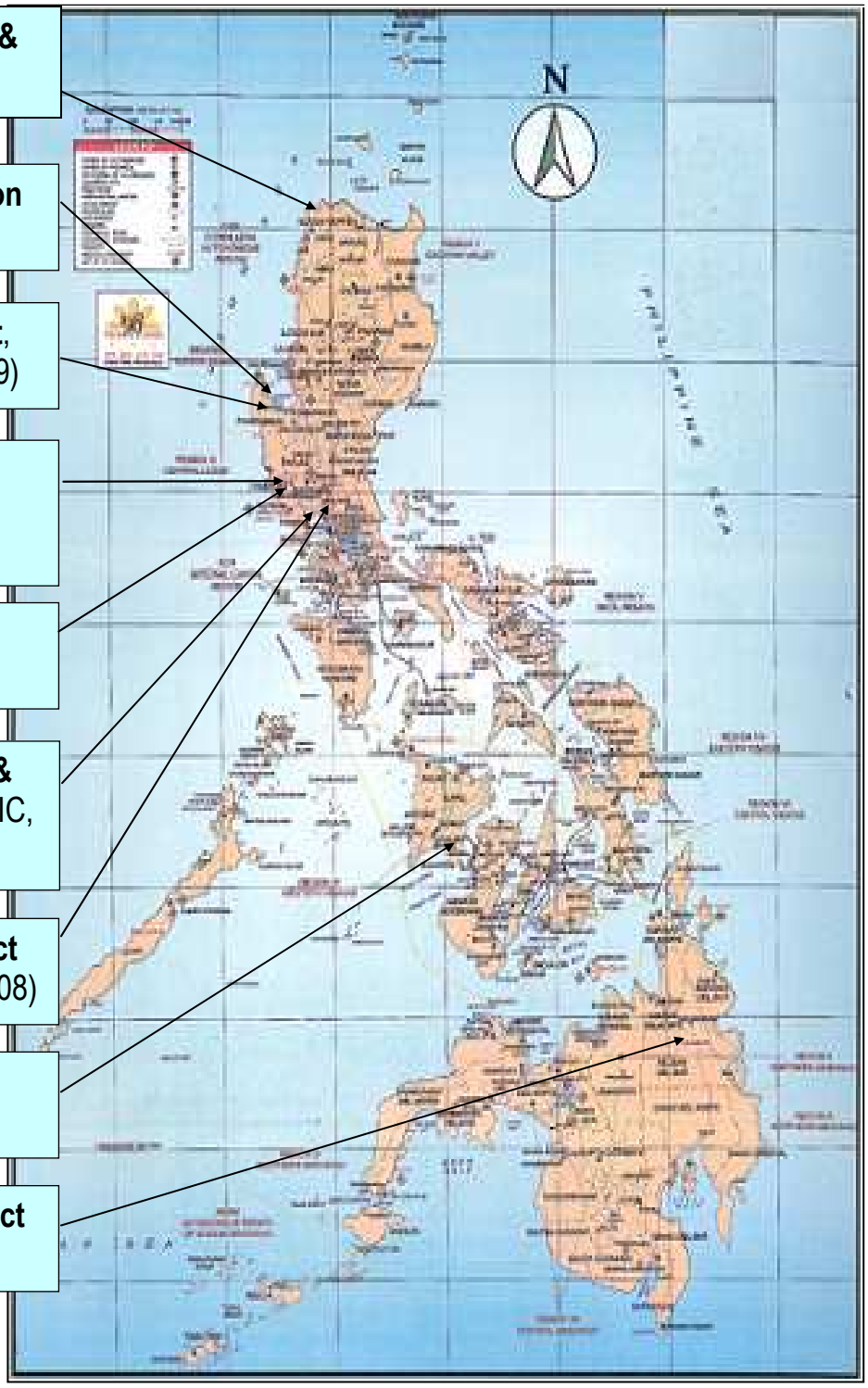
Mount Pinatubo Hazard Urgent Mitigation Project, Phase II, JBIC

KAMANAVA Area Flood Control & Drainage System Improvement, JBIC, (2007)

Metro Manila Flood Control Project West Mangahan Floodway, JBIC, (2008)

Iloilo Flood Control Project Phase II, JBIC, (2009)

Lower Agusan Development Project Stage I, Phase II, JBIC, (2007)



PROJECT PROFILE

Laoag River Basin Flood Control and Sabo Project
Agno River Flood Control Project, Phase II (ARFCPII)
KAMANAVA Area Flood Control and Drainage System Improvement Project (PH-212)
PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT Phase II (PMRCIP II)
ILOILO FLOOD CONTROL PROJECT (PHASE II)

THE PROJECT FOR FLOOD MITIGATION IN ORMOC CITY
REHABILITATION/ENHANCEMENT OF ORMOC CITY FLOOD CONTROL STRUCTURES

PINATUBO HAZARD URGENT MITIGATION PROJECT, PHASE I (Mudflow/Flood Control Works in Sacobia-Bamban River Basin)
PINATUBO HAZARD URGENT MITIGATION PROJECT, PHASE II
(Lahar and Flood Control in the Pasig-Potrero River Basin)
PINATUBO HAZARD URGENT MITIGATION PROJECT, PHASE III

WIDENING OF GAPAN-SAN FERNANDO-OLONGAPO (GSO) ROAD AND EMERGENCY DREDGING OF PORAC-GUAMIN RIVER

BASIC STUDY ON NON-STRUCTURAL DISASTER PREVENTION MEASURES IN CAMIGUIN

Metro Manila Flood Control Project - West Mangahan Floodway

I. PROJECT TITLE : Laoag River Basin Flood Control and Sabo Project
II. LOCATION : Province of Ilocos Norte, Region I

III. BACKGROUND

Laoag river Basin has potential for greater economic development given its brisk economic activities, vast agricultural lands, broad-based human resources and favorable geographic location. The Area is close to Taiwan, Japan and china, which could make it a gateway for foreign trade from the north, with Laoag City as trading center.

However, the area experiences periodic flooding problems compounded by excessive sediment deposition over the river flood plain and alluvial fans. The floodings affect a large number of the area's population as well as inflict tremendous damage to its economy, underlining the need for a responsive and comprehensive flood and sediment control works. Thus it is believed that with the solution of those problems, other infrastructure will develop with renewed effiency, economic investment and growth will increase, and the value of the region as an industrial base will rise.

Realizing the importance of the area to the regional economy, the Government of the Republic of the Philippines (GOP) requested to the Government of Japan (GOJ), the conduct of a basin-wide master plan study to formulate the necessary flood mitigation measures. In response to this request, the Japan International Cooperation Agency (JICA) of the GOJ conducted the Study on Sabo and Flood control in the Laoag River Basin from March 1996 to November 1997. The Feasibility Study identified individual priority projects for urgent planning and implementation

In March 2000, JBIC mission carried out a filed survey and met with DPWH officials to study the feasibility of the Laoag River Basin flood control and Sabo Project. Results of the field survey and meetings were documented in a Minutes of Discussion dated March 22, 2000. Consequently JBIC extended a loan to the GOP for the implementation of the project. The contract for consulting services was signed on 25 July 2001 and the Notice to proceed was issued by the DPWH to the consultant on 22 August 2001. The consultant stated mobilization on 17 September 2001.

IV. OBJECTIVES

The primary objective of the Project is to mitigate damages caused by the flood phenomenon and is intended to be achieved by providing flood protection and sediment control through a combination of earth dikes, floodwalls. Spur dikes, sluiceways, groundsills, sabo dams, and the extension of an existing bridge. Specifically, to attain the primary objective requires the preparation of the detailed design and the necessary construction documents, the execution of the pre-construction and construction works, and successful environmental monitoring during and after the construction stage.

In the long term, the Project is expected to create a more pleasant and safe living environment for residents in the flood prone area, increase agricultural productivity,

stimulate industrial activities and promote regional economic growth that will contribute substantially to the overall national economy.

V. FLOOD CONTROL PLAN

The project involves the construction of river improvement works in the Laoag-Bongo river, river improvement works in the alluvial fan Rivers of Cura/Labugaon, Solsona, Madongan and Papa rivers; and sabo dams across the alluvial fan rivers.
Based on the Final Design, the total length of river to be improved is 53.0 kilometers with structures consisting of 82,200 lineal meters of earth dike, 1,100 lineal meters of floodwall, 1,051 units of spur dike, 26 units of sluiceway, four (4) units of groundsill, five (5) units of sabo dam with sediment storage capacity of 4,709,000 m^3, and one (1) 88 lineal meter bridge extension. The details of flood works are shown below;

- Laoag –Bongo River Improvement - includes Earth dike, floodwall Spurdike and Sluiceway.
- Alluvial Fan River Improvement - includes Earth dike, Spurdike, Groundsill, Sluiceway and Bridge Extension.
- Sabo Dams- Cura Sabo Dam, Libuganon Sabo Dam, Solsona Sabo Dam, Madongan Sabo Dam and Papa Sabo Dam.

Project Location

Laoag River Basin is located in the province of Ilocos Norte in Region I or Ilocos Region. It has an area of 1,332 km2 and covers wholly or partially 11 administrative units, namely Laoag City and the municipalities of Banna, Carasi, Dingras, Marcos, Nueva Era, Piddig San Nicolas, Sarrat, Solsona and Vintar.
It is bounded on the north and south by the rest of Ilocos Norte, on the east by Apayao, on the southeast by Abra and on the west by South China Sea.

Project Works

The priority works and facilities to be constructed for the prioject will be composed of three components, namely: (1) Laoag-Bongo River Improvement, (2) Alluvial Fan River Improvement, and (3) Sabo Dam. These priority works and facilities are described as follows:

(1) Laoag-Bongo River Improvement

River improvement works are planned to be provided along the banks of Laoag-Bongo river in sections at or near the urban centers of Laoag City (right bank), San Nicolas (left bank) and Dingras (left bank). These shall involve 14.0 km of river length to be improved consisting of 12,500 lineal meters earth dike, 1,100 lineal meters floodwall, seven (7) units spur dike, and ten (10) units sluiceway. The breakdown of river improvement works for each of the city and municipalities are tabulated hereunder.

Item	Unit	Pob. Laoag	Pob.San Nicolas	Pob. Dingras	Total
Improvement Length	km	3.7	4.3	6.0	14.0
Earth Dike	M	2,400	4,300	5,800	12,500
Floodwall	M	1,100	-	-	1,100
Spur dike	Unit	-	3	4	7
Sluiceway	unit	2	3	5	10

(2)Alluvial Fan River Improvement

Improvement works for alluvial fan rivers shall cover a total river length of 39.0 km, comprising 69,700 lineal meters earth dike, 1044 units spur dike, four (4) units groundsill, 16 units sluiceway and the extension of one (1) existing bridge. Quantities of work for each of alluvial fan river to be improved are given below

Item	Unit	Cur/ Labungaon River	Solsona River	Madongan River	Papa River	Total
Improvement Length	Km	13.0	10.0	9.0	7.0	39.0
Earth Dike	Lim m	21,000	17,700	16,400	14,600	69,700
Spur Dike	Unit	321	222	286	215	1,044
Groundsill	Unit	1	1	1	1	4
Sluiceway	Unit	5	4	6	1	16
Bridge Extension	unit	1	0	0	0	1

(3) Sabo Dam

Sabo dams with a total sediment storage capacity of 4,709,000 m3 shall be constructed at the upstream portion of every alluvial fan river. The sabo dam works for each of these rivers shall consist of a main dam and a sub-dam. Main dam heights range from 9.5 m of Papa river Sabo Dam to 14.8 m of Labugaon river Sabo Dam No.1 and Solsona river Sabo Dam No.1 while their lengths ranges from 133m of Labugaon river Sabo Dam No.1 while their lengths range from 133m of Labugaon river Sabo Dam No.1 to 208 m of Papa river Sabo Dam. The basic technical data of Sabo dams for each of the rivers are listed in the following table.

Item	Unit	Cura No.1	Labungaon No.1	Solsona No.1	Madongan	Papa	Total
Capacity	1,000	410	1,108	247	2,214	730	4,700

	m3						
Dam Height	M	10.5	14.8	11.0	10.5	9.5	
Dam Length	M	179	133	139	139	208	

For construction purposed the Project has been broken down into two (2) contract packages:

VI. FUNDING SOURCE

(1) Loan Agreement (L/A) No. **:** PH-224
(2) Loan Amount **: Y** 6.309 Billion
P 2.253 billion, P 1.0 = Y2.80
(3) Loan Period **:** September 25, 2001 to September 25, 2009

VII. IMPLEMENTING OFFICE

PMO-Major Flood Control and Drainage Projects, Cluster II
Department of Public Works and Highways
Port Area, Manila
Project Director: Mr. Philip Menez
Telephone No. : 304-3829
304-3752
Fax No. : 304-3813

PROJECT TITLE: Agno River Flood Control Project, Phase II (ARFCPII)

II. LOCATION : Provinces of Pangasinan and Tarlac, Region I

III. BACKGROUND

The Agno River is the fifth largest river in the Philippines with a catchment area of 5,910 sq. km and a total length of 221km. Tha Agno River originates in the Cordillera Mountains and flows southward through gorges in the mountains. From this point the river meanders in a vast alluvial plain joining the Tarlac River near Bayambang, where the Poponto Swamp is located. The Agno River turns northwestward at the confluence with the Tarlac River and discharges into the gulf of Lingayen in Pangasinan.

The Agno river basin has been frequently exposed to tropical typhoons and monsoon rainfall, which have caused damaging floods in the Pangasinan plain.

DPWH constructed earth dikes with revetments and installed a series a boulder groin to protect areas from floods and was continuing to restore the existing facilities. However, the restoration and rehabilitation works have not been achieved to a satisfactory level, due mainly to financial constraint. Duet to the flood, which occurred in September 1992, dikes and other flood control facilities in some sections of the river were damaged.

In order to identify the flood control measures, to determine an appropriate implementation sequence, and to establish a master plan for flood control in the Agno River and the Allied rivers in the long term, a comprehensive study was carried out from April 1989 under the technical assistance of JICA (Japan International Cooperation Agency). The Study identified a number of projects for short- term implementation. Improvement works for the Pantal-Sinocalan River and the upper Agno River were selected as the priority projects.

A feasibility study for the proposed high priority projects was undertaken by JICA and completed at the end of 1991. In view of the importance and urgent need for flood control in the Pangasinan plains, the Government of the Philippines (GOP) requested financing and technical assistance from Government of Japan (GOJ) for undertaking the Detailed Engineering Design of the proposed urgent flood control project. After appraisal of the project, JBIC (Japan Bank for International Corporation) agreed to provide assistance for the design works. The detailed engineering design consisted of urgent rehabilitation works in the lower Agno River and the upper Sinocalan River and river improvement works in the upper Agno River. The Detailed Engineering Design commenced in January 1993 completed in
one year (1994)

The target of the flood control works is to confine 10-year high flow within the contemplated flood control facilities and to consider fifty (50) years lifetime of the Project. It means that the criteria of 50-year sediment deposition in the Poponto Swamp may be applicable for the urgent flood control schemes.

A Hydraulic Model Test was conducted for verification of the flood diversion system in Alcala and was completed in April 1994. The modifications of the previous detailed

design were conducted based on the results of the Hydraulic Model Test and the Addendum for Detailed Design was prepared and completed in May 1997.

The Agno River Flood Control Project (ARFCP) was divided into four (4) Packages for implementation as follows.

Package No.	Coverage Area/ Stretch
I	Bayambang Stretch including the Floodway towards Poponto Swamp (L= 23km)
II	Asingan-San Manuel Stretch (L=16 km)
III	Alcala-Asingan Stretch (L=31 km)
IV	Lower Agno River (L=54 km) and Upper Sinocalan River

After the detailed design, GOP requested financial assistance to GOJ for implementation of the ARFCF works. In response to this request GOJ agreed to finance the implementation of the Urgent Rehabilitation works of the Lower Agno River and upper Sinocalan River (Package IV) as ARFCP Phase I by 20th JBIC Yen Credit. This project is now referred to as Agno and Allied Rivers Urgent Rehabilitation Project (PH-P155) Pre construction work for the project (Review of Detailed Design, P/Q and Tender Work) was conducted from May 1997. The construction works were commenced in April 1998 and completed in May 2005.

The remaining Works of Package I, Package II and package III were proposed as the Agno River Flood Control Project, Phase II (ARFCP II) for financing under the 22nd JBIC Yen Credit in 1996. However, GOJ decided to take up only the Package I as ARFCP II, which is now referred to as ARFCP IIA, in September 1997. The Residual civil works, construction of the Hector Mendoza Bridge, and consulting services of construction supervision for Hector Mendoza Bridge, and the Feasibility Study for the Tarlac River Overall Improvement Works are covered by 24th JBIC Yen Credit (Loan No. PH-223) as ARFCP IIB. The detailed design and tender assistance for Hector Mendoza Bridge are undertaken under the consulting services of ARFCP IIA as supplemental agreement No. 1 which was approved by DPWH on 14 September 2000.

The review of the detailed design was commenced in October 1999 to review and update the detailed of flood control facilities to confirm with the actual social and field conditions. Meanwhile, the detailed design of Hector Mendoza Bridge commenced in June 2000 and completed at the beginning of May 2001.

IV. OBJECTIVES

(1) To mitigate flood damages to villages, towns, agricultural lands, and vital infrastructure facilities in the Agno River basin and

(2) To mitigate the negative impacts on the existing local communities in Poponto Swamp area due to the implementation of the ARFCP II

In order to attain objective (i) above, improvement of existing river channel, heightening existing dike system, constructing new earth dike, closure dike, diversion structure and floodway control weir, and provision of bank protection works, spur dikes, revetments and sluiceways are carried out. In order to attain objective (ii), compensation, civil works and non-structural measures in the Poponto Swamp (Social Development Scheme) are taken up.

V. OUTLINE OF THE PROJECT

This Project is the second phase of the Agno River Flood control Project. The river stretch to be improved in the upper Agno River extends from the Wawa Bridge to Alcala in Pangasinan near the entrance of the existing floodway. The river improvement works are carried out for 23 km of the Bayambang –Alcala stretch. Major improvement works include construction of floodway to the Poponto retarding basin and closure dike at the floodway entrance, heightening of existing dike, construction of new dikes revetment, groin and bridges. The project aims at increasing the flow capacity of the river stretch to cope with a 10-year flood (4,000m³/sec at upstream of floodway)

VI. PROJECT DESCRIPTION

River Stretch in the Upper Agno River and Poponto Swamp

(1) Location and Topography

The proposed river improvement stretch in the Upper Agno River extends from the Wawa Bridge to Alcala. The riverbed slope in this stretch varies from 1/600 to 1/2,200. The average river width varies largely from about 650 m at Alcala to about 200 m in Bayambang stretch.

(2) River Condition

The river discharge capacity in the Bayambang stretch, narrow river course at the Carmen bridge stretch, and river stretch upstream of Asingan is remarkably small, 1,000 to 2,000 m3/sec, which is equivalent to flood with recurrence interval of 2 to 3 years.

The project plans to utilize the existing Poponto Swamp as flood retarding basin. The Swamp, however, has received significant lahar sedimentation from eruption of Mount Pinatubo. The volume of sedimentation in the Poponto swamp was estimated at 52.5 million m3, which about 20% of the assumed 50-year sediment deposit (260 million m3).

(3) Flood control and Other Facilities

A major portion of the river stretch has been protected by earth dikes and the river stretches along urban areas have been protected by concrete walls. Major flood control facilities are earth dikes, concrete walls and spud dikes, In order to protect the

Bayambang urban stretch, part of a flood has been diverted to the Poponto Swamp through a 800 m wide floodway.

Among the existing flood control the earthquake-damaged facilities, about 70% in 1990. Most of these facilities have been rehabilitated by the Project Management Office (PMO) – Agno Flood Control (AFCS) of DPWH. However, a large flood in Bayambang and Alcala damaged the left bank at san Vicente.

Profile of the project

Major features of the Project are summarized in Executive summary, Item 1.6 in accordance with the principal modification of the detailed design and the construction stage.

Scope of Works

(1) Floodway (Package I)

- Low water channel excavation	L = 11,557 m W= 45 m
- Channel dredging	V= 59,900 cu.m. L=3,968m
- Extension earth dike	L= 1,600 m
- Heightening of existing earth dike at PNR	L= 100 m in total
- Straight spur dikes	L = 878 m in total
- Sluiceways	2 places
- Cross road at PNR	L = 45 m
- Grade control structures	8 locations
- Mound dike	1 place
- Evacuation Center	1 place
- Poponto Swamp drainage channel excavation	L = 3,820 m, W = 30 m
- Road crossing pipe	1 place
- Closure dike protection works	1 place

Bayambang Stretch and Alcala Portion (Package I)

- Heightening of existing earth dikes	L = 2,858 m in total
- River bank protection works	L = 1,240 m in total
- Straight spurdikes	L = 1,055 m in total
- Sluiceway	1 place
- Urgent restoration works for the damaged left dike in Brgy. San Pedro Ili, Alcala	L = 1, 600 m (channel)

(2) Guide Channel to Bayambang (Package II)

- Approach channel excavation	L = 1,380 m
- Closure dike with revetment	L = 2,918 m
- T-head spur dikes	L = 896 m in total
- Diversion structure	L = 144 m
- Guide channel	L = 1,978 m
- Diversion bridge	L = 46.7 m

- Food control weir — L = 980 m

(3) Social Development for Poponto Retarding Basin (Package III)

- Provincial road heightening — L = 6,661 m
- Barangay roads heightening — L = 12,275 m in total
- Mound dikes — 22 places
- Evacuation centers — 22 places
- Poponto swamp drainage channel excavation — L = 650 m, W = 30 m

(4) Hector Mendoza Bridge (Package IV)

- Bridge length — L = 1,021 m
- Bridge Total Width — W = 9.5 m
- Bridge span — L = 54 to 62 m
- Superstructures — 5 spans connection RC decks PC 1 girder

  3 units of 4 spans continuous hybrid precast PC deck minority steel girder

  3 spans connection RC deck PCI girder
- Substructures RC piers — Reinforced existing RC piers and new
- Foundation — Cast-in-situ RC bored pile, Ø 1,200
- Approach — W = 11.7 m approximately, L = 250 m at both side

VI. CONSTRUCTION COST

Contract Package	Amount (Mil P)	Remarks
I	955	With Variation order (V.O) Nos. 1 to 3, Supplemental Agreement (S.A.) Nos. 1 to 3, Price Adjustment (P.A), VAT Differential and Price Escalation (P.E) Nos. 1&2
II	1,501	With P.A. V.O No.1 and VAT adjustment
III	574	With V.O Nos 1 to 3 and P.E Nos 1 to 4
IV	995	With V.O Nos. 1 to 5, Standby claim, Incentive bonus and P.E.
Total	4,025	

VII. FUNDING SOURCE

Loan Agreement (L/A) No.: PH-P193 (Phase II-A and PH-P223 (Phase II-B)

(2) Loan Amount : Y6, 734 Million Japanese Yen
(P 2,172 Million, P1.0 = Y 3.10)
+ Y 2,789 Million Japanese Yen)
(P 996 Million, P 1.0 = Y 2.80)

(3) Loan Period : 11 years and 2 months (07 January 1999 To 07 march 2010) for PH-P193 and 8 Years (25 September 2001 to 25 September 2009 for PH-P223

VIII. IMPLEMENTING OFFICE

PMO-Major Flood Control and Drainage Projects, Cluster II
Department of Public Works and Highways
Port Area, Manila
Project Director: Mr. Philip Menez
Telephone No. : 304-3829 Fax No. : 304-3813
304-3752

I. PROJECT TITLE : KAMANAVA Area Flood Control and Drainage System Improvement Project (PH-212)

II. LOCATION :

The project covers 18.50 sq. km of flood-prone areas in the Cities of Kalookan and Malabon and Municipality of Navotas in Metro Manila. Under the project, the feasibility study of Valenzuela area together with Obando and Meycauayan areas will be undertaken under a separate drainage area.

III. BACKGROUND

Floods have occurred since early times due to physical conditions of the site. However, the recent rapid urbanization coupled with land subsidence have induced severe flood damage almost every time it rains, and on a permanent basis since 1970's.

This project is one of the three priority areas identified in the Master Plan and Feasibility Study on Flood Control and Drainage Project in Metro Manila completed in 1990 with the assistance of the Japan International Cooperation Agency (JICA)

This project will relieve flooding in terms of area (18.50 sq. km) through flood control and drainage improvements works and thereby improves the living conditions and promote economic activities in the area.

With the implementation of the Project, the flooding from high tide and overbank flooding from nearly 90 percent of the area to less tan 15 percent during the 10-year flood event with water depth not exceeding 20 cm. The project will reduce the flood damage of more than 500 million pesos every year.

IV. OBJECTIVE

The objective is to mitigate flood damages by flood control and drainage improvement works in the KAMNAVA area and thereby improves the living conditions and promote/enhance economic activities in the said areas.

The Project Area

The proposed flood control protection and drainage improvement system, is designed to protect the project area against inundation from overbank flow of the Malabon-tullahan river; flooding induced by high tides in Manila Bay; and to alleviate internal runoff flooding.

The planning criteria adopted in the development of the proposed system is primarily based on urgency of flood protection measures and priority areas, financial restrictions, trends of urbanization, geodetic and climatic variations, social factors and environmental considerations.

For the protection work against river flows, a design scale of 30 years (30 –year return period) was used based on JICA FS in 1990. For drainage improvement works, a design scale of 10 years (10-year return period) was adopted, based on DPWH's Design Guidelines, Criteria and Standards and MMDA's Policy Target in Flood Control and Drainage in 1993

V. FLOOD CONTROL PLAN

At the Southern Area of Malabon River - Raising of river wall on the left and right bank of the Malabon-Tullahan River, also on the banks of the Navotas-Tullahan river. Construction of flood gates, pumping stations and installation of pumps, improvement of existing drainage channels and construction of new drainage channel and new regulation ponds.

At the Northern Area of Malabon River – Construction of polder dike, construction of submersible type navigation gate, flood control gates, pumping stations and supply and installation of pumps.

VI. SCOPE OF WORK

Southern Area of Malabon River

1. Raising of river wall on the left bank of the Malabon-Tullahan River (L = 4.3 km)

2. Raising of river wall on the right bank of the Malabon-Tullahan River (L =4.4 km)

3. Raising of river wall on the banks of the Navotas-Tullahan River (L=4.4 km)
4. Construction of Flood Control Gates :
   - Maypajo - 2 x 6.0m x 3.8m (Ancillary to P/S)
   - Spine - 1 x 5.0m x 4.9m (Ancillary to P/S)
   - Bangkulasi - 2 x 4.0m x 4.4m (Ancillary to P/S)
   - Catmon - 2 x 4.0m x 5.0m (Ancillary to P/S)
   - Longos - 2 x 4.0m x 4.2m

5. Construction of Pumping Stations and supply and installation of pumps;
   - Maypajo - 2 x 2.3m^3/s Horizontal Shaft Axial Flow
   - Spine - 1 x 3.25m^3/s Horizontal Shaft Axial Flow
   - Bangkulasi - 2 x 2.2 m^3/s Horizontal Shaft Axial Flow
   - Catmon - 4 x 2.625m^3/s Submersible Motor Axial Flow

6. Improvement of existing drainage channels (L=6 km)
7. Construction of new drainage channel (L=2.7 km)
8. Construction of new regulation ponds (A= 6.0 ha)

Northern Area of Malabon River

1. Construction of polder dike (W =3m, L = 8.6 km)
2. Construction of submersible type navigation gate (W =25m, H = 8.9m)
3. Construction of flood control gates;
   Navotas - 2 x 12.0m x 4.4m
   Muzon - 2 x 4.0m x 4.0m
   South Pinagkabalian- 2 x 4.0m x 4.0m
   Kailugan - 2 x 12.0m x 4.4m
   Pinagkabalian - 2 x 4.0m x 5.4m
4. Construction of pumping stations and supply and installation of pumps:
   Navotas North - 3 x 3.2 m^3/s Horizontal Shaft Axial Flow (Ancillary to Navigation Gate)

VII. FUNDING SOURCE

JAPAN BANK FOR INTERNATIONAL COOPERATION (JBIC)
SPECIAL LOAN PACKAGE (2000)
Loan Amount **:** **P** 3.479 B
Loan Period **:** June 10, 2003 – September 2008
(Loan Expiry Date)

VIII. IMPLEMENTING OFFICE

PMO-CAMANAVA
Department of Public Works and Highways
Port Area, Manila

OIC Project Director: **Macariola S. Bartolo**
Telephone No. 301-1057
301-1058
Fax 301-1058

I. PROJECT TITLE: PASIG-MARIKINA RIVER CHANNEL IMPROVEMENT PROJECT Phase II (PMRCIP II)

II. LOCATION : Pasig River from Delpan Bridge up to the NHCS, the Lower Marikina River from NHCS to the effluent point of the Mangahan Floodway, and the Upper Marikina River from the Mangahan Floodway to Sto. Niño Bridge.

III. BACKGROUND

Metro Manila, which encompasses sixteen (16) cities and one (1) municipality having a total population of over 9.933 million in 2000, is the economic, political and cultural center of the Philippines. The Pasig-Marikina River System, being the main natural drainage of the National Capital Region (NCR), runs through the center of Metro Manila and flows out to the Manila Bay. The three (3) largest waterways; Pasig, Marikina and San Juan Rivers with a total catchment area of 621 km2 contribute largely to the flooding in the metropolis brought about by the riverbank overflow of floodwaters during heavy rains.

In 1985, the Mangahan Floodway was completed to provide protection to the center of Metro Manila against a 100-year return flood discharge of the Pasig-Marikina River by diverting the excess flood discharge of the Marikina River into the Laguna Lake. As the main diversion facility towards the Mangahan Floodway, the Marikina Control Gate Structure (MCGS) was proposed to fully attain the maximum utilization of the floodway. Without the MCGS, the floodway could provide protection only against a much lower return period of flood discharge. Consequently, frequent channel overflow of the Pasig-Marikina River will always remain a menace to the densely built-up areas of Metro Manila. Floods of the Pasig-Marikina inflicted serious damage in 1986, 1988, 1990, 1995, 1997, 1998, 1999, 2000, 2002, 2004, 2005 and 2006.

Under the above circumstances, the Department of Public Works and Highways (DPWH) formulated the master plan of the Pasig-Marikina River System in the Study on Flood Control and Drainage Project in Metro Manila (JICA Study). The JICA Study was carried out from January 1988 to March 1990 with the technical assistance from Japan International Cooperation Agency (JICA). To find a solution to the flooding as well as the environmental problems associated with the river improvement plan, the Feasibility Study (F/S) was conducted for the Pasig-Marikina River Channel Improvement as the urgent project in the JICA Study.

The F/S had confirmed that about 1.0 million cubic meters of silt and garbage had accumulated and this considerably reduced the channel flow capacity, causing the difficulty in water transportation and navigation. The garbage/waste deposits also contributed largely to the contamination of river water and the obnoxious odor that adversely affect the riverine areas. Moreover, most sections of the existing revetment/parapet wall in both banks of the Pasig-Marikina River are already seriously damaged and deteriorated. These conditions destroy the aesthetic view of the river and the existing revetments are already structurally unstable to incoming flood flows.

Since 1994, a flagship project named the Pasig River Rehabilitation Program (PRRP) has been implemented as a multi-agency undertaking to retrieve the beauty and lush greenery of the Pasig River as it used to be as early as the 15th century. The implementation of the PRRP is under the leadership of the Department of Environment and Natural Resources (DENR), involving other national government agencies and the Local Government Units (LGUs) as well as some Non-Government Organizations (NGOs). In particular, the DPWH has been appointed for the civil works for flood mitigation, especially channel improvement. Both the National Housing Authority (NHA) and the concerned LGUs have undertaken to relocate all the squatters living along the Pasig River and its tributaries, which is now being carried out by the Pasig River Rehabilitation Commission (PRRC) aiming the completion by the end of 2007.

As part of the continuing noble effort in finding a viable solution to flooding and environmentally related problems, the "Pasig-Marikina River Channel Improvement Project" (the Project) was proposed in 1995 for inclusion and financing under the Japan Bank for International Cooperation (JBIC: formerly Overseas Economic Cooperation Fund of Japan) 22nd Yen Loan Package Program. However, considering that the technical data from the F/S for the Project was already old and outmoded (1988-1990), the National Economic Development Authority (NEDA), in its letter dated 23 April 1996 to DPWH, requested the latter to submit full-blown and updated F/S for the Project.

On 20 January 1998, the Government of the Republic of the Philippines, through NEDA, officially endorsed to JBIC the request for assistance to the updating/review of the F/S for the Project under the JBIC – Special Assistance for Project Formation (JBIC-SAPROF). Being a flagship project of the Government and considering its huge potential impact to flood mitigation and environmental improvement of the covered areas, the JBIC extended its financial support and executed the SAPROF Study starting in February 1998. The SAPROF study was successfully completed in June 1998 with the conclusion that the Project is technically sound and economically viable for immediate implementation. Following the SAPROF study, the Government of Japan through the JBIC has decided to extend its loan to finance for the implementation of the project under 23rd Loan Package in June 1999. Thus, the detailed engineering design was carried out from October 2000 to March 2002 under the 23rd JBIC Loan Package.

After the detailed engineering design, the Chairman of MMDA still had a lot of queries that had to be addressed. This led to the conduct of a Value Engineering Study (VES) by the University of the Philippines-National Hydraulic Research Center (UP-NHRC) from June to September 2005. Results of the VES had been presented to NEDA and MMDA wherein project approval has been made. Initial activities consist of the review design and subsequent construction of Phase II covering the stretch of the Pasig River from Delpan Bridge up to the immediate vicinity of the Napindan Hydraulic Control Structure (NHCS).

The Pasig-Marikina River Channel Improvement Project is divided into three (3) construction stages as follows:

Construction Stage 1: Project Phase II	Lower Pasig River; 9.2 km (Delpan Bridge to Lambingan Bridge) Upper Pasig river; 7.2 km (Lambingan Bridge to immediate Vicinity of NHCS)
Construction Stage 2: Project Phase III	Lower Marikina River; 6.0 km (Napindan Channel to MCGS) MCGS and Its Vicinity; 1.2 km (MCGS to Mangahan Floodway)
Construction Stage 3: Project Phase IV	Upper Marikina River; 6.1 km (Mangahan Floodway to Marikina Bridge)

The construction of Phase II, of the Project, has been requested for financing under the 26th JBIC Yen Loan Package (STEP: Special Term Economic Partnership) on the assumption that Phases III and IV will be undertaken under the future Loan Package of JBIC.

After deliberations on the above Package by and between the JBIC Mission and the DPWH in February 2003, it was concluded that the CTI Engineering International Co., Ltd. will be selected through direct appointment to undertake the consulting engineering services for the construction supervision of the Pasig-Marikina River Channel Improvement Project (Phase II).

After the Loan Agreement for the Pasig-Marikina River Channel Improvement Project (Phase II) was concluded on February 2007 under the 26th JBIC Yen Loan Package (STEP: Special Term Economic Partnership), the JBIC concurred in the procurement of the consultant through direct appointment to CTI Engineering International Co., Ltd. in response to the request of DPWH on February 2007 for the smooth implementation of the Project.

1.2 Location of the Project

The project area is delineated in the most significant portion of the Pasig-Marikina River i.e., the Pasig River from Delpan Bridge up to the immediate vicinity of the NHCS, the Lower Marikina River from the immediate vicinity of the NHCS to the effluent point of the Mangahan Floodway, and the Upper Marikina River from the Mangahan Floodway to Sto. Niño Bridge. This delineation considers the flood control effect as well as the social significance that the river passes through the core of Metro Manila.

1.3 Objectives of the Project

(1) To mitigate the frequent inundation or massive flooding caused by the overflowing of Pasig-Marikina River resulting in severe damages to lives, livestock, properties and infrastructure with the aim of alleviating the living and sanitary conditions in Metro Manila.

(2) To create a more dynamic economy by providing a flood-free urban center as an important strategy for furthering national development.

(3) To rehabilitate and enhance the favorable environment and aesthetic view along the riverine areas by providing with more ecologically stable condition, which will arrest the progressive deterioration of environmental conditions, health and sanitation in Metro Manila.

1.4 Project Works

The components of the Project are river channel improvement works for a stretch about 31 km from Delpan Bridge to Sto. Niño so as to increase the flow capacity of the Pasig-Marikina River, and the construction of the Marikina Control Gate Structure (MCGS) in order to maximize the flood diversion capacity of the Mangahan Floodway.

The Proposed project works are summarized below:

(1) River Improvement Works

Project Phase	Construction Stage	Contract Package	Stretch	River Improvement Works			
				Dredging/ Excavation (m^3)	Embankment (m^3)	Parapet (km)	Revetment (km)
Phase (II)	**Construction Stage 1**	**1-A**	**Lower Pasig River: 9.20 km (Delpan Bridge to Lambingan Bridge)**	**7 x 10^3**	**0**	**14.5**	**9.13**
		1-B	**Upper Pasig River: 7.20 km (Lambingan Bridge to Napindan Channel)**	**8 x 10^3**	**0**	**13.7**	**8.44**
Phase (III)	Construction Stage 2	2-A	Lower Marikina River: 6.00 km (Napindan Channel to MCGS)	500 x 10^3	200 x 10^3	0.34	1.13
		2-B	MCGS and Its Vicinity: 1.20 km (MCGS to Mangahan FW)	250 x 10^3	70 x 10^3	0	1.08
Phase (IV)	Construction Stage 3	3-A	Upper Marikina River: 6.10 km (Mangahan FW to Sto. Niño)	1,360 x 10^3	740 x 10^3	2.1	9.00

Note: Construction Stage 1 will be implemented under the **Pasig-Marikina River Channel Improvement Project (Phase II)**. Detailed Design of the Project was conducted under the Project (I).

(2)Drainage and Bridge Works

Project Phase	Construction Stage	Contract Package	Stretch	Drainage Works		Bridge Works	
				Single Barrel Culvert	Double Barrel Culvert	Foundation Protection Works	Span Expansion Works
Phase (II)	**Construction Stage 1**	**1-A**	**Lower Pasig River: 9.20 km (Delpan Bridge to Lambingan Bridge)**	**28**	**-**	**-**	**-**
		1-B	**Upper Pasig River: 7.20 km (Lambingan Bridge to Napindan Channel)**	**56**	**2**	**-**	**-**

Phase (III)	Construction Stage 2	2-A	Lower Marikina River: 6.00 km (Napindan Channel to MCGS)	11	1	Vargas Br. Sandoval Br. Rosario Br.	-
		2-B	MCGS and Its Vicinity: 1.20 km (MCGS to Mangahan FW)	-	-	-	-
Phase (IV)	Construction Stage 3	3-A	Upper Marikina River: 6.10 km (Mangahan FW to Sto. Niño)	18	7	Marcos Br.	Manalo Br. (One Span)

Note: Single Barrel Pipe Culvert : min. size 610mm – max. size 1,520mm
Double Barrel Pipe Culvert : 1,370mm
Box Culvert : min. size 1.0m x 1.0m – max. size 2.1m x 2.4m

1.5 Project Finance

(1) Loan Agreement No. PH-P239 dated February 27, 2007.

(1) Loan Amount: 8,529 Million Japanese Yen
(3,967 Million Philippine Peso, ₱ 1.0 = Y 2.15) covering:

(a) Civil Works (7,196 million Japanese Yen);
(b) Consulting Engineering Services (973 million Japanese Yen); and
(c) Contingencies (360 million Japanese Yen).

IV. IMPLEMENTING OFFICE

PMO-Major Flood Control Project Cluster -I
Department of Public Works and Highways
Port Area, Manila

Project Director: Mr. Patrick Gatan

Telephone No. 304 -3752 Fax 304-3815
304 - 3813

I. PROJECT TITLE: ILOILO FLOOD CONTROL PROJECT (PHASE II)

I. LOCATION:

The Project area has its center in Iloilo City, which is located in the southeastern edge of Panay Island in the Western Visayas, Region VI. And currently comprising a total land area of about 6,852 ha, or 68.5 km2. It is wide seaside plain that has been developed by the Jaro River (its basin area of 412 km2) from the river mouth to the confluence with the Aganan River, and IIoilo River (93 km2) from the river mouth to the Carpenter (Molo) Bridge. The distribution of Iloilo City land area by district is as listed below.

District/City	Area (ha)	Proportion of Total City Land Area (%)
Arevalo	663.9	9.7
City Proper	289.2	4.2
Jaro	2,987.1	43.6
La Paz	1,148.6	16.8
Mandurriao	1,311.9	19.1
Molo	451.6	6.6
Iloilo City	6,852.2	100

Source: Socio-Economic Profile of Iloilo City, 1997

Aside from the above, the upstream area of the confluence and some parts of the proposed Jaro Floodway belong to the Municipality of Pavia.

III. BACKGROUND

A comprehensive flood control plan was carried out for medium and small-scale rivers nationwide, especially for those rivers flowing in regional urban centers, with the technical assistance of Japan International Cooperation Agency (JICA) from 1993 to 1995, namely, the "**Study on Flood Control for Rivers in the Selected Urban Centers in the Republic of the Philippines"**. In the Study, the feasibility study on flood control was prepared for Iloilo City as one of the most priority areas among the thirteen cities in the Philippines.

Iloilo City, classified as a first class city, has been suffering from flood damages in almost every year due in part to the insufficient flow capacity of the Jaro River and in part to poor drainage in the Iloilo River Basin. Thus, to solve such circumstances,

the early implementation of the flood control project is imperative to attain a safer and a more pleasant urban environment for the city. In order to execute the detailed design, financial assistance was extended under the 22nd Yen Loan Package from the Japan Bank for International Cooperation (JBIC; formerly OECF or the Overseas Economic Cooperation Fund of Japan).

The construction of the Stage 1 project was requested for financing under the 25th Yen Loan Package on the assumption that Stage 2 will be undertaken under a future Loan

Package of JBIC. The development works of resettlement sites for families affected by Stage 2 project is included in the works of Package 4 under Stage 1.

1V. OBJECTIVES

(1) To mitigate flood damage and inundation with the aim of creating a more sustainable urban community and of providing a safer and a more pleasant living condition for people in the urban area of Iloilo City and its vicinity.

(2) To create a more dynamic regional economy by providing a flood-free urban center as an important part of the strategy for furthering national development; and

(3) To rehabilitate and restore the urban environment by providing for more ecologically stable conditions that will arrest the progressive deterioration of environmental conditions, health and sanitation in Iloilo City and its vicinity.

V. FLOOD CONTROL PLAN

The Project will be implemented in two (2) stages; namely, Stage 1 and Stage 2). For the sake of flood control, Stage 1 will be carried out basically to attain the flood control works with a scale of a 20-year return period, and Stage 2 shall be successively undertaken and upgraded to the project scale of a 50-year return period. For the sake of the drainage plan, the Upper Ingore Creek improvement works shall be implemented under Stage 1, whereas, the improvement works of Lower Ingore Creek, Rizal Creek and Bo. Obrero Creek shall be successively undertaken under Stage 2, all at the scale of a 5-year return period.

The Project plan and the works for both Stage 1 and Stage 2 are as presented briefly below.

(1) River Improvement Plan

The flood control plan is composed mainly of river improvement and construction of floodways.

Two (2) floodways are to divert the excess flood discharge of the Jaro River towards the Iloilo Strait; namely, the Jaro Floodway and the La Paz Floodway. With the river diversion, the design discharges for the river improvement works of Stage 1 and Stage 2

(2)Drainage Improvement Plan

Three (3) drainage basins in Iloilo City; namely, the basins of Ingore Creek, Obrero Creek and Rizal Creek, have been selected for implementation under the Project. The design scale adopted for the drainage improvement is 5-year return period.

VI. FUNDING SOURCE

Funds for the Stage 1 Project are made available, as follows:

(1) JBIC Loan Agreement No. PH-P230, dated March 28, 2002.

(2) Amount of Loan: 6,790 million Japanese Yen

(2,920 million Philippine Peso; P1.00 = ¥2.325 as of July 24, 2002)

(3) Expiry Date of Loan: September 24, 2010

VII. IMPLEMENTING OFFICE

PMO-Major Flood Control Project Cluster -I
Department of Public Works and Highways
Port Area, Manila
Project Director: PATRICK GATAN

Telephone No. 304 -3752
304 - 3813
Fax 304-3815

I. PROJECT TITLE: THE PROJECT FOR FLOOD MITIGATION IN ORMOC CITY

II. LOCATION : Ormoc City, Province of Leyte, Region VIII

III. BACKGROUND

On November 5, 1991, Ormoc City suffered tremendous damage from the devastating flood brought about by Typhoon Uring. It has been reported that 4,922people were dead, 3,000 missing, 14,000 houses destroyed and more than 600 million pesos worth of properties were damaged.

Although rehabilitation works were carried out both by the national and the local government right after the typhoon, the works merely consisted of the reconstruction of bridges and dikes. Major improvement works for the two (2) biggest rivers in Ormoc City, the Anilao and Malbasag rivers, were left almost unattended because of fund limitation, so that Ormoc City remained exposed to the menace of disastrous floods.

The Japan International Cooperation Agency (JICA) conducted the “Study on Flood Control for Rivers in the Selected Urban Centers” from 1993 to 1994, and the flood mitigation project in Ormoc City was selected as one of the high priority projects. Based on the results of the study, the Government of the Republic of the Philippines, in December 1995, requested the Government of Japan to extend assistance through the Japanese Grant Aid Program for the implementation of “The Project for Flood Mitigation in Ormoc City.”

The above project was divided into two (2) phases, namely; Phase Phase II and I. The Detailed Design of Phase I was completed in December 1997 and construction started in the early part of March 1998 with completion on March15, 1999. On the other hand, Phase II was started on February11, 1999 and its completion was on August7, 2001.

“The Project for Flood Mitigation in Ormoc City” displayed its effectiveness during the floods in February 2001 and July 2003, whose magnitudes were almost equal to that of the flood in November 1991 (the 1991 Ormoc Tragedy).

However, the recorded maximum hourly rainfall of 100mm/hr brought about by Typhoon “Gilas” that hit Ormoc City on July17, 2003 and caused the July 2003 flood was more than the recorded rainfall of 60mm/hr during the 1991 Ormoc Tragedy. Therefore, the strong typhoon in July 2003 brought considerable damage to the river structures including those constructed in the said project, although it continued to function well to protect Ormoc City. And fortunately, this time there were no casualties.

Furthermore, it should be mentioned that the Asian Development Bank (ADB) had funded the construction of the urgent revetment works along the upper section of Malbasag River. A section of the Nadongholan Dike that was linked to the dike constructed under the project also collapsed due to the July 2003 flood.

In response to the strong request of the City Government of Ormoc for the immediate reconstruction of the dike structures, the Department of Public Works and Highways (DPWH), Government of the Republic of the Philippines, applied for funding under the “Fourth Non-Project Grant Assistance of Japan Counter-Value Fund (NPGA4-CVF)” for the rehabilitation/enhancement works. in accordance with its letter dated 06September

2005, the Department of Finance favorably endorsed the Project for funding under the NPGA4-CVF. DPWH is the Implementing Agency and its Project Management Office for Major Flood Control and Drainage Projects, Cluster II (MFCDP II-PMO) is the Executing Agency. The project for the "Rehabilitation/Enhancement of Ormoc Flood Mitigation Structures" completed in Oct. 2007.

IV. OBJECTIVES

1. To secure human lives and people's properties of Ormoc city from the flood with a return period less than 50-year, not to repeat such disastrous flood damage as brought by Typhoon Uring in November 1991.

2. To conserve and improve the river environment of Anilao and Malbasag rivers, since those are closely related to a daily common life of the resident of Ormoc City. Also to generate a impact to other major rural cities as a model project to mitigate flood damage and sustainable future development.

VI. FLOOD CONTROL PLAN

1. River Improvement

River improvement is to be made to safeguard Ormoc City from floods of a 50-year return period, by widening the channel and setting the high water level in almost the same elevation as the ground level of both banks. Hydraulic drops will be provided to both Anilao and Malbasag River channels, not only to decrease the flow velocity of floods but also to improve the river environment.

Drainage sluices and culverts are to be provided along the dike to drain the rainwater and domestic sewage water of inland areas. Not to allow the reverse flow of floodwaters, gates are to be provided for two sluices at just upstream of Anilao Bridge and just upstream of Algeria Bridge

2. Slit Dams

In the upstream of both Anilao and Malbasag River, 3 slit type dams (2 dams for Anilao and 1 dam for Malbasag) are to be provided to stop the floating logs and prevent the recurrence of serious damage like that caused in November 1991 of clogging by logs.

3. Bridges

All of the five (5) major bridges will be reconstructed so that they will not cause clogging by floating logs, adopting the appropriate length of span and clearance

VII. FUNDING SOURCE

VII. IMPLEMENTING OFFICE

PMO-Major Flood Control and Drainage Projects, Cluster II
Department of Public Works and Highways
Port Area, Manila
Project Director: Mr. Philip Menez
Telephone No. : 304-3829
304-3752

I. PROJECT TITLE: REHABILITATION/ENHANCEMENT OF ORMOC CITY FLOOD CONTROL STRUCTURES

II. LOCATION

The project area will cover Ormoc City. Ormoc City is located in the Province of Leyte, Eastern Visayas Region (Region VIII)

III. BACKGROUND

On November 5, 1991, Ormoc City suffered tremendous damage from the devastating flood brought about by Typhoon Uring. It has been reported that 4,922 people were dead, 3,000 missing, 14,000 houses destroyed and more than 600 million pesos worth of properties were damaged.

Although rehabilitation works were carried out both by the national and the local government right after the typhoon, the works merely consisted of the reconstruction of bridges and dikes. Major improvement works for the two (2) biggest rivers in Ormoc City, the Anilao and Malbasag rivers, were left almost unattended because of fund limitation, so that Ormoc City remained exposed to the menace of disastrous floods.

The Japan International Cooperation Agency (JICA) conducted the **"Study on Flood Control for Rivers in the Selected Urban Centers"** from 1993 to 1994, and the flood mitigation project in Ormoc City was selected as one of the high priority projects. Based on the results of the study, the Government of the Republic of the Philippines, in December 1995, requested the Government of Japan to extend assistance through the Japanese Grant Aid Program for the implementation of **"The Project for Flood Mitigation in Ormoc City."**

The above project was divided into two (2) phases, namely; Phase I and Phase II. The Detailed Design of Phase I was completed in December 1997 and construction started in the early part of March 1998 with completion on March 15, 1999. On the other hand, Phase II was started on February 11, 1999 and its completion was on August 7, 2001.

The project had involved the construction of three (3) slit dams, eight (8) kilometers of river channel improvement, and five (5) bridges. For its part, the Government of the Republic of the Philippines (GOP) secured the right-of-way (ROW) and developed the site for the resettlement of project-affected families (PAFs). The GOP also provided the PAFs with basic services and livelihood opportunities.

"The Project for Flood Mitigation in Ormoc City" displayed its effectiveness during the floods in February 2001 and July 2003, whose magnitudes were almost equal to that of the flood in November 1991 (the 1991 Ormoc Tragedy). However, the recorded maximum hourly rainfall of 100 mm/hr brought about by Typhoon "Gilas" that hit Ormoc City on July 17, 2003 and caused the July 2003 flood was more than the recorded rainfall of 60 mm/hr during the 1991 Ormoc Tragedy. Therefore, the strong typhoon in July 2003 brought considerable damage to the river structures including those constructed in the said project, although it continued to function well to protect Ormoc City.

One of the major damaged structures was the access/maintenance road of the Biliboy Slit Dam, which was eroded by local scouring near the toe of revetment. About 40 m of

revetment was damaged and the river channel boulder riprap also got washed out. It should be noted that the access/maintenance road of the Biliboy Slit Dam is crucial to the removal of trapped boulders, logs and driftwood. The trapped materials have to be removed after every major flood in preparation for the next flood to assure the full functioning of the slit dam.

Furthermore, it should be mentioned that the Asian Development Bank (ADB) had funded the construction of the urgent revetment works along the upper section of Malbasag River. A section of the Nadongholan Dike that was linked to the dike constructed under the project also collapsed due to the July 2003 flood.

The damaged portion of the Nadongholan Dike was the path of floodwaters that devastated the city proper in 1991 and, although the City Government had undertaken riprap works as emergency measures, these temporary structures may not withstand the onslaught of major floods. Therefore, without the full reconstruction of the damaged portion of the said dike, the remaining revetment will be damaged and floods of the Malbasag River will surely overflow towards the city proper.

Being a model flood control project safeguarding one of the regional growth centers of the Philippines, the present project named as the **"Rehabilitation/Enhancement of Ormoc Flood Mitigation Structures"** was required to enhance the function and sustainability of the said structures. To avoid further damage and prevent the danger posed by the damaged structures, the immediate reconstruction of dikes was deemed necessary.

GRANT AID OF THE GOVERNMENT OF JAPAN

In response to the strong request of the City Government of Ormoc for the immediate reconstruction of the dike structures, the Department of Public Works and Highways, Government of the Republic of the Philippines, applied for funding under the **"Fourth Non-Project Grant Assistance of Japan Counter-Value Fund (NPGA4-CVF)"** for the rehabilitation/enhancement works. In January 2005, the Department of Finance of the Philippine Government endorsed the request to the Embassy of Japan in Manila and, subsequently, in accordance with its letter dated 06 September 2005, the Department of Finance favorably endorsed the Project for funding under the NPGA4-CVF.

IV. OBJECTIVES:

1. To enhance the function and the sustainability of the Ormoc City Flood Mitigation Project in order to attain a safe and pleasant living condition in Ormoc City
2. To restore and rehabilitate the damaged portions of the river structures in Ormoc City
3. Reconstruction of the existing Nadongholan Dike in the upper section of Malbasag River.
4. Rehabilitation of access/maintenance roads for Billboy Slit Dam

V. Flood control Plan

Project Works

A. The original civil works consisted of the following:

(1) Upstream of Malbasag River

Work Item	Quantity
Construction of Revetment Type III (Leaning Wall)	207 m
Construction of Revetment Type II (Wet Stone Masonry)	65 m
Construction of 600mm Diameter RC Pipe Culvert	11 m
Construction of Approach Step	5 locations

(2) Biliboy Slit Dam

Work Item	Quantity
Construction of Revetment Type III (Leaning Wall)	70 m
Construction of 600mm Diameter RC Pipe Culvert	11 m
Construction of Lined Canal	80 m

(3) Other Works

Work Item	Quantity
Fencing	600 m
Disposal Area Development	10,100 sq.m

B. Additional Works (Variation Order No. 1)

The additional works in Malbasag River Revetment Works, as follows:

- 50 linear meters of drainage ditch
- 1 unit catch basin
- 6 linear meters of 600 mm diameter reinforced concrete pipe culvert
- Additional river excavation from hydraulic drop M-3 to hydraulic drop M-4.
- 2 units storage building
- 200 linear meters of H Beam – Pile

PROJECT COST

Funds for the Rehabilitation/Enhancement of Ormoc Flood Mitigation Structures were made available by the DPWH, as follows:

(1) NPGA4-CVF (Amount from the Grant): PHP 72,001,259.00
(2) GOP Funds: PHP 81,582,159.80

Particulars	Amount in Peso (PHP)
A. Civil Works and Procurement of Equipment/Materials	
- Original Cost	121,512,747.95
- Revised Cost	129,183,558.80
B Consulting Services	17,753,600.00
C. Right-of-Way	4,176,260.00
D. Administration/Others	2,470,000.00
E. Physical Contingency	-.-
Total	**153,583,418.80**

Expected impact/benefit

The avoidance of flood disaster like the 1991 Ormoc City Tragedy will be the most important contribution of the proposed project. The effectiveness of the existing flood control structures will be hardly attained if the rehabilitation/reconstruction works will not be implemented. Hence, the benefit of the project will be the cost of the existing structures and the reduction of flood damages. It will also give peace to people and further improve their living standard as well as the environment. With assurance of the safety of Ormoc city from devastating floods, more investors and tourist will come to the city and economic activities will be more progressive. The implementation of the project will also generate jobs and related opportunities for the people of Ormoc City as well as the whole region.

VI. Funding Source

VII. IMPLEMENTING OFFICE

PMO-Major Flood Control and Drainage Projects, Cluster II
Department of Public Works and Highways
Port Area, Manila
Project Director: Mr. Philip Menez
Telephone No. : 304-3829
304-3752

I. PROJECT TITLE: PINATUBO HAZARD URGENT MITIGATION PROJECT, PHASE I (Mudflow/Flood Control Works in Sacobia-Bamban River Basin)

II. LOCATION: Sacobia-Bamban River, covering the provinces of Papanga and Tarlac

III. BACKGROUND

With the completion of the said project, 14,000 households of 33 barangays located in the downstream areas threatened by flooding and mudflow in the towns of Mabalacat and Magalang in Pampanga and towns of Bamban and Concepcion in the province of Tarlac were the beneficiaries. People in the devastated area are not the only those directly affected but also those in nearby areas have the feeling of security with the completion of the project. Social and economic activities are already beginning to restore. The daily traffic volume reaches 16,000 and travel time from Mabalacat to Tarlac and vice versa is reduce by about one hour. The agricultural productivity is increased. The completion of the project accelerated the materialization of the long –term Regional Development Plan.

IV. OBJECTIVES

1. To rehabilitate/restore the Sacobia-Bamban River Basin damaged due to the eruption of Mount Pinatubo in order to prevent further destruction of life and property.

2. To rehabilitate/improve the major road link between Pampanga and Tarlac (Manila North Road of Route 3 Highway) in order to ensure ease of transport, strengthen interregional linkages, and to support the growth of agricultural, industrial, fishing, commercial and tourism activities in Central Luzon, and

3. To recover the vast agricultural land now covered with lahar.

VII. FLOOD CONTROL PLAN

Scope of work comprises of construction of 3.22 kms. road, 333.20 linear meters of bridge, 51.89 kms. dike with slope protection, 1 unit consolidation dam, 6 units of groundsill, 30 units of spur dike and 11.7 kms. dike raising.

IV. FUNDING SOURCE

JBIC – P 1.745 B or Y 6.991 B Phil Govt. – P1.328 B

V. IMPLEMENTING OFFICE

PMO- Mount Pinatubo Emergency (MPE)
Department of Public Works and Highways
Region III, San Fernando City, Pampanga

I. **PROJECT TITLE:** PINATUBO HAZARD URGENT MITIGATION PROJECT, PHASE II
(Lahar and Flood Control in the Pasig-Potrero River Basin)

II. LOCATION: Pasig-Potrero River, Pampanga

III. BACKGROUND

After the dredging/excavation works was completed along the Pasac-Delta Area (Third River Project), duration of flooding in the nearby municipalities like Minalin, Sto. Tomas, among others, was lessen. Construction of dikes has prevented the disastrous effect of the lahar flow/flood water in the municipalities of Bicolor, Guagua, Minalin, and Sto. Tomas and the City of San Fernando. The construction of evacuation roads and the restoration of Old McArthur Highway have eased the traffic congestion along the GSO Road. It has also provided a ready access to safer grounds during heavy rains when flood occur in Bacolor.

Beneficiaries from the completed project are the municipalities of Bacolor, Sto. Tomas, Mexico, San Simon, Minalin, Macabebe, Sasmuan, Guagua, Sta. Rita, Porac and City of San Fernando, all in the province of Pampanga.

IV. OBJECTIVES

1. To minimize the potential disastrous effects of lahar/mudflow and flood inundation in the Pasig-Potrero River Basin and Pasac Delta Area (Third River) and limit future areas of sediment deposition within the presently affected areas.
2. To come up with future land use plan and restore dislocated families to their original settlement that are covered with lahar, and
3. To integrate the approach of intervention measures throughout the Pasac Delta Area.

V. FLOOD CONTROL PLAN

Scope of work comprises of construction of 24.9 kms. Asphalt road pavement and 3.6 kms. concrete road pavement, roads 5 units bridges, 38.8 kms. dikes with slope protection, construction/upgrading of 7 units box culverts and 67 kms. excavation/dredging works 37.6 kms. Of which is for the “Third River”.

VI. FUNDING SOURCE

JBIC – P 3.195 B or Y 7.861 B Phil Govt. P 1.328 B

VII. MPLEMENTING OFFICE

PMO- Mount Pinatubo Emergency (MPE)
Department of Public Works and Highways
Region III, San Fernando City, Pampanga

I. PROJECT TITLE: PINATUBO HAZARD URGENT MITIGATION PROJECT, PHASE III

II. LOCATION: The Project area, located some 100km northwest of Manila in the southern - central region of Luzon, is bounded on the west by the Zambales Range, to the south by Manila Bay, to the east by the Pampanga River and to the north by the Sacobia-Bamban River catchment.

The coalescing deltas of the Pampanga River and Pasac-Guagua River cover an area of about 200km and includes/include the towns of Lubao, Sasmuan, Guagua, City of San Fernando, Minalin etc. The Pasac-Guagua River and Pampanga River have formed an intricate pattern of river channels across Pasac Delta. Most of this land is less than EL 2 m and is subject to inundation during extremely high tides.

III. BACKGROUND

Major rivers flowing down from the eastern slope of mt. Pinatubo, such as the Abacan, Pasig-Potrero and Porac-gumain Rivers converge on Pasac Delta, lying west of the Pampanga River. However most of the rivers/creeks in the delta area have been heavily silted and eventually clogged by the continuous lahar flow during the past several years after the Pinatubo eruption on June 15, 1991 that has resulted in serious inundation in the delta area during rainy season. In other words, the delta area is a catch basin of flood and lahar without sufficient drainage capacity to Pampanga Bay.

Under such situation, the flood problem in the delta area has been an outstanding issue among local people and residents since the latest lahar event in august 1997, because it has taken more than one month for inundation to subside.

In order to formulate a comprehensive flood control plan covering Pasac Delta, a Study entitled, The Monitoring and Planning of Flood control Works on Pasac Delta (including Porac-Gumain River) and Third River Channel (proposed PHUMP Phases III and IV)" was conducted in March 2001 and the Final Report was submitted in July 2002 by the association of Nippon Koei Co.,Ltd and Philkoei International, Inc.

IV. OBJECTIVES

1. To protect life and minimize damages to properties from perennial flooding and lahar in the project area.
2. Reduce flood level and flooding duration in the City of San Fernando, Lubao, Guagua, Sasmuan, Bacolor and other adjacent towns.
3. Improve drainage efficiency of the river channel network in Pasac Delta including the Porac-Gumain River, linking up the Third River
4. To formulate an integrated plan for a comprehensive non-structural measure.
5. Conduct Institutional Capability Building (ICB)

Rationale of the project

The target area of the Project has severely suffered from perennial flooding since Mt. Pinatubo eruption in 1991. The main cause of flooding in the area is the clogging of river channels due to lahar deposition. The government of the Philippines demands the implementation of flood control projects to mitigate the flooding damage in the target area.

More than a decade after the historic eruption, Central Luzon has slowly regained its strength through the rehabilitation works including Pinatubo Hazard Urgent Mitigation Project, Phase I and II. However, there are still some areas debilitated by the effects of lahar and associated flooding, which should be fully addressed. The project is expected to result in lower peak flood levels, and inundation of shorter duration thus alleviating the Lubao, Guagua, Sasmuan and City of San Fernando. The Government of the Philippines prioritizes this project due to expected significant contribution to the regional and national economic growth in the coming years.

History of the Project

After the June 15, 1991 eruption of Mt. Pinatubo, the stream piracy of the Sacobia Bamban river headwaters (21 Km^2) to the Pasig-Potrero River in October 1993 and the ecompletion of the Megadike in 1990 (implemented by the DPWH, MPR-PMO), succeeding lahar events in the Pasig-Potrero justify the need to provide continuous protection against mudflows and flooding in the areas downstream brought about by continuous siltation.

Lahars in 1997 put to test the integrity of the Megadike. During continuous rains triggered by tropical storm Luming on the 20^{th} and 21^{st} of august 1997. Corresponding to that with 20-year return period, the river aggraded nearly 5m at the Angeles-Porac road crossing and washed out the Mabey Bridge. Upstream of the transverse Dike, proving its effectiveness as a major component of the entire Megadike System.

A series of Pinatubo Hazard Urgent Mitigation Project (PHUMP) i.e., PHUMP Phase I, II, III, IV, and V were proposed to continuously rehabilitate the areas devastated by the Mt. Pinatubo eruption and its induced events. The rehabilitation works started from 1996 and the following phases of PHUMP, both implemented by the DPWH, MPE-PMO, had already been completed to date:

(1) PHUMP Phase I- Rehabilitation Works for Sacobia Bamban River
July 1996-July 2001
(2) PHUMP Phase II - Rehabilitation works for Pasig-Potrero River
October 1999-February 2006

List of Relevant Studies and Basic Datta

Mount Pinatubo Commission (MPC) formulated the “Integrated Plan for the Mount Pinatubo Affected Areas (Final Draft)” in July 1994. The Integrated Plan is organized into three major rehabilitation programs, namely, infrastructure, livelihood, and resettlement. In the preparation of plans and programs on river basin infrastructure, the “Integrated Plan” referred to the following related studies/plans and other pertinent data, namely:

(a) The Philippine Institute of Volcanology and Seismology (PHIVOLCS) /United State of Geological Survey (USGS) studies and projections on pyroclastic deposit, lahar flows, areas at risk from lahar attack and flooding
(b) US Army Corps of Engineers (USACE) Recovery Action Plan Report
(c) Swiss Disaster Relief (SDR) Engineering Report on O'Donnel River
(d) Japan International Cooperation Agency (JICA) Master Plan for Sacobia-Bamban / Abacan Rivers

V.FLOOD CONTROL PLAN

Structural Components of the Project

Originally, the structural components were divided into five (5) contract packages, which are summarized below:

Project Description	Salient Features/Dimensions
Contract Package No.1 Excavation/Dredging of Local Drainage Channels	P390 Million
1. Natividad Creek, Sapang Matua, Cailano Creek, Matsin Creek, Sapang Luma and Sapang Bayu	- Length 14.20 km in total,
2. Channel Diversion for Sapang Maragul and Sapang Luma	- Length 6.4 km,
3. Construction of brides	- 4 bridges
Contract Package No.2 Lower Porac-Gumain River Diversion Channel	P1,200 Million - Length 18.7 km in total (7.2 km with dike and 11.5 km without dike) - Width 13.5m with dike - Volume 4.9 mil cu.m - Embankment Length 14.4 km - Embankment Volume 0.4 mil cu. m
Contract Package No.3 City of San Fernando Flood Control Works	P590 Million
CP-3A: San Fernando River	P170 Million
1. Dredging /Embankment of San Fernando River 2. Modification of San Jose Closure Dike to Sluiceway	- Length 5.24 km, Riverbed width 5-17 m
CP-3B: Outlet Channels and Bridges	P420 Million
1. Dredging /Embankment of Outlet Channels	- Length 9.0 km, Riverbed width 30-60 m
2.Construction of Cut-off Channel	-Length 9.0 km, Riverbed width 30-60 m
3.Improvement /Replacement of Bridges	- 5 bridges

Contract Package No.4 Excavation / Dredging of Major Rivers	P700 Million - Length 19.2 km in total (Pasac River 2.9 km, Lower Guagua River 3.1 km, Dalan Bapor River 8.3 km, Upper Guagua River 4.9 km) - Width 40 to 60 m at riverbed - Depth 1.6 to 4.4 m - Volume 3.6 mil cu. m
Contract Package No.5 Raising of Roads and Construction of New Bridges 1. Road Raising in Municipality of Guagua, Lubao, Sasmuan 2. Bridge Raising	P370 Million -Length 16 km -Height 1.1 m - 5 bridges
Total Cost of Civil Works	P3,250 Million

Scope of Consulting Services

The Scope of Consulting Services is divided into two parts as follows:
PART I: Detailed Engineering, Preconstruction and Construction Supervision of Flood/Mudflow Control Work for Porac-Gumain River Basin in Pasac Delta and City of San Fernando and
PART II: Monitoring and planning of Non-structural Measure and Institutional Capacity Building (ICaB)

Under Part I, the Consultant will carry out the preparation of the detail design and tender documents, provision of engineering assistance for bidding and construction supervision of the structural components of the project, And also carry out the following
(1) ECC Monitoring
(2) Monitoring of Land Acquisition
(3) Conduct of Project Information and Environmental Awareness Seminars
(4) Preparation of Progress Reports and Project Completion Report

Under Part II, Monitoring and planning of Non-structural Measure for related government agencies and local government units (LGUs) will be carried out to undertake the following tasks:
(1) Formulation of Watershed Management Plan,
(2) Formulation of Disaster Preparedness and Flood Management Plan including FFWS, and
(3) Formulation of Land Use Management Plan

VI. FUNDING SOURCE

JBIC Loan under the 27th yen Loan package for the implementation of PHUMP III
7,604 million yen –Validity period from 15 April 2007 up to 15 April 2015.

VII. IMPLEMENTING OFFICE

PMO- Mount Pinatubo Emergency (MPE)
Department of Public Works and Highways Region III, San Fernando City, Pampanga

I. PROJECT TITLE: **WIDENING OF GAPAN-SAN FERNANDO-OLONGAPO (GSO) ROAD AND EMERGENCY DREDGING OF PORAC-GUAMIN RIVER**

II. LOCATION: At the towns of Guagua, Lubao, Bacolor and the City of San Fernando, all in the province of Pampanga.

III. BACKGROUND

After the completion of the roads and bridges project, traffic congestion is minimized and the travel time from the City of San Fernando to Lubao and vice versa will be reduced. Experienced inundation along some sections of the GSO road in Guagua and Lubao will also be eliminated. The dredging works along the Porac-Gumain river will prevent the spilling over of lahar/floodwater from the Porac-Gumain river and eventual inundation in some sections of Lubao. Beneficiaries from the project are the towns of Guagua, Lubao, Bacolor and the City of San Fernando, all in the province of Pampanga.

IV. OBJECTIVES

1. Ensure the reliability and integrity of the Gapan-San Fernando-Olongapo road (GSO) particularly from the Dolores Flyover (City of San Fernando) – Sta. Cruz Bridge Section (Lubao, Pampanga).

2. Control the lahar and flooding threats of the Porac-Gumain River within the premises of the said section of the GSO.

V. FLOOD CONTROL PLAN

Scope of work comprises of raising/upgrading and widening of roads (18 kms.) construction of bridges and diking/dredging works.

VI. FUNDING SOURCE

(EDCF) LOAN AGREEMENT No. PHL-8

VII. IMPLEMENTING OFFICE

PMO- Mount Pinatubo Emergency (MPE)
Department of Public Works and Highways
Region III, San Fernando City, Pampanga

I. PROJECT TITLE: **BASIC STUDY ON NON-STRUCTURAL DISASTER PREVENTION MEASURES IN CAMIGUIN**

II. LOCATION: Camiguin Island, Region XI

III. BACKGROUND

Typhoon Nanang crossed the area within 250 km radius of Camiguin on 7 November 2001. Peak rainfall occurred between 2-3 in the morning that triggered mud and debris flow. Debris flow resulted to death and destruction of public facilities and houses. Barangay Hubangon was severely affected. This disaster is comparable to the disaster associated with Hibok-hibok eruption of 1950. Long-term residents of the Island Province recall a few events that resulted to flooding but none compare in magnitude to the devastating effect of Typhoon Nanang. Bridges were damaged, houses collapsed under the weight of boulders and people were killed as a consequence of the debris flow.

The Government of Japan, through the Japanese International Cooperation Agency (JICA), implemented a study to identify structural measures that will prevent a repeat of Nanang disaster. The Basic Study for Structural Disaster Prevention Measures was conducted in mid – 2003. This Phase 1 of the Basic Study recommended the institution of non-structural measures in Camiguin in order to fully address the need to strengthen disaster prevention capacities of DCCs at all levels in Camiguin. Thus, Phase 2, which is the Basic Study on Non-structural Disaster Prevention Measures in Camiguin, was funded by JICA to help strengthen the disaster prevention capacities of Camiguin. The Center for Disaster Preparedness (CDP), in partnership with Pacific Consultants International – Philippines, was contracted to implement Phase 2 of the Basic Study. The Japanese firm of Earth System Science Ltd, Inc. acted as the Study Adviser. The Study started on March 22 and ended on September 21, 2004.

IV. OBJECTIVES

1. Strengthen disaster prevention capacities of PDCC/ MDCC / BDCC
2. Increase the level of local people awareness of disaster prevention
3. Establish Simple and Effective Disaster Prevention Procedure

VI. FLOOD CONTROL PLAN

1. Mapping of hazard boundaries
2. Establish debris flow and flash flood rainfall criteria and install appropriate warning system
3. Increasing public awareness on flood and debris flow disaster prevention

VI. FUNDING SOURCE

VII. IMPLEMENTING OFFICE

I. PROJECT TITLE Metro Manila Flood Control Project -West of Mangahan Floodway

(Source: Draft service completion report Oct. 2007)

II. LOCATION

The Project Area is located along the north lakeshore of Laguna Lake, west of the Mangahan Floodway from Lower Bicutan of Taguig City to Mangahan Floodway of Taytay Municipality. It extents up to the lower Pasig-Marikina River on the northwest, covering a drainage area of approximately 39.01 square kilometers located in Pateros and Pasig in Metro Manila and Taytay and Cainta in Rizal Province.

III. BACKGROUND

The area is located west of Mangahan Floodway with Napindan River in-between. The total drainage area is 39.01 km2; in which 13.49km2 is between Mangahan Floodway and Napindan River, while 25.52 km2 is west of Napindan River. In the area there are a number of drainage channels discharging into Laguna de Bay or Napindan River. Major channels are Tapayan, Labasan, Taguig-Pateros and Hagonoy drainage channels. Napindan River with a length of 8.3 km from Lakeshore Dike to junction with Marikina River is a sole outlet of Laguna Lake.

Inundation in this vegetation area generally starts when the water stage of Laguna Lake goes up to approximately EL. 11.5 m and most of the Project area is submerged at the water stage of approximately EL. 13.5 m. The inundation sometimes lasts for a few months, affecting not only cultivating fields but also towns/communities/subdivisions thriving in the area. On ground elevation 12.0 m number of houses increase and most houses in the Project area exist more than EL. 12.5 m ground.

The North Laguna Lakeshore Project for the east and west areas with the project area of 47 km2 in total approved by the NEDA-ICC on October 8, 1993. However in view of volume of the project and number of project affected families, the west of Mangahan Floodway, covering an area of 39.01 km^2, was considered as a 1^{st} stage for funding given that only 142 families would be affected in the west side compared with more than 700 families in the east side. Thus the Metro Manila Flood Control – West of Mangahan Floodway was approved by the NEDA-ICC on 11 July 1996 as a part of the 21^{st} JBIC Yen Credit Package. Loan Agreement (PH-P179) for this Project was concluded between GOP and JBIC (OECF) in March 18, 1997

Laguna de Bay (Laguna Lake) is bounded by the Guadalupe Formation Lowland on the west, which separates the lake from Manila Bay, the Sierra Madre Range on the north and east, and a group of volcanic mountains on the south. The lake drains water from several river basins and has a catchment area of 3,160 km^2 Aside from the above, the Mangahan Floodway conveys a part of the floodway from the upper Marikina River to the Laguna Lake.

Laguna de Bay is the largest lake in the Philippines, with approximately 900 km^2 of surface area, 220 km of shoreline and an average depth of 3 m at annual average water stage of E.L.11.5 m. The water stage of the lake, on an average, varies throughout the year between E.L. 10.5 m in the dry season and E.L. 12.5 m in the rainy season. The following table shows the relationship between water levels and days:

Water Stage	Elevation (m)

Average Annual Maximum	12.5
95 days	11.7 or more
185 days	11.2 or more
275 days	10.7 or more
355 days	10.5 or more

Annual inflow and outflow volumes of the lake are simulated subjectiveness of Mangahan Floodway and improvement of Pasig-Napindan River. The average of annual inflow/outflow volumes are estimated approximately as 4,600 to 4,800 million m^3,which are divided into the following items:

Outflow Volume from Laguna Lake into Manila Bay
a) Outflow through Napindan River 66.2%
b) Outflow through Mangahan Floodway 4.7%
c) Evaporation Loss 29.1 %
Total 100.0 %

Inflow Volume into Laguna Lake
a) Inflow from Laguna de Bay Basin 98.7%
b) Inflow from Marikina River Basin through Mangahan Floodway 1.3 %
Total 100%

On the other hand, tidal levels of Manila de Bay are shown in below;
Mean Spring High Tide E.L. 11.300 m
Mean Higher High Water (MHHW) EL. 10.980 m
Mean High Water (MHW) EL. 10.838 m
Mean Sea Level (MSL) EL. 10.462 m
Mean Low Water (MLW) EL. 10.101 m
Mean Lower Low Water (MLLW) EL. 10.000 m

Because of its proximity to Metro Manila, the resources and use contain unique potentials for economic development. At present the Laguna Lake is used for flood control as a reservoir of floodwater of Marikina River in order to protect Metro Manila through Mangahan Floodway, fishery (saline water), water supply for irrigation, industry and drinking water, power generation, transport route for oil products and the lakeshore dwellers, tourism and huge sink for waste coming from domestic household and service sectors (source Laguna de Bay Master Plan, LLAD, 1997)

IV. OBJECTIVES

(1) To mitigate flood damages caused by high water stages of the Laguna Lake, and
(2) To enhance the advancement of the general welfare of the residents of the Project area through the expected improvement of living, ecology, and environmental conditions.

V. FLOOD CONTROL PLAN

The following table shows breakdown of the phased implementation of the North Laguna Flood Control Project:

Item	Overall Project	Phase I		Phase II
		Stage 1	Stage 2	
A. Project Area	46.7 km^2 (East & West of Mangahan Floodway)	39.0 km^2 (West of Mangahan Floodway)		7.7 km^2 (East of Mangahan Floodway)
B. Project Scale (year Return Period)				
1) Lakeshore Dike	40	40	-	40
2) River	30	-	30	30
3) Drainage Channel	5	-	5	5
4) Pumping Station	5	2	5	5
c. Proposed Structures				
1) Lakeshore Dike (exclude. Bridge Sections)	10.4 km	9.4 km	-	1.0 km
2) Mangahan Diversion	5.4 km	-	-	5.4 km
3) Napindan River (Dike/parapet Walls)	6.1 km	6.1 km	-	-
4) Napindang River (Dredging)	8.3 km	-	8.3 km	-
5) River Improvement (Buli. Cainta, Taytay & Bangiad)	4.4 km	-	-	4.4 km
6) Drainage Channels	47.5 km	-	39.1 km	8.4 km
7) Regulation Ponds	6 sites (29.5 ha)	4 sites(25.5 ha)	-	2 sites (4.0 ha)
8) Pumping Stations	7 sites (82 m^3/s)	4 sites (36 m^3/s)	1 site (12 m^3/s) & Pump Capacity for 4 sites (24 m3/s)	2 sites (10 m^3/s)
9) Floodgates	13 sites	8 sites	-	5 sites
10) Bridge &	46 sites (1,140	2 sites (456m)	24 sites (400	20 sites (284

Boxculverts	m)		m)	sites)

VI. FUNDING SOURCE

OECF (Overseas Economic Cooperation Fund) of Japan (Loan No. PH-P107)
Loan Portion (yen) 8,958,706,268 ,
GOP Portion (Pesos) 1,628,425,170.35
GOP (Tax) (Pesos) 229,689,454.91
Total (Pesos) 5,022,044,747.80

VII. IMPLEMENTING OFFICE

PMO-Major Flood Control Project Cluster -I
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