NO.

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
THE REPUBLIC OF THE PHILIPPINES

Japan International Cooperation Agency

THE STUDY ON FLOOD CONTROL PROJECT IMPLEMENTATION SYSTEM FOR PRINCIPAL RIVERS IN THE PHILIPPINES

Under

THE PROJECT FOR ENHANCEMENT OF CAPABILITIES IN FLOOD CONTROL AND SABO ENGINEERING OF THE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

MAIN REPORT

SEPTEMBER 2004

CTI Engineering International Co., Ltd.

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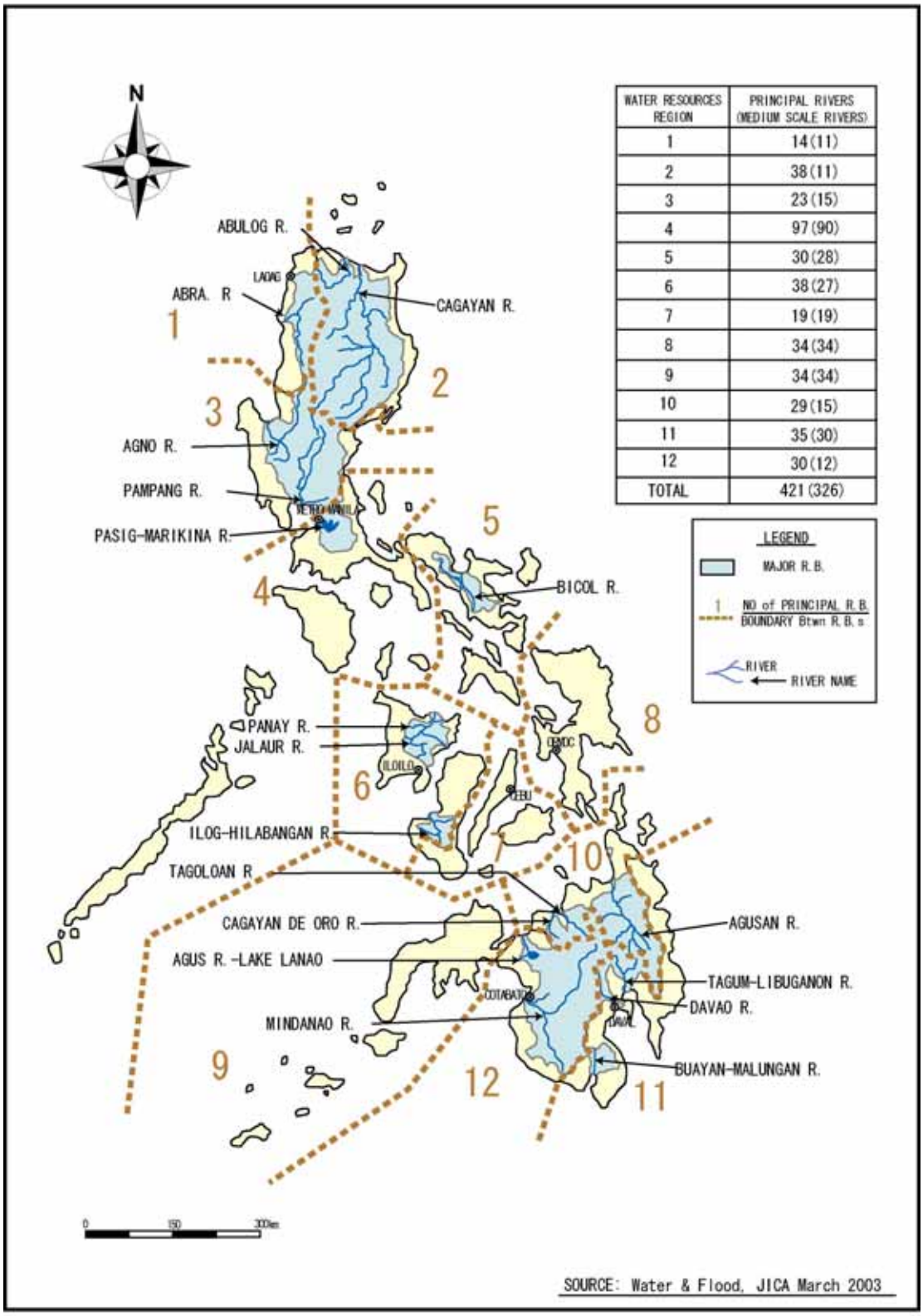
LOCATION MAP



WATER RESOURCES REGION	PRINCIPAL RIVERS (MEDIUM SCALE RIVERS)
1	14(11)
2	38(11)
3	23(15)
4	97(90)
5	30(28)
6	38(27)
7	19(19)
8	34(34)
9	34(34)
10	29(15)
11	35(30)
12	30(12)
TOTAL	421(326)

SOURCE: Water & Flood, JICA March 2003

MAJOR RIVERS LOCATION MAP

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ADB	: Asian Development Bank
AFP	: Armed Forces of Philippines
AMMS	: Administrative & Manpower Management Service, DPWH
AO	: Administrative Order
ARMM	: Autonomous Region in Muslim Mindanao
ASEAN	: Association of South East Asian Nations
ASSEC	: Assistant Secretary
AusAID	: Australian Agency for International Development
BFD	: Bureau of Forest Development, DENR
BIR	: Bureau of Internal Revenue
BOC	: Bureau of Construction, DPWH
BOD	: Bureau of Design, DPWH
BOE	: Bureau of Equipment, DPWH
BOM	: Bureau of Maintenance, DPWH
BRS	: Bureau of Research and Standards, DPWH
BSP	: Bangko Sentral ng Pilipinas (Central Bank of the Philippines)
CAR	: Cordillera Administrative Region, DPWH
CARL	: Comprehensive Agrarian Reforms Law
CARP	: Comprehensive Agrarian Reform Program
CBFM	: Community-Based Forest Management
CBM	: Community-Based Management
CBFMO	: Community-Based Forest Management Office
CBFMS	: Community-Based Forest Management Strategy
CBRMP	: Community Based Resource Management Project
CBO	: Community-Based Organization
CDA	: Co-operative Development Authority
CENRO	: Community Environment and Natural Resources Office/Officer(DENR)
CFP	: Community Forestry Program
CIDA	: Canadian International Development Agency
CALABARZON	: Region; Cavite, Laguna, Batangas, Rizal, Quezon
CO	: Community Organization (also Certificate of Origin)
COA	: Commission on Audit
CRM	: Coastal Resources Management
CY	: Calendar Year
DA	: Department of Agriculture
DANIDA	: Danish International Development Agency
DAO	: Department (DENR) Administrative Order
DAR	: Department of Agrarian Reform
DBCC	: Development Budget Coordination Committee
DBM	: Department of Budget and Management

DECS	: Department of Education Culture and Sports
DENR	: Department of Environment and Natural Resources
DEO	: District Engineering Office, DPWH
DepEd	: Department of Educations
DFA	: Department of Foreign Affairs
DILG	: Department of Interior and Local Government
DND	: Department of National Defense
DOF	: Department of Finance
DOH	: Department of Health
DOJ	: Department of Justice
DOT	: Department of Tourism
DOST	: Department of Science and Technology
DOTC	: Department of Transportation and Communications
DPWH	: Department of Public Works and Highways
DSWD	: Department of Social Welfare and Development
DTI	: Department of Trade and Industry
EC	: European Commission
ECC	: Environmental Compliance Certificate
EIA	: Environmental Impact Assessment
EMB	: Environmental Management Bureau, DENR
ENFOR	: Environment Forestry Program
ENR	: Environment and Natural Resources
ENRO	: Environment and Natural Resources Office
EO	: Executive Order
FCSEC	: Flood Control and Sabo Engineering Center
FDC	: Forest Development Center
FFWSDO	: Flood Forecasting and Warning System for Dam Operation
FINNIDA	: Finnish International Development Agency
FMB	: Forest Management Bureau, DENR
FSP	: Forestry Sector Project
GAA	: General Appropriations Act
GDP	: Gross Domestic Product
GIS	: Geographic Information System
GNP	: Gross National Product
GPS	: Global Positioning System
GWP	: Global Water Partnership
HLURB	: Housing and Land Use Regulatory Board
HUDCC	: Housing and Urban Development Coordinating Council
HQ	: Head Quarters
IEC	: Information and Education Campaign
IEE	: Initial Environmental Examination
IRR	: Implementing Rules and Regulations

ISDR	: International Strategy for Disaster Reduction
IT	: Information Technology
IWRM	: Integrated Water Resources Management
JBIC	: Japan Bank for International Cooperation
JMC	: Joint Memorandum Circular
KfW	: Kreditanstait fur Wiederaufbau (German Development Bank)
LGC	: Local Government Code (RA 7160)
LGU(s)	: Local Government Unit(s)
LLDA	: Laguna Lake Development Authority, DENR
LMB	: Land Management Bureau, DENR
LWUA	: Local Water Utilities Administration
MIS	: Monitoring and Information Services, DPWH
MMDA	: Metro Manila Development Authority
MOA	: Memorandum of Agreement
MOU	: Memorandum of Understandings
MTDIDP	: Medium-Term DPWH Infrastructure Development Plan
MTPDP	: Medium Term Philippine Development Plan
MWRMC	: Municipal Watershed Resources Management Committees
MWSS	: Manila Water and Sewerage Services
NA	: Not available
NAMRIA	: National Mapping and Resource Information Authority
NCSB	: National Statistical Coordination Board
NCR	: National Capital Region
NDCC	: National Disaster Coordinating Council
NEDA	: National Economic and Development Authority
NFPP	: National Framework for Physical Planning
NGO(s)	: Non-Governmental Organization(s)
NHA	: National Housing Authority
NHCS	: Napindan Hydraulic Control Structures
NHRC	: National Hydraulic Research Center, UPERDFI
NIA	: National Irrigation Administration
NIPAS	: National Integrated Protected Area System
NLUC	: National Land Use Code
NPC	: National Power Corporation
NSO	: National Statistics Office
NWIN	: National Water Information Network
NWRB	: National Water Resources Board
OCD	: Office of Civil Defense
ODA	: Official Development Assistance
OECF	: Overseas Economic Cooperation Fund of Japan (JBIC)
PAGASA	: Philippine Atmospheric, Geophysical, and Astronomical Services Administration

PCSD	: Philippine Council for Sustainable Development
PD	: Presidential Decree
PDCC	Provincial Disaster Coordinating Council
PDED	: Project Development and Evaluation Division, DPWH
PENRO	: Provincial Environment and Natural Resources Office/Officer
PFA	: Public Forest Administration
PHVOLCS	: Philippine Institute of Volcanology and Seismology
PIA	: Philippine Information Agency
PNCC	: Philippine National Construction Corporation
PNP	: Philippine National Police
PNRC	: Philippine National Red Cross
PO	: Peoples' Organization
PS	: Planning Service, DPWH
PWP	: Philippine Water Partnership
RA	: Republic Act
RDCC	: Regional Disaster Coordinating Council
RDP	: Regional Development Plan
RENRO	: Regional Environment and Natural Resources Office/r
RO	: Regional Office, DPWH
ROW	: Right-of-Way
TOR	: Terms of Reference
UN	: United Nations
UNDP	: United Nations Development Programme
UP	: University of the Philippines.
UPERDFI	: U.P. Engineering Research & Development Foundation Inc.
UPLB	: University of the Philippines at Los Baños.
US-AID	: United States Agency for International Development.
USDA	: United States Department of Agriculture
USEC	: Undersecretary
VAT	: Value Added Tax
WB	: World Bank
WMO	: World Meteorological Organization
WSSD	: World Summit of Sustainable Development
WTO	: World Trade Organization
WWF	: World Water Forum

CHAPTER 1. INTRODUCTION

1.1 Background

The Philippines has frequently suffered from natural disasters such as typhoons, volcanic eruptions and earthquakes while the government has continuously endeavored to mitigate the damages. Such disasters have brought heavy losses to the country's economy and claimed hundreds of lives every year. Approximately 700 lives have been lost and damages have amounted 8.1 billion pesos annually. It has affected primarily agricultural productions, transportation and communication resulting in aggravated and long time economic depression, enlargement of regional differential and influx of the poor to the urban areas. The Government of the Republic of the Philippines has hardly prevented disasters due to its limited technical background, organization structures, regulations as well as budgetary constraint.

Therefore, the Government has requested a technical cooperation project to develop the capacities of engineers by means of establishing "**Flood Control and Sabo Engineering Center**" to the Government of Japan. In response to the request, Japan International Cooperation Agency (JICA) has started "**The Project for Enhancement of Capabilities in Flood Control and Sabo Engineering of the Department of Public Works and Highways**" (herein after referred to as "the Project") on 10 January 2000.

The Project has been implemented aiming at enhancing the capacities of the engineers of DPWH regional offices, while the Project is now under the Stage 2 (10 January 2003 to 30 June 2005) to accomplish the objectives below:

Profile of Project for Enhancement of Capabilities in Flood Control and Sabo Engineering of the DPWH

Super Goal	Water-induced disasters will be mitigated through improved effectiveness of disaster prevention facilities and structures constructed or/and maintained by the DPWH in accordance with technical standards guidelines (TSG), technical manuals and guidelines, and flood & sediment control measures developed by the Project.
Overall Goal	1. More effective and appropriately designed flood control and sabo structures/facilities will be constructed by the DPWH in accordance with technical standards and guidelines (TSG), technical manuals and guidelines formulated and produced by the project.
	2. Engineers of the DPWH offices other than the offices where OJT training program was conducted/extended shall be trained by the DPWH.
Project Purpose	Capability of the selected DPWH offices in planning, design, construction and maintenance of flood control and sabo structures will be enhanced in order to cope with water-induced disasters.
Output	1. The technical manuals and guidelines in the field of construction and maintenance of flood control structures will be upgraded and be made available for use by all concerned.
	2. Sufficient number of the personnel of the selected DPWH offices will be trained.
	3. Recommendations shall be made through Research and Development activities, and information from damaged structure-profiling database.
	4. The DPWH will have an internal mechanism to extend the technical standards, guideline, manuals and other output of the project throughout all relevant offices of the DPWH for effective implementation of flood control projects.

Under the Project Stage 2, DPWH engineers of 50 officers are trained for structural designing/planning through OJT and those of 30 offices are trained for construction supervision and maintenance until June 2005. It is envisaged that the counterpart personnel, who are conducting the training will continue the said training activities to the engineers of other DPWH regional offices, and capabilities of DPWH engineers in planning, designing, construction and maintenance of flood control and sabo structures will be enhanced.

In the course of the Project, it is recognized that the flood control project implementation system be improved to accomplish the Project Purpose: "Capability of the selected DPWH offices in planning, design, construction and maintenance of flood control structures will be enhanced, especially for the flood control projects in principal rivers". This "***Study on Flood Control Project Implementation System for Principal Rivers in the Philippines***" is decided to conduct to prepare and propose an effective flood control project implementation system.

1.2 Study Objectives

The objectives of the Study are

(1) To collect and review data and information of flood control projects and their relevant activities in the Philippines

(2) To prepare and propose the improvement plan of implementation system for flood control projects on principal rivers∗ in the Philippines.

1.3 Study Area

The study area covers the whole area of the Philippines, while the site survey is focused to the principal rivers in Luzon Region.

∗ Principal rivers (catchment area is bigger than 40 km^2) are counted at 421 rivers nationwide, out of which major rivers (catchment area is bigger than 1,400 km^2) and their tributaries are counted at 95 rivers. Therefore, Principal Rivers of which catchment area ranges 40 km^2 to 1,400 km^2 are 326 rivers.

CHAPTER 2. FLOODS IN THE PHILIPPINES

2.1 Natural and Socio-economical Conditions

2.1.1 Natural Conditions

Most of weather-related disasters in the Philippines are directly or indirectly caused by tropical cyclones/typhoons. During the months of July to September, the presence of tropical cyclones northeast of the Philippines may intensify the southeast flow, bringing considerable rain and resulting in inland flooding and inundation of major river basins. With 421 principal rivers with drainage areas varying form 41 to 25,649 km^2, the hydrological profile of the Philippines makes it imperative to address the problem of flooding by prioritizing the development of water resources and river management programs for 18 major rivers and other noted key cities and urban centers nationwide.

(1) Topography

The Philippine archipelago lies off the southeastern coast of the Asia mainland. As shown in **Figure 2.1**, the archipelago surrounded by the Pacific Ocean, the Celebes Sea, and the South China Sea consists of 7,107 islands and islets, making it one of the largest archipelagos in the world. The total land area is about 298,170 square kilometers. The 11 largest islands make up more than 90% of the total area: Luzon, Mindanao, Samar, Negros, Palawan, Panay, Mindoro, Leyte, Cebu, Bohol and Masbate.

The Philippines is divided into three major island groups known as Luzon, Visayas and Mindanao. The largest island is Luzon (150,212.8 km^2), followed by Mindanao (128,624.2 km^2) and the Visayas (59,817.9 km^2). The Visayas region is composed of about 6,000 islands, including Panay, Samar, Cebu, Leyte and Bohol. Mindanao encompasses about 400 islands. Only about 460 islands are larger than 2.6 km^2.

The islands extend about 1,850 km from north to south and almost 1,127 km from east to west, lying between latitude 4º 23'N and 21º 25'N and between longitude 116º E and 127º E. The coastlines of all the islands are extremely irregular, measuring about 36,289 km in length.

Of volcanic origin, the Philippines is generally mountainous. Mountain ranges extend north to south, running parallel to the coasts and, in many places, bordering them. The mountains in Luzon include the Sierra Madre, Cordillera Central, the Caraballo Mountains and the Zambales Mountains. In the second largest island, Mindanao, are the Diwata Mountains and the mountain ranges in southern Mindanao including Mount Apo (a volcano), which, at 2,954 m, is the highest point in the Philippines.

The Philippines is part of the so-called Ring of Fire, an area encircling the Pacific Ocean where earthquakes and volcanic activity result from the movements of tectonic plates, or segments of Earth's crust. To the east of the islands lies the 10,539 m deep Philippine Trench, where one tectonic plate is being forced beneath another in a process known as subduction. This subduction causes frequent earthquakes in the Philippines. Large submarine earthquakes are known to cause tidal waves, or *tsunamis*, that can strike the coasts.

Laguna de Bay, 13 km southeast of Manila, is the largest lake of the Philippines. Lake Taal, 56 km south of Manila, occupies a huge volcanic crater and contains an island that is itself a volcano, with its own crater lake. Lake Lanao is the largest lake of Mindanao and the source of the Agus River, which exits the lake in the spectacular Maria Cristina Falls. **Figure 2.2** shows the locations of these lakes.

There are four large marshes – two in Mindanao, one in Central Luzon and one in Mindoro Island. Semi-enclosed bays are too many to mention.

(2) Geology

The Philippine archipelago could be considered as wedges caught between two oppositely dipping subduction zones (see **Figure 2.3** for the geological map of the Philippines). The North and Central Luzon are situated between the Manila Trench and the East Luzon Trench. These trenches are interpreted as subduction zones where the ocean submarine floor under thrusts beneath the continental or island massif. A similar situation can be observed in the Visayas Shelf between the Sulu-Negros Trench and the Philippine Trench.

Trending toward NNW to N direction, the alignment of these trenches (especially the two major ones, Philippine Trench and East Luzon Trench) characterizes the Philippine Archipelago as a zonal structure with several wide belts connecting island to island arch-wise in the same trend with trenches.

The archipelago consists essentially of two separable and distinct structural units, a mobile belt and a stable region. The mobile belt covers almost all the archipelago and is characterized by the concentration of earthquake epicenters, numerous active and inactive volcanoes and deeply sheared zone forming narrow canyons, intermountain basins and straits. The stable region, which embraces mainly Palawan and Sulu Sea in the southwestern part of the country, is essentially seismic and shows the virtual absence of Tertiary igneous activity.

Great variety of rocks exists in the country: igneous, sedimentary, and metamorphic. Basement complex is generally made up of gabbro, andesites, agglomerates, serpentine, greisses, schist, volcanic breccias, volcanic tuff, quartzite and basalt flows. Igneous rock is generally basic to semi-basic, i.e. low to intermediate in silica content.

Philippine soils have considerable depth even on relatively steep slopes due to rapid chemical weathering and slow physical weathering of rocks. However, due to this rapid chemical decomposition, organic matter in the Philippines is very small. Plant material in the tropical forest is about two to three times that in the temperate forest, but because of rapid chemical decomposition, very little humus is found in tropical soil. Carbon dioxide and organic acids provided by this plant material through decomposition attack the rocks, causing their rapid chemical weathering.

(3) Climate

The Philippines has a tropical climate. At sea level, temperatures rarely fall below 27°C. The country experiences an average temperature ranging from 28°C to 36°C and humidity varies from 70% to 85% depending on the time of year. Interior valleys and leeward sides of islands tend to be warmer, while mountain slopes and peaks and windward sides of islands tend to be cooler.

The highest annual rainfall amount (9,006 mm) in the country was recorded in Baguio City in 1910 and the lowest (94.2 mm) in Vigan City, Ilocos Sur in 1948. Rainfall averages about 2,030 mm a year, with more precipitation in coastal plains than in sheltered inland valleys. In the western part of the country, the rainy season occurs during the summer monsoon, from May to November, when the wind blows from the southwest; the dry season occurs during the winter monsoon, from December to April, when the wind blows from the northeast. In contrast, the eastern side of the country receives most of its rainfall during the winter monsoon and has no true dry season.

Tropical storms are common from June to October; each year about 20 typhoons strike the Philippines, mostly on the eastern coasts of Luzon and Samar, bringing high winds and flooding that sometimes result in property damage and loss of life.

The classification of climate is basically based on rainfall characteristics rather than temperature variations. The rainfall variability, topography and air stream direction define the climate at different parts of the country. As shown in **Figure 2.4**, the various areas in the Philippines are thus characterized by four types of climates, which are based on dry and wet seasons induced by minimum or maximum rain periods, according to Corona Climate Classification:

Type I: Two pronounced seasons, dry from November to April, wet during the rest of the year

Type II: No dry season with a very pronounced maximum rainfall period from November to January

Type III: Seasons are not very pronounced with relatively dry season from November to April and wet season during the rest of the year

Type IV: Rainfall more or less evenly distributed throughout the year

Rainfall in the Philippines is brought about by different rainfall-causing weather patterns such as air streams, tropical cyclones, the Intertropical Convergence Zone (ITCZ), fronts, easterly waves, local thunderstorm, etc. About 47% of the average annual rainfall in the country is attributed to the occurrence of tropical cyclones, 14% to the monsoons while 39% are due to the effects of the other weather disturbances. The significance of each of these climatic influences varies with the time of the year.

Tropical cyclones are characterized by a low-pressure center where winds of varying intensities blow around this center. The tropical cyclones are the most destructive weather disturbances because they are accompanied by strong winds aside from large amounts of rains. They contribute largely to the rainfall from May to December and result to annual maximum quantities in many areas of the country especially in Luzon and the Visayas. Tropical cyclones are classified according to maximum wind speed near the center as follows:

Tropical Depression (TD)	- winds with speeds from 45 to 63 kph
Tropical Storm (TS)	- winds with speeds from 63 to 117 kph
Typhoon (T)	- winds with speeds of more than 117 kph

Figure 2.5 illustrates the monthly representative typhoon tracks and probability of occurrence within the Philippine area of responsibility (PAR).

The ITCZ is a series of cloudiness that oscillates from May to October. It typically appears in the southwestern portion of the archipelago in May and moves north reaching its northernmost position in July or August. It begins moving back southward in August moving south of the Philippines by November and its southernmost position in January and February. Several floods in Mindanao are caused by the ITCZ.

The monsoons are wind flows coming from the northeast or southwest. The northeast and southwest monsoons trigger the onset and recession of the rainy season in the Philippines. The southwest monsoon may begin as early as mid-April and end as late as early November, depending on location, while the northeast monsoon may affect the country from November to March. The eastern coastal areas have a marked rainy season from October to March when the northeast monsoon is dominant. During the period from May to October when the southwest monsoon and tropical cyclone seasons are dominant, the western coastal areas receive heavy rainfall that may trigger flooding and landslides.

Topography also modifies the climate of a locality. In general, the windward side of a mountain receives more precipitation due topographic effect compared with the leeward side. Maximum rainfall is also observed at intermediate elevations. When a rapid change in elevation occurs, a "splash effect" usually occurs and result to significant rainfall. The "splash effect" is a phenomenon that results when cold air moves down slope from precipitating clouds and causes the formation of another cloud at a lower elevation.

Another weather disturbance that effect the eastern sections of the Philippines from November to late April or early May is the cold front. The cold front coupled with topography produce rainfall along the eastern coasts and occasionally over the middle and western portions of the country. Other rainfall-producing systems are the easterly waves, which are frequent in summer and affect the mountainous and eastern coastal areas. Thunderstorms are localized or small-scale disturbances that produce considerable amount of rainfall and occur over a relatively short period of time.

(4) Water Resources Regions

For purposes of comprehensive planning of water resources development, the National Water Resources Council (NWRC) divided the Philippines into 12 water resources regions (WRR), as shown in **Figure 2.6** and listed in the table below. Major considerations taken into account in this regionalization are hydrological boundaries defined by physiographic features and homogeneity in climate of the different parts of the country.

Drawn up from institutional considerations, the Philippines is divided into 16 political regions: Region 1 to 12, NCR, CAR, ARMM and CARAGA. NCR covers the Metro Manila. These 16 regions are further subdivided into smaller political units: provinces, cities/municipalities and barangays: the smallest being the barangay.

Actually the water resources regions generally correspond to the existing political regions, except for Ilocos, Cagayan, Central Luzon and Northern Mindanao where there are minor deviations dictated primarily by hydrological boundaries.

List of Water Resources Regions

Code	Name	Major River Basin	No. of Principal Rivers
WRR I	Ilocos Region	Abra River	14
WRR II	Cagayan Valley	Cagayan River	39
WRR III	Central Luzon	Pampanga and Agno Rivers	24
WRR IV	Southern Tagalog	Pasig-Laguna de Bay Rivers	97
WRR V	Bicol Region	Bicol River	30
WRR VI	Western Visayas	Panay, Jalaur and Ilog-Hilabangan Rivers	37
WRR VII	Central Visayas	-	19
WRR VIII	Eastern Visayas	-	34
WRR IX	Southwestern Mindanao	-	34
WRR X	Northern Mindanao	Agusan, Cagayan de Oro and Tagoloan Rivers	29
WRR XI	Southeastern Mindanao	Davao, Tagum-Libuganon, Buayan Rivers	35
WRR XII	Southern Mindanao	Agus and Mindanao Rivers	30

Source: "Principal River Basin of the Philippines" published by NWRC in October 1976

(5) River Basins

Large rivers, some of which are navigable, traverse the principal islands of the Philippines. The longest river is the Cagayan, in northern Luzon. Other important rivers of Luzon include the Agno and Pampanga, crossing the Central Luzon Valley; the Abra, flowing through the Cordillera Central and irrigating the mountainside rice terraces; the Pasig, a commercially important artery flowing through Manila; and the Bicol, the primary river of the Bicol Peninsula. The major rivers of Mindanao are the Mindanao (Cotabato), which receives the waters of the Pulangi, and the Agusan.

In the report "Principal River Basins of the Philippines" published by NWRC in October 1976, NWRC identified the principal river basins (PRBs) of the Philippines with these objectives: 1) to delineate and codify the PRBs for hydrologic purposes; 2) to determine the physical characteristics of each basin; 3) to generate interest on the minor river basins with potentials for development; 4) to define the major river basins (MRBs) in the country and trigger national interest in water resources development; 5) to prepare water resources regional maps showing the principal rivers and their respective basin boundaries to aid in the preparation of regional water resources plans and programs; and 6) to initiate an extensive, continuous program for collecting and organizing data on these basins for a complete characterization of each basin.

For the purpose of identification, principal river basins are defined as those with at least 40 km^2 of drainage area. River basins with areas of at least 1,400 km^2 are classified as major river basins as shown below as 18 were identified as MRBs. The locations of the major river basins are shown in **Figure 2.7**.

Eighteen Major River Basins

Code No.	Rank	River Basin	Water Resources Region	Catchment Area (km^2)
02001	1	Cagayan	Region II	25,469
12342	2	Mindanao	Region XI and XII	23,169
10315	3	Agusan	Region XIII	10,921
03059	4	Pampanga	Region III	9,759
03070	5	Agno	Region III	5,952
01036	6	Abra	Region I	5,125
04076	7	Pasig-Laguna Bay	NCR and Region IVA	4,678
05114	8	Bicol	Region V	3,771
02028	9	Abulug	Region II	3,372
11303	10	Tagum-Libuganon	Region XI	3,064
06235	11	Ilog-Hilabangan	Region VI and VII	1,945
06197	12	Panay	Region VI	1,843
10331	13	Tagoloan	Region X	1,704
12336	14	Agus	Region XII and ARMM	1,645
11307	15	Davao	Region XI	1,623
10332	16	Cagayan	Region X	1,521
06205	17	Jalaur	Region VI	1,503
11364	18	Buayan-Malungun	Region XI	1,434

Source: "Principal River Basins of the Philippines" published by NWRC in October 1976

The identification included not only drainage area but also other physical characteristics of the river basin, such as the location and elevation of the headwater and outlet, extent of built-up area, cultivated area, grassland area, soils, channel gradient, drainage density and extent of level area,

where these information were considered then as sufficient for subsequent framework studies but necessary to update them as made more than 30 years.

Counting the number of PRBs listed in the above-said report, 421 principal river basins were identified with drainage areas varying from 41 km^2 to 25,649 km^2. However, 77 of which are parts of major river basins where the rivers are tributaries of major rivers, and of the 345 are independent PRBs.

2.1.2 Infrastructure Development

The infrastructure of the Philippines is inadequate for the economic development sought by the government, international agencies, and multinational corporations. Some large-scale improvements were made in the past to the country's schools, health centers, bridges, roads, and irrigation works. However, government investment in infrastructure has not kept pace with population growth and modern technologies. Roads remain unpaved in most rural areas. Cities lack sufficient public transportation, garbage collection, energy resources, potable water and sewerage treatment. Resources for infrastructure-development projects are often limited because of the country's huge payments on its foreign debt.

Cognizant of the huge investment requirements, the government shall increasingly rely on the private sector in the financing, construction, operation, maintenance, and rehabilitation of major infrastructure in power, water, and transportation where costs will be partly or totally recovered through user charges, according to the Medium-Term Philippine Development Plan 2001-2004. This will be a sustained effort carried out under a regulatory framework that favors fair market competition while safeguarding the common good and environmental quality.

(1) Road/Transportation Sector

The overall road network of the Philippines as of end-1999 measured 200,187 km., which translates into a road density of 0.67 km/km^2. The road density of the Philippines is much higher than those of other developing countries in the Association of Southeast Asian Nations (ASEAN) region. However, the Philippines still falls below its neighbors in terms of road quality, as measured by the paved road ratio, i.e. the length of paved roads over the total length of roads.

The total length of Philippine roads has increased by 38,000 km as of end-2000 from that in 1985 mainly due to the expansion of barangay roads[1]. About 85% or 171,956 km of the total Philippine road network is composed of provincial, city, municipal, and barangay roads, which fall under the responsibility of the LGUs.

For the national road system of 29,878 km., investments for rehabilitation and upgrading resulted in the improvement of both paved and all-weather roads. Moreover, about 89% of the 276,878 m of bridges along national roads are now permanent structures, compared to 83% in 1998.

The government rehabilitated and improved the Pan-Philippine Highway in several parts of Cagayan Valley and the Camarines provinces, and completed the Sto. Tomas-Lipa Expressway. However, inadequate funding for road maintenance over the years has resulted in a huge backlog of roads requiring rehabilitation. Financing this backlog will thus reduce funding of additional road improvement and new construction.

Meanwhile, a Road Safety Program was instituted. The Department of Public Works and Highways (DPWH) is also installing a computerized Road Information Management and Support System (RIMSS) to improve the quality and delivery of services in the provision and

[1] Source: Medium-Term Philippine Development Plan 2001-2004

management of the national road network. However, difficulties in acquiring right-of-way (ROW) continued to hound government projects.

Several transport infrastructure projects under the BOT and other joint venture schemes were put on stream.

(2) Flood Control and Drainage Sector

By end-2000, the total area provided by DPWH with river control and drainage facilities reached about 305,725 ha. This represents 62.03% of the total potential coverage area of 492,831 ha[1]. On the other hand, the accomplishments for the Impounding/Mini Sabo Dams were not available due to the inability of the LGUs concerned to submit the information needed.

The BSWM has been training recipient farmers to operate and maintain the Small Water Impounding Management (SWIM) projects that will be turned-over to them. About 25 sub-projects are covered by this arrangement.

Extensive networks of flood control measures, (such as dikes, river walls, river and channel improvement/dredging) have been undertaken in the major river basins Agno, Cagayan, Pampanga, Bicol and Agusan river basins). Major components of the flood control and drainage program in Metro Manila have been built, particularly additional drainage mains, pumping stations (including the recently completed Balut, Vitas and San Andres pumping stations), estero improvement works, dredging and related facilities. In Ormoc City, the first phase of the JICA-assisted Flood Mitigation Project is already completed. This involves the construction of three slit dams and reconstruction of five bridges. In Butuan City, Phase I of the Lower Agusan Development Project was completed in 1999 which involves the construction of 10.6 km embankment levee, 5.28 km concrete floodwall, including related structures such as floodgates and drainage sluices and dredging works of Agusan River.

Sediment control measures are continuously being pursued, especially within the Mt. Pinatubo and Mt. Mayon influence areas. To prevent further destruction to lives and properties, help restore social and economic activities and recover vast agricultural areas now covered by lahar, a number of projects funded through loans and local funds have been implemented.

(3) DPWH Medium-Term Infrastructure Program

Under the Medium-Term Philippine Development Plan 2001-2004, the medium-term targets ***for road transportation infrastructure*** are the following:

(a) National arterial roads (16,799 km.) will be 90% paved by 2004, compared to 70% in 2000. This will require the paving of 3,358 km of roads and the rehabilitation/ widening/upgrading/construction of 2,504 km.

(b) National secondary roads (13,079 km) will be 65% paved by 2004, compared to the existing 51% in 2000. This will entail the paving of 1,838 km of roads and the rehabilitation of 1,086 km.

(c) National bridges (276,878 m) will be 95% permanent by 2004, compared to 89% in 2000. It involves the reconstruction of 16,612 m of temporary bridges, the improvement of 36,494 m of existing bridges, and the construction of 4,211 m of new bridges.

(d) The structure of investments for national roads will shift in favor of regions with low road densities and low paved road ratios, as reflected in the percentage shares of investments and target paved road ratios.

(e) The medium-term plan will emphasize the upgrading of arterial roads leading to regional

growth centers with special attention to Mindanao and other underdeveloped regions.

(f) About 271 km of BOT interurban expressways along heavily traveled corridors will be built, including:

- North Luzon Expressway (widening of existing facility;
- Southern Tagalog Arterial Road (STAR) or Batangas Expressway (Lipa-Batangas City);
- South Expressway (widening and extension to Lucena); and
- Subic-Clark-Tarlac Expressway.

(g) Access roads will be improved or built to and from the priority tourism hubs, particularly Manila, Cebu, Davao, Subic-Clark, and Baguio.

(h) Strategic roads will be improved to stabilize the peace and order situation in areas affected by armed conflicts and, therefore, provide for an environment more conducive to economic growth. These include among others:

- Basilan Circumferential Road;
- Jolo Circumferential Road;
- Zamboanga-Pagadian Road;
- Awang-Upi-Lebak Road (Maguindanao and Sultan Kudarat);
- Narciso Ramos Highway;
- Parang-Barira-Abubakar Road;
- Davao-Cotabato Road;
- Lake Lanao Circumferential Road;
- Abra-Kalinga and Kalinga-Mt. Province Roads;
- Bondoc Peninsula Roads in Quezon; and
- Hinobnan-Basay Road in CHICKS area; and (l) South Samar Road.

For flood control and drainage infrastructure, the medium-term targets are the following:

(a) The government will implement desirable flood control and drainage projects in major river systems in the country. It will pursue the provision of adequate structural schemes especially flooding for Metro Manila and other highly urbanized industrial centers. With lahar-associated problem still very much in existence due to the continuous demobilization of lahar sediments, continuing dredging and desilting activities should likewise be implemented.

(b) The projected total accomplishment for the plan period 2001-2004 is about 1.4 million ha. Controlling the flow of rivers and the provision of drainage is the main priority. With the generation of this additional area, the total area with flood control and drainage facilities is about 1.70 million ha, or 87.57% of the total coverage in hectares for river control and drainage by 2004. The total investment requirements for the program are about 34.79 billion pesos.

(c) The priority flood control projects to be implemented are in the following areas: Agno, Laoag, Lower Cagayan, Mt. Pinatubo Rehabilitation, Iloilo, Lower Agusan, Lower Cotabato, West Mangahan, KAMANAVA (Kaloocan, Malabon, Navotas and Valenzuela), and Pasig River in Metro Manila.

The table below presents the revised and updated medium-term infrastructure program of the DPWH covering the period 1999-2004.

1999-2004 DPWH Medium-Term Infrastructure Program

(In Million Pesos, Current Prices)

Projects	1999	2000	2001	2002	2003	2004	Later Years	Total
National Roads	24,273	22,951	28,161	29,063	39,983	41,640	238,564	**186,070**
Arterial Roads	*16,018*	*14,134*	*17,422*	*17,046*	*27,738*	*28,116*	*94,630*	***120,468***
Secondary Roads	*4,747*	*6,172*	*7,871*	*8,689*	*8,515*	*9,918*	*107,855*	***45,913***
Urban Roads	*3,505*	*2,645*	*2,868*	*3,328*	*3,735*	*3,606*	*36,079*	***19,690***
Flood Control	4,384	4,791	6,089	8,285	9,641	10,773	66,160	**43,963**
Other Projects	581	2,147	458	719	905	1,950	-	**6,760**
Various Infra. Incl. Local	606	14,999	1,720	8,430	8,430	11,864	-	**46,050**
Total	**29,843**	**44,889**	**36,429**	**46,497**	**58,958**	**66,228**	**304,724**	**282,843**

Note: *: Provincial Development Assistance allocated to every Congressional District.
Source: DPWH web-site

2.2 Flood Damages

The Philippines has always been subjected to constant disasters and calamities. The archipelago is exposed to different types of natural hazards, such as typhoons, floods, tsunamis, landslides, mudflows, droughts, earthquakes and volcanic eruptions. Destructive typhoons and monsoons come from the ocean and seas surrounding the country.

There are about 421 principal river basins including 77 sub-basins of major rivers scattered all over the Philippine archipelago. With an average number of 20 typhoons occurring every year, causing intense rainfall, overflowing of waterways, inundation and deposition of sediment in the flood plain, extensive flood damages often result. Monsoons also bring heavy rains that cause flooding. Flood-prone areas are abundantly located in the eastern Mindanao, Northern Samar, Central Luzon and Bicol Region. Approximately, there is an aggregate total of about 1,316,230 ha susceptible to flooding nationwide; of which almost 423,000 ha or 32% are located in Central Luzon alone[2]. Inadequate drainage systems in urban areas such as Metro Manila, makes them similarly susceptible to flood. High tides coinciding with typhoons also intensify storm surges along the coastlines.

Generally, there are only a limited number of the major rivers in the affected regions that have enough carrying capacity to accommodate excessive flow resulting from heavy rains. River meandering and inundation due to overbank flows are two of the major river control and flood problems affecting almost every river basin. These are attributed largely to:

- Partially implemented schemes;
- Poorly designed structures;
- Inadequate and silted waterways due to excessive sediment transport brought about by denuded watersheds;

[2] Source: Philippine Flood Control 1977, NWRC

- Sluggish network of tidal streams at the mouth of major rivers, and
- Encroachment on the flood plains.

The mitigation of flood damages thru various measures is essential in the process of economic development and raising the people's standards of living. Several local flood protection schemes have been proposed in the past but few have reached fruition due to lack of funds for implementation. However, considerable gains were made lately in the overall flood control program of the Department of Public Works and Highways (DPWH). The DPWH is the agency responsible for the over-all conduct, development and implementation of flood control plans and programs in the country. Out of 66.2 billion pesos budgeted for basic infrastructure program of DPWH in 2004, about 10.8 billion pesos or 16% is allotted to flood control including the foreign fund (*Source: 1999-2004 Medium-Term DPWH Infrastructure .Program*)

2.2.1 Flood Conditions

Urban Flooding

Urban flooding usually takes a form of flash flooding, often occurring from localized heavy rainfall over an urbanized area. As land is converted from fields to roads and cemented lots, it loses its ability to absorb rainfall. Urbanization increases runoff 2 to 6 times over what would occur on natural terrain. In most places in the country, during periods of urban flooding streets can become swift moving waterways. Urban floodwaters overflow drainage channels and gather in low-lying areas first. This is dangerous due to the proximity of the floodwaters to increased numbers of people and vehicles. In urban centers, encroachments into natural waterways and drainage mains restrict the flow of surface run-off, consequently concentrating floods of greater quantity in longer duration.

In Metro Manila, the recurring floods could possibly be due to the inadequate capacity of drainage channels. Further, prompt maintenance and improvement programs are hindered by prevalent construction of dwellings by informal settlers along the banks of waterways. The improper disposal of garbage into waterways is also a major problem. Garbage diminishes the pumping capacity and efficiency of existing pumping stations. Flood plains being converted into residential areas and utilized as farmlands increase the flood risks even in rural areas.

Flash Flood

The tragic flash flood on November 5, 1991 that claimed human lives of almost 8,000 people in Ormoc City, Leyte is a classic example of flash flood. Flash floods are local floods of great volume and short duration. A flash flood generally results from a torrential rain or "cloudburst" on relatively small and widely dispersed streams. Runoff from the intense rainfall results in high flood waves. Discharges quickly reach a maximum and diminish almost as rapidly. Flood flows frequently contain large concentrations of sediment and debris. Flash floods are particularly common in mountainous areas but are a potential threat in any area where the terrain is steep, surface runoff rates are high, streams flow in narrow canyons, and severe thunderstorms prevail.

Riverine Flood

Frequently experiencing typhoons, overbanking of the Agno River had caused damaging floods in the Pangasinan Plain. It was estimated that a total area of 180,000 to 200,000 ha are prone to flooding in the provinces of Pangasinan and Tarlac. The population in these areas is conservatively estimated at 700,000. In 1972, Agno River inundated almost its entire flood prone area with damages estimated at 2 billion pesos, making it the largest flood ever recorded (*Source: Water and Flood, DPWH/JICA, 2004*).

Riverine floods such as those in the Agno River are caused by rainfall over large areas. These floods differ from flash floods in their extent and duration. Whereas flash floods are of short duration in small

streams, riverine floods take place in river systems whose tributaries may drain large geographic areas. Floods on large river systems may continue for periods ranging from a few hours to days. The condition of the ground (amount of soil moisture, seasonal variations in vegetation, imperviousness due to urbanization, etc.) directly affects runoff.

Coastal Flooding

In most cases the most devastating flooding from rainfall is that associated with tropical cyclones. Catastrophic flooding from rainfall is often aggravated by wind-induced surcharge along the coastline. Rainfall intensity is high and the area of the storm is broad-based; these two factors together are capable of producing extreme flood discharges.

Flood-producing rainfall can also be of extratropical or weather frontal character. It may alternatively be the result of a large atmospheric depression with moisture-laden winds, moving from a marine environment onto and over a landmass. Rainfall in these events is generally widespread and can be heavy. Intensity can be high and is generally influenced by topographic relief. Coastal seawater flooding is usually caused by a combination of circumstances that may include astronomical tides, storm surges, or tsunamis.

Debris, Landslides, Mudflow, and Lahar Floods

The Mt. Pinatubo eruption in June 1991 brought the Philippines face-to-face with sediment flow at its most vicious form: lahar, i.e. ashes and pyroclastic materials combined with runoff. Massive lahar flows from the slopes of Mt. Pinatubo buried homes, infrastructures and entire towns. Some 250,000 families were rendered homeless; bridges collapsed, while roads disappeared. Damage to agriculture was overwhelming: destroying or burying crops and fruit-yielding trees. Some 77,000 ha of farmlands were buried under one to 12 feet of volcanic debris. Official records indicate a total of 932 persons dead, 41,979 houses totally destroyed, and 70,257 houses severely damaged as a direct result of lahar on-slaught. Total damage to infrastructure, agriculture, trade and industry and natural resources immediately after the initial lahar flows was estimated at 10.4 billion pesos (*Source: Water and Flood, DPWH/JICA, 2004*).

2.2.2 Flood Damages

From 1990 to 2003 alone, the Philippines experienced an average of 3.5 destructive typhoons per year with damages costing up to 96.566 billon pesos mostly incurred from flood-damaged properties, infrastructures and crops. The eruption of Mt. Pinatubo, the world's biggest in this century, devastated an entire region. The eruption came at the heels of a destructive intensity 7.9 earthquake that originated in Northern Luzon, severely affecting the economies of urbanized commercial centers in Central and Northern Luzon.

From the damage figures of the Office of Civil Defense (OCD) and National Disaster Coordinating Council (NDCC), the large number of typhoons that hit the Philippine Area of Responsibility (PAR) undoubtedly takes the heaviest toll on lives and properties. This strikes a heavy blow on the economy of the Philippines, especially upon the agricultural sector. It is reported that an average of 900 persons are killed and an estimated cost of approximately 8 billion pesos are lost due to typhoons and associated flooding events.

The loss of human lives and damages to agricultural crops as well as private properties, and interruption of business operations deplete the economic development and hinder the delivery of basic social services. The flood damages are equivalent to 2% of the national budget and almost double the budgetary allocation of the DPWH for flood control.

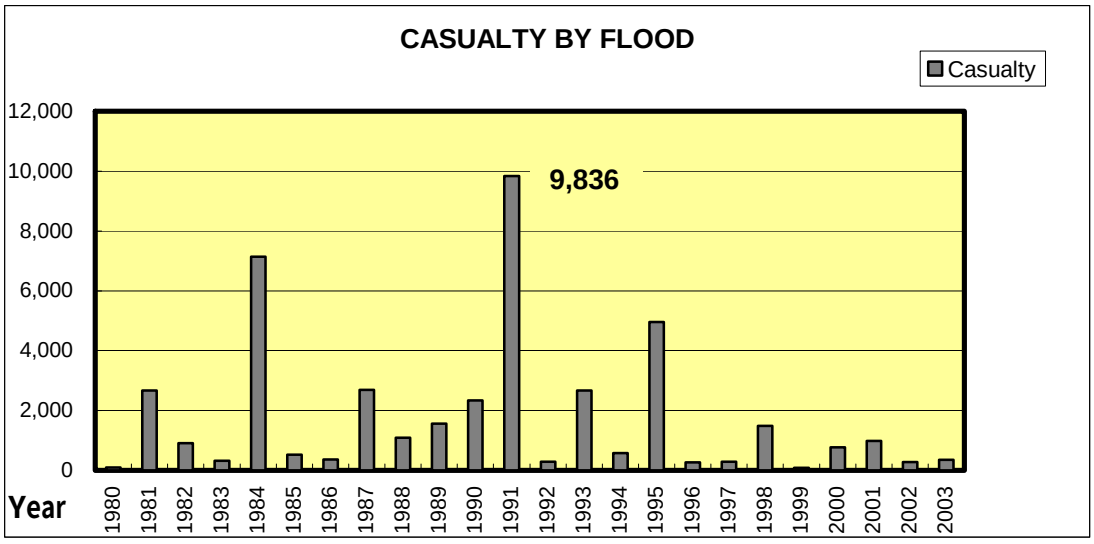
Despite the gains made in flood protection measures, the ever-growing flood problems and associated flood damages persist as a result of partially implemented schemes and insufficient protection measures

to existing dikes and structures, which sometimes lead to dike breaks. The flood situation is being aggravated by uncontrolled development in the floodplains, exploitation of basin watersheds, sedimentation of waterways and reduction in wetlands storage areas due to rapid urbanization. Unless development in the floodplains are controlled and managed properly, the annual flood damages due to floods are anticipated to increase further. Table below lists the amount of flood damages incurred for the last 24 years (1980-2003). See also **Annex 1**.

Recorded Annual Flood Damages

Year	Population Affected		Causalities			House Damaged		Damage Value* (million peso)
	Families	Persons	Dead	Missing	Injured	Totally	Partially	
1980	248,164	1,666,498	36	4	55	16,510	51,101	1,472
1981	250,325	1,472,417	484	264	1,922	44,994	159,251	1,273
1982	266,476	1,569,017	337	223	347	84,027	97,485	1,754
1983	140,604	747,155	126	168	28	29,892	85,072	523
1984	741,510	4,048,805	1,979	4,426	732	310,646	313,391	416
1985	318,106	1,643,142	211	300	17	8,204	211,151	3
1986	287,240	1,524,301	171	43	155	3,162	14,595	1,838
1987	464,162	2,591,914	1,020	213	1,455	180,550	344,416	8,763
1988	1,173,994	6,081,572	429	195	468	134,344	585,732	8,675
1989	501,682	2,582,822	382	89	1,088	56,473	184,584	4,494
1990	1,265,652	6,661,474	676	262	1,392	223,535	636,742	11,713
1991	150,894	759,335	**5,201**	**4,278**	**357**	15,458	83,664	74
1992	418,964	2,097,693	145	95	51	3,472	8,342	7,359
1993	1,523,250	8,202,118	814	214	1,637	166,004	456,773	25,038
1994	670,078	3,306,783	266	54	260	58,869	226,291	3,401
1995	1,710,619	8,567,666	1,255	669	3,027	294,654	720,502	57,781
1996	260,581	1,254,989	124	49	97	2,690	17,557	10,109
1997	777,997	3,954,175	199	28	66	13,225	53,980	4,842
1998	1,590,905	7,197,953	498	116	873	137,020	406,438	17,823
1999	270,424	1,281,194	56	3	25	144	687	1,555
2000	1,426,965	6,852,826	338	59	370	24,573	195,536	7,217
2001	756,938	3,629,295	431	134	418	14,899	54,422	6,924
2002	538,600	3,546,469	169	33	71	2,980	15,947	829
2003	702,223	3,362,991	139	28	182	12,306	51,579	4,567
Total	**16,456,353**	**84,602,604**	**15,486**	**11,947**	**15,093**	**1,838,631**	**4,975,238**	**188,443**

* Total damages in infrastructure, agriculture and private properties.



The following table summarizes the tropical cyclones, casualty and missing persons for which exceeded 100 in total. **Annex A.2** details the number of casualties and damaged infrastructures by river basin basis.

Destructive Tropical Disturbance and Corresponding Casualties

Tropical Disturbance	Date of Occurrence	Casualties		
		Dead	Missing	Injured
T Ruping	Nov 10-14, 1990	508	246	
TS Uring	Nov 2-6, 1991	5,101	1,256	292
TD Ditang	July 17-21, 1992	36	77	
T Kadiang	Sep 30-Oct 7, 1993	126	26	37
T Monang	Dec 3-4, 1993	273	90	607
T Puring	Dec 24-29, 1993	187	52	280
TS Mameng	Sep 27 - Oct 1, 1995	116	126	49
TS Pepang	Oct 26 -30, 1995	265	67	323
T Rosing	Oct 31 - Nov 3, 1995	936	316	4,152
T Emang & TS Gading	Sept 16-21, 1998	108	20	
Loleng	Oct 15-23, 1998	303	29	751
Reming	Oct 26-Nov 1, 2000	114	10	
T. Feria	July 2-6, 2001	188	44	241
TY Nanang	Nov. 6-10, 2001	236	88	169
T. Florita, Gloria Hambalos, Inday	June 28-July 14, 2002	85	4	45
T. Harurut	July 19-21, 2003	64	2	154
Total		8,497	2,447	6,901

T: Typhoon, TS: Tropical Storm, TD: Tropical Depression
Source: Office of Civil Defense

2.3 Data and Information of Floods

2.3.1 Hydrological Data

The Study Team conducted the survey on condition of hydrological data collection. This survey aims to analyze the status of hydrological data collection in the country. The results of which are presented below.

(1) Inventory

Details of this inventory of hydrological data collection are shown in **Annex 3**

(a) Gauging Stations

The agencies involved in hydrological data collection are:

- Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
- Bureau of Research and Standards (BRS)
- National Irrigation Administration (NIA)
- National Power Corporation (NPC)

Agency	Operational	Abandoned	Total	Remarks
A. RAINFALL				
PAGASA	181	165	346	Source: Station Profile, CDS-CAB, PAGASA, January 2004 (Data as of August 2002)
Synoptic	*59*	*9*	*68*	
Climat/ VSS/ Cooperative/Rain	*96*	*147*	*243*	During the field survey, 2 climat stations were found abandoned contrary to the records of PAGASA.
Agromet	*26*	*9*	*35*	During the field survey, 2 agromet stations were found abandoned contrary to the records of PAGASA.
NIA	0	157	157	Source: NIA-PDD
NPC	0	69	69	Data were already turned over to NWRB
B. STREAMFLOW				
BRS	272	479	751	Source: Integration of published streamflow records
NIA	1	178	179	Source: PDD-NIA

As shown in the table above, PAGASA has established a network of 346 hydro-meteorological stations, which are classified into synoptic, climatic and agro-meteorological, for its weather studies and forecasting. At present, 181 are operational stations; 59 of which are synoptic stations, 96 are climatic stations, and 26 are agro-meteorological stations. Nine of the 165 closed stations are synoptic, 147 are climatic stations, and nine are agro-meteorological stations.

BRS undertakes hydrological surveys and data collection. At present, 272 out of 751 streamflow gauging stations are operational, while the rest of the stations are already closed.

NIA established 157 rainfall stations, which are now all closed, and 179 streamflow gauging stations with only one at present operational. NIA's provincial offices maintain those stations. All collection of streamflow and rainfall data of NPC ceased completely in 1997.

(b) Available Records

PAGASA's data are in spreadsheets and databases. These data include daily rainfall total as well as monthly and annual summaries. For most of the stations, daily rainfall data are available for the period from 1951 to 2002. There are 129 stations with more than 30 years of record. According to the NWRB, PAGASA has shared with NWIN their rainfall records up to year 2000.

NWRB had already given BRS a database established by the National Water Data Collection Network (NWDCN) and trained them on how-to-use it. In spite of this, data are still encoded in spreadsheets in different files. BRS still has several years backlog in data encoding for some stations. Streamflow data are available for the period from 1945 to 2002. As shown in the table below, 112 stations have more than 30 years of record.

NIA's data are recorded in spreadsheets, which are partially stored in NWIN. Rainfall data are available for the period from 1972 to 1997. Streamflow data are available for the period from 1974 to 2004.

When NPC hydrological stations stopped operations in 1997, all records available were turned over to NWRB. The data are now stored in NWIN databases in Microsoft SQL 2000 format. Rainfall data are available for the period from 1972 to 1996.

Inventory of Rainfall and Stream-flow Records

Agency	Length of Records			Available Data
	< 20 years	20 - 30 years	> 30 years	
A. RAINFALL				
PAGASA	118	99	129	
Synoptic	*6*	*4*	*58*	3-hourly, daily, monthly, annual
Climat/ VSS/ Cooperative/Rain	*96*	*81*	*66*	Daily, monthly, annual
Agromet	*16*	*14*	*5*	Daily, monthly, annual
NIA	156	1	0	Daily, monthly, annual
NPC	56	10	3	Daily, monthly, annual
B. STREAMFLOW				
BRS	380	259	112	Daily, monthly, annual
NIA	175	4	0	Daily, monthly, annual

(c) Station Density

Rainfall observation represents point measurement. For an area rainfall to be representative, it must be determined from an optimum number of rain gauge network. The WMO Guide to Hydrometeorological Practices recommends at least one station for every 600-900 km^2 for flat regions; and at least one station for 100-200 km^2 for mountainous regions.

With the torrential nature of rains in the Philippines, the minimum rain gauge densities for different topographic categories are as follows:

- Extensive flat plain areas: 1 station/400 km^2
- Rolling/mountainous areas: 1 station/200 km^2
- Islands at least 1,000 km^2: 1 station/100 km^2

Streamflow refers to river discharge measurement at a given gauging station. In accordance with the WMO Guide to Hydro-meteorological Practices, the minimum densities for different topographic categories are as follows:

- Flat region: 1 station/500 km^2
- Mountainous region: 1 station/200 km^2

In the two succeeding tables, the number of existing operational and total gauging stations is shown, in which the number of stations compared to the drainage area may serve as an indicator on the adequacy or inadequacy of the hydrologic network in the basin. **Annex 4** shows the station density for other principal river basins.

For the major river basins, the densities of operational rain and stream-flow gauging stations are only one station per 2,470 km^2 and 913 km^2, respectively. Some river basins have no rain gauge or stream-flow gauging stations, as shown below.

Station Density of the Rain Gauge

Rank	River Basin	Drainage Area (km^2)	Level Area* (km^2)	Operational		Total	
				Number	Density	Number	Density
1	Cagayan	25,649	3,546	8	3,206	19	1,350
2	Mindanao	23,169	5,132	2	11,585	9	2,574
3	Agusan	10,921	2,494	1	10,921	2	5,461
4	Pampanga	9,759	6,660	7	1,394	9	1,084
5	Agno	5,952	1,883	2	2,976	11	541
6	Abra	5,125	299	3	1,708	7	732
7	Pasig-Lagu	4,678	1,065	8	585	20	234
8	Bicol	3,771	549	4	943	8	471
9	Abulug	3,362	178	1	3,362	2	1,681
10	Tagum-Libu	3,064	504	0	-	0	-
11	Ilog-Hilaba	1,945	645	1	1,945	1	1,945
12	Panay	1,843	430	1	1,843	2	922
13	Tagaloan	1,704	173	2	852	9	189
14	Agus	1,645	166	0	-	0	-
15	Davao	1,623	164	0	-	0	-
16	Cagayan	1,521	86	1	1,521	2	761
17	Jalaud	1,503	301	2	752	2	752
18	Buayan-Ma	1,435	150	1	1,435	1	1,435
Total/Mean		108,669	24,425	44	2,470	104	1,045

*Level Area includes all level to nearly level lands with slopes ranging from 0 to 3%.

Station Density of the Streamflow Gauges

Rank	River Basin	Drainage Area (km^2)	Level Area* (km^2)	Operational		Total	
				Number	Density	Number	Density
1	Cagayan	25,649	3,546	22	1,166	83	309
2	Mindanao	23,169	5,132	13	1,782	45	515
3	Agusan	10,921	2,494	6	1,820	10	1,092
4	Pampanga	9,759	6,660	15	651	68	144
5	Agno	5,952	1,883	7	850	24	248
6	Abra	5,125	299	2	2,563	8	641
7	Pasig-Lagu	4,678	1,065	20	234	45	104
8	Bicol	3,771	549	8	471	30	126
9	Abulug	3,362	178	1	3,362	1	3,362
10	Tagum-Libu	3,064	504	2	1,532	2	1,532
11	Ilog-Hilaba	1,945	645	4	486	11	177
12	Panay	1,843	430	6	307	9	205
13	Tagaloan	1,704	173	0	-	2	852
14	Agus	1,645	166	1	1,645	3	548
15	Davao	1,623	164	0	-	0	-
16	Cagayan	1,521	86	3	507	5	304
17	Jalaud	1,503	301	6	251	12	125
18	Buayan-Ma	1,435	150	3	478	8	179
Total/Mean		108,669		119	913	366	297

*Level Area includes all level to nearly level lands with slopes ranging from 0 to 3%.

(2) Data Collection

Hydrological data collection in hydrometeorological stations (synoptic, climat and agromet) and river gauging stations established and maintained by PAGASA and DPWH-BRS are briefly described below.

Synoptic Stations – Rainfall information from the synoptic stations are logged by 3-hourly manual observation using 8-inch standard rain gauge and an automatic rainfall recorder that has the rainfall data read every minute and recorded in a strip chart. Observation parameters follow WMO practices. All meteorological elements are observed and made at fixed observation times and are transmitted to the Weather and Flood Forecasting Center (WFFC).

Climat Stations – Rainfall information from climatic stations are done by manual observation. Rainfall data generated by this type are daily average rainfall.

Agromet Stations – Rainfall information from agromet stations are observed using 8-inch standard rain gauge twice daily and an automatic rainfall recorder that has the rainfall data read every minute and recorded in a strip chart. Agromet stations also gather and provide simultaneous meteorological and biological information. These stations are responsible for the dissemination of agricultural meteorological advice, warning, forecast, bulletin and other important information needed by farmers.

Streamflow Stations – Streamflow stations are classified into three types: manual, automatic and modern automated/telemetered. Manual type of station is the most common type that uses calibrated staff gage in water level measurements. Instrument used in measuring water level are staff gage, water level recorders and stilling wells. Hydrology Team of DPWH Regional Office also conducts the monthly water quality and discharge measurements in these stations. At present the Hydrology Team uses current meter and float method in measuring velocity.

The standard procedure in acquiring, processing and transmitting hydrologic data (streamflow, synoptic, agromet and climat) are presented in flow charts shown in **Annex 4**). The standard procedure and general instruction to observers are presented in detail in the Manual of Water Data Standards, *Volumes 1-2* (NWRC, 1976). Volume 1 of this manual presents the development and construction of rating curves.

The following table shows the activities shall be undertaken in the hydrological stations surveyed.

Details of Rainfall Stations Surveyed

ACTIVITY	EQUIPMENT	FREQUENCY	PERSONNEL
1. Rain gauge measurement	8-inch Standard Rain Gauge	Climat Sta. - 2 times/day (extra readings during rainy season)	Part-time Weather Observation Aid
		Synoptic Sta.- 3 hourly reading	Chief Meteorological Observer
	Automatic Rainfall Recorder	Continuous reading recorded in a strip chart.	

Details of Streamflow Stations Surveyed

ACTIVITY	EQUIPMENT	FREQUENCY	PERSONNEL
1. Water level monitoring	Staff Gage	3 times/day (extra reading during floods)	Gage Keeper
2. River discharge measurement	Current Meter	Once a month	DPWH-Regional Office, Hydrology Div.
3. Collection of water sample		Once a month (with discharge measurement)	DPWH-Regional Office, Hydrology Div.
4. Conduct of river cross-section survey		Once a year, during summer (or after a major flood)	DPWH-Regional Office, Hydrology Div.
5. Establishment, rehabilitation and maintenance		As the need arises	DPWH-Regional Office, Hydrology Div.
6. Initial processing of streamflow data		15 discharge measurements or sufficient measurements to represent the whole range of water levels.	DPWH-Regional Office, Hydrology Div.

(3) Budget

The fund allocated for observation, measurement, recording and reporting of atmospheric, geophysical and astronomical data, including the operation and maintenance of surface and upper air observation network of PAGASA-Field Operation Center is presented in the following table, excluding expenses for agrometeorological stations. The Personnel Services cover the wages for Chief Meteorological Observers (CMOs). The data in this table is taken from the Current Operating Expenditures of General Appropriation Act of 2004.

	ITEMS	AMOUNT (pesos)	PERCENTAGE (%)
A.	Personal Services	72,648,000	88.60
B.	Maintenance and Operating Expenses		
1.	Traveling	1,072,000	1.31
2.	Repair/ Maintenance of Gov't. Facilities	279,000	0.34
3.	Repair/ Maintenance of Gov't. Vehicles	110,000	0.13
4.	Transportation	58,000	0.07
5.	Supplies/ Materials	7,031,000	8.57
6.	Training/ Seminar	60,000	0.07
7.	Gasoline, Oil and Lubricants	599,000	0.73
8.	Fidelity Bond/ Insurance	147,000	0.18
	TOTAL	82,008,000	100

The total annual hydrology budget of BRS-DPWH for CY 2000 as provided in General Appropriations Act is presented in the table below.

	ITEMS	AMOUNT (pesos)	PERCENTAGE (%)
A.	Wages of Gage keepers	2,896,000	53
B.	Maintenance and Operating Expenses		
1.	Traveling	1,178,000	21
2.	Supplies/ Materials	605,000	11
3.	Repair Vehicles	289,000	5
4.	Transport Services	47,000	1
5.	Gas, Oil Lubricants	178,000	3
6.	Other Services	341,000	6
	TOTAL	5,534,000	100

(4) Field Investigations

Field investigations were conducted to further study the existing condition of hydrological data collection in the field. **Figure 2.8** shows the location map of surveyed gauging stations, while **Annex 6** shows the photo documentations of the said field investigations.

Stations Surveyed

Observers (CMOs/Gage Keepers) of 32 selected stations in NCR and neighboring provinces were interviewed, as detailed in the following table.

AGENCY	TYPE OF STATION	NUMBER SURVEYED	PERCENTAGE
PAGASA	Synoptic	6	19
PAGASA	Climatic	8	25
PAGASA	Agromet	6	19
DPWH-BRS	Streamflow	10	31
NIA	Streamflow	2	6
TOTAL		32	100

Findings

The survey revealed some basic problems in hydrological data collection such as unavailability of reliable inventory and information of established gauging stations, lack of coordination with other agencies, and non-involvement of LGUs. The most common issues/concerns encountered are listed below:

ACTIVITY	ISSUES/CONCERNS
1. Data Collection	- Low compensation and delay of payment for observers - Failure to collect and read data during high floods - Incomplete/inaccurate information filled in prescribed forms - Insufficient supply of materials for observation & recording - Standard procedures in measuring not being followed - Inaccessible during heavy rains, unsafe trail going to the staff gauge - Lack of formal training to observers - For river gauging, no standard practice in the replacement of staff gages relative to flow direction - Reluctant investment in hydrological data collection
2. Operation & Maintenance	- Unavailability of new equipment - No funds for maintenance and instrumentation in case of breakage and lost - No regular checking and verification of established stations - Agency uninformed of unleveled instruments and change of location
3. Data Processing	- Delay of raw data transmission to Central Office - Delayed rectification of erroneous data - Variations in quality assurance procedures and standards between different agencies - Unreliable telecommunication systems
4. Data Banking	- Unavailability of reliable inventory of gauging stations - Outdated system for information management - No comprehensive data submittal to NWIN due to funding and institutional constraints of some participating system
5. Rating Curves	- Discharge rating curves are mostly for low flows - Available river cross-sections are limited

(5) Data Quality

The worth of rainfall data depends primarily on the instrument, its installation, site conditions and operation by a responsible observer. Likewise, the production of reliable streamflow records is dependent on the quality of basic measurements. Hence some observations on data quality are made relative to the above survey findings.

Rainfall Data

Except for synoptic stations, which are operated and maintained by PAGASA personnel, climatic stations, which are manned by part-time weather observation aide have not been visited by PAGASA staff for the past few years due to inadequate funds for travel. Hence there is no regular checking and verification of established climatic stations. The agency is sometimes uninformed of unleveled instruments and changes of location of rain gauge.

It is essential for reliable rainfall analyses to have direct knowledge of a rain gauge station, and authorities are recommended to keep a 'history' of each station. A well-documented up-to-date history of a rain gauge station is invaluable in assessing the reliability of rainfall measurements and is an important first step in quality control.

Before using or storing rainfall records, their validity is checked on receipt at the agency's central office based on certain procedure. However, it is up to the hydrologist using the data to do station comparison and regional mapping to identify errors and anomalies.

Streamflow Data

Of first importance are the field observations whether they are made manually or automatically. Observers must be very careful in reading the water level at the stage gauge and in recording immediately the correct level and time. All instrumentation should be checked regularly with all parts of the recorders, clockwork, mechanical or electronic, receiving routine maintenance and testing for correct settings.

Since the river discharge is usually indirectly computed from current meter measurements, float or slope area methods; and then extrapolated from the rating curve, it is necessary to use the data providing alternative means of checking and verification of processed data.

Adjustment for errors or mistakes from instrumental and observational deficiencies may be made by double mass analysis. The base station shall be either flow at one or more gauging stations, that have not been moved, or average rainfall from a number of stations in the area.

(6) New Development

NWRB created in 1974 is mandated as the national agency for coordination of water-related data and information collection and dissemination for effective water resources management.

The collection of water data in the Philippines has historically been the responsibility of many agencies concerned with water resources development and management. For some agencies, data collection is one of their primary responsibilities. Other agencies are basically development or regulatory agencies whose data collection activity is only a secondary responsibility. The data collected by each agency is usually limited to those, which are needed by the agency to carry out its mandate. Access to the databases of the various agencies is inconvenient. Most of the data has remained as unpublished reports in files.

The conventional way to make the data readily accessible is to have a central repository in NWRB containing printed copies of all information from the various agencies. Data were usually submitted to NWRB on a goodwill basis by other agencies, which, however, have little

incentive to do so. This situation made it difficult for NWRB to conduct comprehensive water resources planning or to decide on water allocations and investments due to inadequate information on supply, demand and use.

Therefore, NWRB is now implementing the National Water Information Network (NWIN), which is being funded by the World Bank. The design and establishment of NWIN represents one of the more recent efforts to address the need to rationalize the collection of water-related data in the Philippines.

NWIN is a computer-based network system that electronically links the databases of the collection agencies and providing easy access to user agencies. This is done via modems and multi-node Wide Area Network (WAN). NWRB acts as the central database (or hub) to which the various agencies are linked. Any updates made in the databases of the participating agencies can be downloaded into the central database. The public may access to the data through *Internet* by visiting the website of NWIN (www.nwin.nwrb.gov.ph).

With the establishment of NWIN, the GOP now hopes to see a common and solid technical foundation for cooperation and coordination among the participating agencies, and a common monitoring tool of the water sector for the implementation of medium and long-term development of the country's water resources. NWIN now links the nine agencies tabulated below:

1	NWRB	-	National Water Resources Board – the lead agency for NWIN
2	BRS	-	Bureau of Research and Standards, DPWH
3	EMB	-	Environmental Management Bureau, DENR
4	MGB	-	Mines and Geo-sciences Bureau, DENR
5	LWUA	-	Local Water Utilities Administration
6	NIA	-	National Irrigation Authority
7	NEDA	-	National Economic Development Authority
8	PAGASA	-	Philippine Atmospheric, Geophysical, and Astronomical Services Administration, DOST
9	WSSPMO	-	Water Supply and Sanitation Program Management Office, DILG

The second batch of members, which is now being connected to NWIN are

1	DENR	-	Department of Environment and Natural Resources
2	FMB	-	Forest Management Bureau
3	BSWM	-	Bureau of Soils and Water Management, DA
4	ARBC	-	Agno River Basin Commission
5	LLDA	-	Laguna Lake Development Authority
6	NAMRIA	-	National Mapping and Resource Information Authority, DENR
7	PMO-MFCP	-	Major Flood Control Projects Project Management Office, DPWH
8	DOE	-	Department of Energy

The National Water Data Collection Network (NWDCN) of the World Bank-funded Water Resources Development Project (WRDP) developed three databases listed below:

Database	Main Beneficiary
Stream Flow	BRS, DPWH
Groundwater	MGB, DENR
Water Quality	EMB, DENR

Because they are NWIN's main data sources, these NWDCN databases are connected to NWIN.

(7) Assessments

Need for Capacity Building in Hydrological Data Collection

In spite of the wide recognition that such information is needed, the past two decades have seen decline in the coverage and reliability of systems for the collection of hydrological data. To counteract this trend,

- Strengthen the technical and institutional capacities of agencies to capture and process hydrological data, and meet the needs of their end-users for information on the status and trend of water resources;
- Conduct lectures, trainings and other capability building activities for gage keepers, CMOs and weather observers;
- Develop data management capabilities;
- Strengthen and update observation networks; (1) Adopt modern data collection and transmission technologies; (2) Establish a national network of observatories which provide information of a consistent quality, transmitted in real-time to national and regional databases, via the Global Telecommunication System; and
- Promote and facilitate the dissemination and use of water related information, using modern IT such as the World Wide Web and CD-ROMs.

Sustainability of NWIN

NWIN participating agencies can organize themselves as a visible and effective group able to convince donors, funding agencies and the government that it is necessary to operate efficient information systems on water quality and quantity. Users of hydrological information should also act as an external driving force to get the best possible services from hydrological data collection agencies, and in particular for putting into practice the WMO resolution on free and unrestricted exchange of essential hydrological data and products (Resolution 25 of WMO Congress, Cg-XIII).

2.3.2 River Data

(1) General

Considering various characteristics of rivers, river channel improvement shall be planned and designed based on not only geometrical shape but also kinetic motion of river channels (river morphology). The following river data shall be surveyed, collected and made available for river improvement planning:

River Channel	River Flow & Water Level	Geology	Catchment
1. Channel Network	1. Recorded Maximum	1. General Geology	1. Area
2. Alignment	2. Frequency of Floods	2. Geology along River Channel	2. Topography
3. Longitudinal Profile	3. Annual Mean Flow	3. Riverbed Materials	3. Vegetation Cover (Land Use)
4. Cross-section	4. Seasonal Variation	4. River Bank Materials	4. Surface Soil

Among those river data, BRS is obliged to observe and collect the following in the survey of hydrological stations:

Survey Item	Frequency
1. Water level monitoring	3 times/day (extra reading during floods)
2. River discharge measurement	Once a month
3. Conduct of river cross-section survey	Once a year, during summer (or after major flood)
4. Initial processing of streamflow data	Fifteen discharge measurements or sufficient measurements to represent the whole range of water levels.

However, the survey has not been conducted by BRS in the recent years due to funding and manpower constraints. The existing river data has been prepared only in studies and projects for flood control works in major rivers.

(2) Classification of River Segment

Existing river channels have been formed by the interaction of water and sediment. During large floods, floodwater not only overflows and brings about inundation to riverine areas, but also causes serious damages related to sedimentation. These are bank erosion/collapse and riverbed aggradations. Therefore, river improvement should be planned and designed to attain the following objectives based on adequate analysis of the river characteristics.

- To carry out design flood water, which is allocated to the target river channel, and
- To protect the target river channel from scouring for flood discharges equal to and lower than the design flood discharge.

According to the classification, each river segment is classified by riverbed gradient, which has its own characteristics. These characteristics pertain to the riverbed material, tractive force of flow during flood, river width and water depth during ordinary flood, etc. In the same segment, if the roughness and/or sand bar conditions are almost the same, the velocity of flow and phenomena of scouring will also be almost in the same range. It is very useful in doing river planning and design of river structures, if the river segment of target stretch for improvement is known. Availability of past plan and design of structures in the same segment are useful references. A river system is classified into several segments as shown in this table. This classification table is further explained in the "*Study for the Preparation of Flood Control Manual for Department of Public Works and Highways Technical Standards and Guidelines (DPWH, 2003)*".

Longitudinal profile of the river gradually becomes gentle from the upstream towards the downstream. It has been observed the friction action of the riverbed materials makes them smaller. The riverbed materials such as gravel disappear at certain area, and the rough sand appears. There is no tractive force to move the gravel in the downstream at that point where the riverbed gradient is gentle, and gravel accumulates in the upstream. Moreover, the fine sediments, which are produced from the mountain area and flows downstream, do not remain so much in the upstream area.

The safety of river structure against scouring phenomena depends upon the river characteristics by segment. The main factor of external forces that destroy the dikes and banks is flow velocity. This flow velocity depends upon the river alignment, longitudinal and cross section profiles and types of riverbed materials. The countermeasure required to overcome this external force is by changing/adjusting the riverbed gradient. Thus, when the river improvement plan is discussed, the classification of each river segment should be recognized primarily.

(3) River Segment of Rivers in the Philippines

The table below listed the rivers in the Philippines, for which cross sectional survey and longitudinal profile were conducted in previous studies. In the *Study for the Preparation of Flood Control Manual for Department of Public Works and Highways Technical Standards and Guidelines (DPWH, 2003)*, the river segments of each river were analyzed based on the slope. The bed material size distributions for Cagayan, Pasig-Potrero and Tarlac River basins were also shown in this study.

Rivers in the Philippines with Cross Sectional and Longitudinal Profile

Rivers	Major River	Rivers	Principal River	Rivers	River Basin/City
Cagayan	Cagayan	Laoag-Bongo	Laoag	Iloilo R	Iloilo/Iloilo
Agno	Agno	Cura Labogaon	Laoag	Mandurriao R	Mandurriao/Iloilo
Pampanga	Pampanga	Madongan	Laoag	Tigum R	Tigum/Iloilo
Pasig-Potrero	Pampanga	Papa	Laoag	Bulacao R	Bulacao/Cebu
Tarlac	Agno	Solsona	Laoag	Guadalupe R	Guadalupe/Cebu
Timbu	Pampanga	Aganan	Jaro-Aganan	Kinalumsan R	Kinalumsan/Cebu
Marikina	Pasig-Laguna	Jaro	Jaro-Aganan	Lahug R	Lahug/Cebu
Pasig	Pasig-Laguna			Subang Daku	Subang Daku/Cebu
Panay	Panay			Anilao R	Anilao/Ormoc
Agusan	Agusan			Malbasag R	Malbasag/Ormoc
Cotabato	Mindanao				

Most Philippine rivers flow from mountain headwaters towards the sea. The aforementioned major river basins have river delta ranging from 50 to 280 km. In comparison with rivers in other parts of the world, most major Philippine Rivers are short and steep with channel gradients ranging from 0.40% to 0.70%. However, the two largest rivers in the Philippines – Cagayan and Cotabato Rivers, have channel gradients of 0.08% and 0.13% respectively, according to *Water and Floods* (*DPWH, 2004*).

2.3.3 Flood Data

Flood data are basic information for the planning and development of flood control projects. Better data are required for better project decisions. However, they are rarely adequate in this country. Deficient flood data may result in the danger of under- or over-designed flood control structures. Despite deficiencies, adequate analysis and utilization of available data are necessary for planning and developing flood control projects. Methods of analyzing flood data are variously described in many literatures. Many tools are available for flood analysis, including recorder graphs, hydrographs, probability curves, and various methods of frequency and correlation analysis. When hydrologic data are unavailable at the project site, indirect determinations may be employed.

The principal kinds of hydrological data required for flood control projects include rainfall (depth, intensity, duration, aerial distribution, and maximum probable precipitation); river stage (peak stages, stage hydrograph during floods, flood-wave profiles along the stream and tributaries); discharge (peak rates, frequencies, hydrographs); and sediment (rate of suspended and bed-load transportation).

The main publications of streamflow and flood information in the Philippines are the following:

- Water Supply Bulletin Nos. 1-12, Surface Water Supply of the Philippines, 1945-1969, Bureau of Public Works (BPW)
- Surface Water Records Nos. 13-15, Philippines Water Data 1970-1972, National Water Resources Council (NWRC)
- Philippine Water Resources Summary Data, 1980, NWRC

- Streamflow Data 1980-2000, Bureau of Research and Standards, DPWH

The informally recorded information may be found in newspapers. Less reliable, but vital, information may be obtained from field observations, such as flood marks on trees and buildings, and from people who have lived for a long time in the project area.

Another form of flood data is the flood inundation map which is available only in major river basins where comprehensive planning for flood control has been undertaken.

CHAPTER 3. POLICY AND DIRECTION

3.1 Flood Control in the National Development Plan

Several national development plans were prepared to orient the policy and direction for economic and infrastructure development including flood control in the Philippines. Selected among them are Medium-Term Philippine Development Plan 2001-2004, Medium-Term DPWH Infrastructure Development Plan 2001-2004 and National Framework for Physical Planning 2001-2004. As well some national or international organizations have been developing programs to show the direction of *Water Resources Development, Flood Management* and *Integrated Water Resources Management (IWRM),* which is briefed in this section.

3.1.1 Medium-Term Philippine Development Plan 2001 – 2004 (MTPDP 2001-2004)[3]

Description on Flood Control in the MTPDP 2001-2004, accelerating the infrastructure development as "Flood Control and Drainage" or one of components of water resources sector, is excerpted as follows:

(1) Assessment of Flood Control and Drainage

While flooding has been reduced in many parts of the country, it is still a major concern together with erosion and sediment control due to the following: (a) deterioration of some rivers and streams in flood plains and delta areas due to encroachment on their natural channels, indiscriminate mining operations and deforestation of watershed areas; (b) in urban areas, encroachment of the waterways and river channels by squatters and private landowners, indiscriminate garbage dumping and rapid urbanization which cause frequent flooding as a result of increase of runoff; and (c) deficiencies in technical standards and regulations, organization and budget for continuous O&M, rehabilitation and improvement of existing facilities and natural channels.

(2) Policy Framework

(a) General on Water Resources Sector

Water resources planning is based on the following principles: (a) water is a limited resource that must be conserved and managed efficiently; and (b) water has an economic value in all its competing uses and shall be treated as an economic good, thus, capacity and willingness-to-pay must be taken into consideration in pricing water.

Sustainable development and management of water resources through appropriate policy and legal reforms, particularly in resource exploitation, allocation, prioritization, optimization, protection and conservation shall be pursued. Accordingly, the promotion of an integrated approach that will link social and economic development with environmental concerns shall be emphasized. The government shall support the creation of river basin and watershed authorities to effect integrated water resources management (IWRM). Each basin authority shall develop a master plan for their respective area. Further, forest protection efforts including reforestation activities shall be strengthened through community-based projects.

Policies shall be implemented through decentralized operations within a national framework cognizant of the policy of devolution and community-based approaches in

[3] NEDA is preparing a Medium Term Development Plan for 2005 – 2010 that emphasized promoting IWRM for Water Resources Sector.

water management. This will address the need for capacity building and training in the local levels in development planning, operation, and maintenance.

Private sector participation in all aspects of water resources management, utilization and development shall be continued. Towards this end, promotion of market-based incentives to rationalize water utilization will be pursued. Furthermore, incentive programs for private sector investments on all water resources development initiatives will be provided.

In the assessment of water resources, a coordinated basic water data collection system for efficient and effective flow of information shall be rationalized and institutionalized. Priority shall be given to research and development on applicable and appropriate technologies for groundwater assessment and water conservation, sanitation and pollution control both in concession areas and resource/watershed sites. The government shall support the strengthening of existing and efficiently operating river/lake basin authorities.

(c) Flood Control and Drainage

The objective under the flood control sub sector is to promote economic development and poverty reduction through the implementation of several flood control projects.

In the mitigation of flood damages, two methods are employed, namely: structural and non-structural. Structural measures in rural areas are dikes, levees, cut-off channels, diversion floodways, training levees and bank protection. Structural measures in urban areas are river wall revetment, drainage mains and pumping stations. O&M, rehabilitation and improvement of the facilities mentioned are also considered as structural measures. Non-structural measures are flood forecasting and warning system, flood zoning, reforestation, floodplain management and river management. Expeditious implementation of sabo projects and sourcing of technical assistance in implementing forecasting/warning system will be pursued in cooperation with concerned agencies and local government units.

Gender concerns will be integrated specifically in project development and management activities. Women's participation therein will be encouraged accordingly.

Reduction/minimization of liquid wastes generation will be implemented at source. The efficiency and effectiveness of transfer and transport system from source to processing of liquid waste will be improved.

(3) Strategies

(a) General on Water Resources

- Pursue the strengthening/creation of an independent regulatory authority;
- Implement capability building programs;
- Strengthen water data collection activities;
- Adopt a holistic approach in water resources development;
- Implement adequate erosion and sediment control programs (sabo works) in river basins, mountains and volcanic areas;
- Pursue economic pricing of raw water to ensure sustainability of the quantity and quality aspects of raw water sources;
- Safeguard the quality of water at all times;
- Pursue the preservation of the environment, particularly the maintenance and development of watershed areas; and

- Prioritize the *Water Resources Management Act*, which provides for a comprehensive water resources management to address the national water crisis, and for other purposes.

(b) Flood Control and Drainage including Sabo

The policies and strategies for flood control, drainage and sabo are:

- Mitigate flooding to *tolerable levels* in Metro Manila and major river basins with the additional construction/installation of flood control facilities such as dikes, river walls, levees, cut-off channels, diversion floodways and revetments and installation of pumping stations, dredging and related works in all flood prone areas that need protection as determined under the national land use plan. To this end, pursue the *Flood Control Act* which provides for a flood control mechanism;
- Strengthen the *Flood Control and Sabo Engineering Center* to conduct basic and applied research and development, human resource development, feasibility studies and preliminary engineering;
- Conduct comprehensive floodplain management strategy with the installation of flood forecasting and warning systems in all major river basins;
- Pursue proper O & M of flood control and drainage facilities including an effective garbage collection and disposal, *Bantay Estero/Ilog Brigades* and regulation/rules in coordination with other concerned government agencies and LGUs;
- Coordinate the development of flood control projects with the implementation of water resources development projects;
- Relocate and prevent informal settlers living along the banks of rivers/esteros/creeks;
- Implement sabo projects for the prevention/mitigation of sediment-related disasters, debris and lahar flow/landslide;
- Study and formulate guidelines leading to sustainable development/land use in sediment-related disaster-prone areas. In relation, the *Erosion and Sediment Movement Management Act* providing for a comprehensive erosion and sediment movement management will be promoted to address the national problems on sedimentation;
- Implement comprehensive measures consisting of construction, warning/ evacuation, livelihood programs in coordination with concerned agencies and LGUs; and
- Legislate an act creating a *National Commission on Flood Control and Drainage Research and Development*.

3.1.2 Medium-Term DPWH Infrastructure Development Plan 2001 – 2004

(1) Overall Objectives

In addressing these developmental concerns, the DPWH through its Medium-Term Infrastructure Program seeks to provide the physical foundation needed to support the government through sustained growth and reduced poverty under an institutional and policy environment that is fair and transparent and provide a level competitive playing field for the transport and service providers.

Specifically the Medium-Term DPWH Infrastructure Challenges are the following:

- Provide the primary needs of the population such as reliable and adequate highway network for mobility and flood control for health and production;

- Improve the quality of maintenance to preserve existing asset;
- Speedy clearing of the ROW for flood control projects specially of squatters, with due consideration to the total costs to society of delays and the special needs of poor households that may be displaced; and
- Focus on road infrastructure that would cater on the development efforts t5o support 1) agricultural modernization, 2) peace and order, 3) tourism, 4) traffic decongestion and 5) IGT.

Overall Policies and Strategies

- Focus the transportation strategy on well-defined complementary roles of the government and private sectors;
- Improve the quality of existing infrastructure through proper and preventive maintenance in order to prolong the useful life of the road network at minimum cost;
- Institutional restructuring to separate regulation from operation;
- Inter-modal transport system for efficient traffic flow;
- Prioritize maintenance, then rehabilitation, improvement, and construction;
- Focus on roads leading to regional growth centers and in less developed areas, with special attention Mindanao; and
- Local roads to complement national roads through Integrated Area Development Appropriation.

(2) Objectives for Flood Control and Drainage

To support the economic development, poverty reduction and land use improvement of the country, the flood control and sabo program will give priority to the major river basins identified by the National Water Resource Board, and other principal river basins which require urgent measures to avoid extensive loss of lives and properties.

(3) Policies and Strategies of Flood Control and Drainage

- Pursue comprehensive planning of prioritized major and principal river basins;
- Identify inundation areas in major and principal river basins and rationalize prioritization of river segment protection;
- Provide adequate flood control and drainage facilities in all flood/sediments disaster prone areas to mitigate flooding within tolerable levels;
- Strengthen the *Flood Control and Sabo Engineering Center (FCSEC)* to conduct basic and applied research and development feasibility studies, serve as an information center, and implementation sabo engineering programs;
- Establish database on river information (i.e., flood prone area, sediment-risk area, socio-economic data, etc.) including existing flood control, drainage and sabo structures;
- Pursue non-structure measures to mitigate floods, such as flood forecasting, warning and monitoring system, evacuation plan, hazard mapping and reforestation;
- Implement adequate erosion and sediment control programs (sabo works) in sediment disaster-prone areas; and
- Keep optimum conveyance capacities of river channels, floodways, drainage canals, esteros, etc. through riverbank protection, dredging/desilting, observance or river easements, efficient management in coordination with LGUs.

3.1.3 National Framework for Physical Planning 2001 – 2030

Land Use Committee has promulgated National Framework for Physical Planning (NFPP) 2001 – 2030 to guide effective land use planning with guidelines for infrastructure development including an item as "Protection and Disaster Mitigation" that is excerpted in the followings:

(1) Vision and Principles

The vision of national development is anchored on sustainable development and growth with social equity. It is development that will be sustainable for all generations of Filipinos, such that the use of the country's land and other physical resources yields the greatest economic benefit to both the present and future generations. To achieve the national vision, land use, physical and related planning activities shall proceed within the context of the principles that support the allocation, and use of land and water resources with due regard to their sustainability. These principles include:

- Food security;
- Environmental stability and ecological integrity;
- Rational urban development;
- Spatial integration;
- Equitable access to physical and natural resources;
- Private-public sector partnership;
- People empowerment;
- Recognition of the rights of indigenous people; and
- Market orientation.

(2) Land Use Policy Guidelines for Infrastructure Development

The role of infrastructure in national development is to provide the built-up environment that allows production, consumption, and service activities to take place. Infrastructure is the physical entity that enables economic processes, supports and guides urban and rural development, integrates the various communities of the archipelago into the Philippine nation, and links the country to the global community. In this manner, the state of infrastructure, including the way it enhances and complements the natural environment, provides a physical measure of national and local development and, ultimately, of the quality of life.

Infrastructure is the common, physical link among the production, protection, and the settlements components of the NFPP. Infrastructure development in the NFPP covers five subsectors: transportation, communications, energy, water resources, and social infrastructure. Its basic concerns are the provision of basic services, fostering economic and other forms of integration necessary for producing or obtaining the material requirements of Filipinos, and the development of an efficient, responsive, safe, and ecologically friendly built environment. The major planning concerns and corresponding policy guidelines in infrastructure development are:

(a) Strategic Role of Infrastructure

- Prioritize and implement infrastructure projects that support the policy of national dispersal through regional concentration;
- Promote inter-modal transportation systems, taking into account compatibility, economic feasibility, comparative advantage and linkages of desired transportation modes to facilitate smooth transfer of people and goods between designated transfer points;

- Prioritize and implement infrastructure projects that allow increased access to basic social and other development services while catering to the productive sectors and market-based industry putting the entire population into the mainstream of sustainable development;
- Ensure compatibility of infrastructure with local land use and development plans, giving priority to projects with the most strategic impacts; and
- Protect infrastructure right-of-way.

(b) Protection and Disaster Mitigation

(i) Compatibility with NIPAS and other production areas

Infrastructure facilities can have a double-edged impact on local and regional development objectives. They are indispensable elements to urban and economic growth but they can also cause or encourage environmental degradation and threaten protected areas. Infrastructure can expose previously inaccessible areas to intensive and unsustainable activities and, by the nature of the infrastructure facility itself, cause environmental damage. These can be avoided by the following:

- Avoid unnecessary encroachment into NIPAS and other protection areas; provide only required capacities; minimize extensive alignments; *provide slope and erosion protection measures* and buffer areas; and utilize environmentally-sensitive construction methods and technologies;
- Adopt *river basin management concept* in infrastructure planning to ensure upstream and downstream compatibility;
- Conserve and develop water resources in areas where existing supply is constrained and protect against saline water intrusion in aquifers, groundwater contamination, and *ground subsidence*;
- Mitigate hazardous impacts of infrastructure projects by strict compliance with environmental rules and regulations particularly in the implementation of environmentally-critical infrastructure projects; and
- Require urban infrastructure projects to include properly designed and integrated landscaping components. This is especially relevant in built-up areas where major infrastructure projects are dominant visual elements that can compromise urban aesthetics and contribute to the degradation of the urban landscape.

While the negative impacts of infrastructure projects on protection areas should be prevented, established infrastructure projects also need to be protected from encroachment settlements and other activities that threaten their operational efficiency. Many infrastructure projects represent large investments that are difficult to replace and require extensive funding commitments. Such protection of infrastructure projects can be achieved by integrating them into local development and land use plans – by providing appropriate buffer areas, for example – and involving local (public and private sector) participation in monitoring enforcement activities.

(ii) Incorporate disaster mitigation principles in infrastructure development.

In addition to avoiding unnecessary encroachment into NIPAS and other protection areas, additional planning considerations are needed to incorporate disaster mitigation principles in infrastructure planning. These include:

- Designing infrastructure facilities according to specific hazard risk assessments;

- Building backup capabilities and alternative routes into infrastructure facilities, where appropriate, to ensure life support systems and services (fire-fighting services, access to medical services, power and water supply, transportation, and telecommunication) in the event of a disaster; and
- Intensifying or introducing disaster mitigation disaster mitigation measures in road projects, for instance, designing roads with slope protection, while at the same time emphasizing the need to adopt non-structural or non-engineering measures, such as warning system and controlled zoning. The use of non-structural measures also intends to reduce the need for large infrastructure investments. The adoption of non-traditional measures such as terracing rock sheds is also encouraged.

(c) Local and Private Sector Participation

Promote local and private sector participation in infrastructure planning and implementation**.**

Local and private sector participation in the planning and implementation of infrastructure projects should be encouraged. Lack of such participation has led to increased project costs, wasted resources, and protracted delays in project implementation. Sufficient participation, on the other hand, can lead to better design (through primary source identification and confirmation of project objectives), facilitate construction, and improve maintenance by fostering a degree of ownership among concerned local communities.

Sharing of capital costs and maintenance responsibilities between the LGUs and the private sector should also be encouraged.

3.1.4 Integrated Water Resources Management

(1) World Summit on Sustainable Development

The Plan of Implementation adopted at the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002 called for countries to "*develop Integrated Water Resources Management and Water Efficiency Plans by 2005"*. These "plans" are in fact milestones in cyclic and long-term national water strategy processes.

(2) World Water Forum

Along this line, the Third World Water Forum held in Kyoto, Japan, March 2003, has maintained discussion on IWRM in the sessions and reported by raising three key issues (details are referred to **Table 3.1**), as (1) IWRM shall address both the management of water as a resource and the framework for provision of water services to all categories of users, (2) Basin (river, lake or groundwater) must be recognized as the basic unit for planning and management, and (3) a firm societal commitment and proper public participation must be pursued.

The Fourth World Water Forum is scheduled to hold in Mexico, March 2006, and to announce IWRM as one of four Framework Themes, which are shown as follows (details are referred to **Table 3.2**):

- Providing water supply and sanitation services and infrastructure;
- Feeding the world while maintaining ecosystems;
- Revisiting Integrated Water Resource Management; and
- Interlinking water with other policy sectors for environmental sustainability.

(3) National Water Forum 2004

National Water Forum 2004 was held on March 22, 2004 in Manila to present and discuss the recent water issues and to hold the signing ceremony on *Clean Water Act* in Malacañang. The National Water Forum was originally the *National Water Conference* and led by the National Economic Development Authority (NEDA), which was then proposed to hold in 2002.

The holding of the Forum at this time was part of the directive to the 3rd World Water Forum meeting in Kyoto, Japan in March 22 – 24, 2003 and a manifestation to the 3rd World Water Forum declaration. The Forum is in consonance with the *Ministerial Declaration* during the 1st *Ministerial Meeting on Managing Water Resources* at the *First Southeast Asia Water Forum* held in Chiang Mai, Thailand on 21 November 2003, espousing among others the implementation of Integrated Water Resources Management (IWRM), basin approach, taking into consideration the critical role of water resources in the country's socio-economic development.

NWRB's role as the lead convener of the Forum is in light of its reconstitution per Executive No. 123 series of 2002. National Water Conference was then renamed as the National Water Forum to be held on March 22, 2004 to coincide with the celebration of World Water Day.

In this Forum the following recommendations to water related disasters and risk management were submitted.

- Intensify reforestation, forest protection and other watershed protection activities;
- Adopt philosophy of flood management in place of flood control;
- Enhance comprehensive land use planning LGUs;
- Push for the full implementation of solid wasted management plans under the *Ecological Solid Waste Management Acts*; and
- Conduct public awareness program and more research on disaster preparedness and mitigation.

OCD submitted recommendations to flood control are summarized and shown as follows;

- Adopt the revised master plan for forestry development recently completed by the Forest Management Bureau of the DENR;
- Undertake forestation and terracing or contour farming in hilly lands. Conversion of certain areas into forests to stem erosion and regain lost forestlands and watersheds;
- Adopt the philosophy of *Flood Management* in place of flood control, as part of IWRM. Flood management must be considered as part of IWRM because there are beneficial uses of floods such as in sustaining natural system;
- Include proper drainage and erosion control components in all roads and other public works particularly in hilly areas. This applies not only to national roads but also local roads and other public works;
- Restore the original width and channel capacity of rivers to allow them to convey flood discharge to the sea;
- Construct flood mitigation reservoirs and flood channels wherever appropriate to capture runoff and recharge groundwater aquifers;
- National government agencies should provide necessary technical assistance to LGUs in considering geophysical hazards and protection of water and other natural resources in the preparation of their comprehensive land use plans. Land-use regulations and zoning ordinances should consider the capacity of communities to accommodate the population so that people do not encroach into hazardous areas or in areas used for flood control;

- Secure multi-stakeholder consensus on and early passage of the pending *National Land Use Act*;
- Accelerate implementation of the *Ecological Solid Waste Management Act* of 2000 with the cooperation of the LGUs;
- Disaster preparedness, monitoring and mitigation: It is important that flood forecasting and early warning systems are properly maintained. These become especially important as communities continue to settle and grow in flood-prone areas;
- Public awareness and information campaign on possible water-related disasters as well as corresponding mitigation measures should be more intensely conducted through the printed material, radio and television;
- The efficiency of flood control strategies cannot be properly evaluated without a monitoring system. The duration and magnitude of every flood event should be mapped at the local and regional level by local government units and/or national government agencies. Flood mapping can aid in pinpointing local causes of flooding; and
- More research on water-related hazards should be conducted and flood forecasting methods and early warning systems should be further developed. The information-sharing system among government agencies involved in the generation and collection of information on weather and other natural phenomena that can induce water-related disasters should be further enhanced.

(4) Global Water Partnership (GWP)[4]

Global Water Partnership (GWP) Technical Committee (TEC) prepared 'Guidance in Preparing a National Integrated Water Resources Management and Efficient Plan' to provide practical advice on implementing the WSSD Plan of Implementation 2005 directive – explaining IWRM approaches in practical terms and outlining what needs to be done to prepare plans. It addresses in a practical, implementation-oriented way some of the constraints that countries may experience in preparing plans. It puts special emphasis on demystifying concepts, identifying the essential elements that need to be addressed as part of the process of change, and providing practical ideas on how to deal with typical issues that arise in the preparation of plans.

Some of tools provided in this guidance are shown as follows;

(a) Preparing a Plan-the Technical Content

Clearly, the technical content of a Plan will be entirely context-driven, responding directly to the specific water demand and supply characteristics of each country as well as its politics, history, culture, and ecology. As noted earlier, a Plan should provide a road map for changing from current fragmented ways of water resources planning, development, management and use to an integrated approach. It should therefore contain at least three parts: 1) Current approaches and 2) Desired future approaches to water resources planning, development, management and use and 3) The transition plan to change from current to future approaches, involving the updating of existing approaches to bring them in line with the desired new approach.

(b) Checklist of issues that might be addressed in an IWRM plan

- Interfaces between macro-economic and water resource decision making:
- Efficiency of water infrastructure;

4 Drawn from Falkenmark, Malin, "Water Management and Ecosystems: Living with Change", TEC Background Paper No. 9, Global Water Partnership

- Mitigation of the effects of floods and droughts and other extreme water-related events;
- Non-conventional water resources and conservation technologies;
- Water quality and broader environmental issues;
- Data collection systems, and access to information by users;
- Policy instruments and the legal and regulatory framework;
- The role of the state and the potential for public private partnerships;
- Processes for reconciling water quantity and quality need of all water users;
- Mechanisms for consultation and public participation;
- Water allocation systems;
- The roles of women in the provision, management and safeguarding of water;
- Capacity building;
- Management agencies (including river basin organizations); and
- Mechanisms to achieve financial sustainability.

(c) Practical approaches to balance human activities and ecosystem protection

Three key directions have to be incorporated in the emerging management system (secure-avoid-foresee): securing water-related services to the population, avoiding ecosystem degradation, and foreseeing changes and variability. Adequate attention has to be paid to the fact that water is deeply involved from many different perspectives through its many parallel functions:

- As societal support: health, socio-economic production, food/timber production, and energy production;
- In ecological services, both in terrestrial and aquatic ecosystems;
- In environmental threats from floods, droughts, diseases; and
- In its function as a "silent destroyer" through its two lift up/ carry away functions (erosion/sedimentation and solute transport).

(d) International Strategy for Disaster Reduction

The International Strategy for Disaster Reduction (ISDR) and UNDP are developing a framework for understanding, guiding and monitoring disaster risk reduction at all levels (refer to **Table 3.3**). The framework is composed of five thematic areas: (1) Political Commitment and Institutional Aspects, (2) Risk Identification, (3) Knowledge Management, (4) Risk Management Applications and (5) Preparedness and Emergency. In the framework, building and strengthening of community-based risk management and reduction are focused through information and educational activities over the affected and/or to be affected communities.

3.2 Budgeting System for Flood Control Works

3.2.1 General Appropriation

On the basis of MTPDP the national agencies prepare the Medium-Term Public Investment Program (MTPIP), in which the agencies provide all projects and programs to be implemented within the medium-term (six years). Until the annual budget execution/implementation, it may take a year starting in January (Budgeting timetable is shown in **Table 3.4**).

(1) General Appropriation of DPWH

The general appropriations bill is categorized into three references, they are first, second and third. Further, each reference is itemized with Programs and Projects. For the budget of 2003, a total of 42 billion pesos is allocated to the DPWH. The detailed percentage of allocations for the respective programs and projects are shown in table below:

Projects and Programs				Ratio
FIRST PREFERENCE				74.1%
A	PROGRAMS			
	I	General Administration and Support Services		1.3%
	II	Support to Operation		1.6%
	III	Operation		14.2%
B	PROJECTS			
	I	Locally Funded Project(s)		57.0%
		a.	National Arterial, Secondary & Local Roads and Bridges	20.7%
		b	Flood Control and Drainage Projects	1.8%
		c	Various Infrastructures including Local Projects	27.1%
		d	Preliminary/Detailed Engineering	0.6%
		e	National Buildings	0.2%
		f	Other National Public Works/Local Infrastructure Projects	6.5%
		g	Accessibility Facilities for Disabled Persons	0.1%
		h	Infrastructure Support to Gender and Development	0.0%
SECOND PREFERENCE				25.9%
A	PROGRAMS			
	I	General Administation and Support		0.1%
	II	Support to Operation		0.1%
	III	Operations		3.1%
B	PROJECTS			
	II	Foreign Assisted Project(s)		22.6%
		a	Highways (Roads and Bridges) Projects	17.6%
		b	Flood Control Projects	5.0%

In the Locally Funded Projects, the biggest allocation is Various Infrastructures including Local Projects, which is a lump-sum budget to be allocated to the Representatives (Congressman and Senator) so called as “Pork Barrel” (Priority Development Assistant Fund = PDAF, previously Countrywide Development Fund = CDF) accounting for 27.1% of total budget. Flood Control and Drainage Projects shares only 1.8% of total and 3.2% of Locally Funded Projects, while National Roads and Bridges occupies 20.7% of total and 36.3% of Locally Funded Projects.

The ratio of foreign loan in the 2003 budget of the DPWH is estimated at 22.6%, out of which Flood Control Projects is 22.1% and Highways Projects is 77.9%.

(2) Locally Funded Flood Control Projects

In the general appropriation, the budget for flood control projects, which were locally funded are estimated within last five years.

The allocation for each region is tabulated below:

	Region and Item	2003	2002	2000	1999
1	National Capital Region		6,388,000	955,000,000	264,000,000
2	Region I		5,007,000	35,130,000	187,000,000
3	Cordillera Administration Region	15,400,000	33,932,000	37,000,000	23,000,000
4	Region II	7,371,000	14,740,000	33,100,000	80,000,000
5	Region III		36,200,000	112,500,000	141,294,000
6	Region IV-A	1,000,000	1,250,000	99,792,000	47,000,000
7	Region IV-B	78,624,000	28,892,000	54,140,000	82,000,000
8	Region V	24,630,000	100,639,000	71,360,000	111,000,000
9	Region VI	3,258,000	10,731,000	149,640,000	164,000,000
10	Region VII	550,000	17,210,000	33,000,000	118,000,000
11	Region VIII	69,900,000	89,358,000	69,500,000	20,000,000
12	Region IX + ARMM (Basilan, Sulu & Tawi-tawi)	10,000,000		40,761,000	30,000,000
13	Region X	3,395,000	12,603,000	64,695,000	76,000,000
14	Region XI	8,000	26,169,000	191,700,000	102,000,000
15	Region XII + ARMM (Lanao del Sur & Maguuindanao)	58,926,000	102,198,000	71,260,000	62,891,000
16	Region XIII	10,632,000	31,873,000	115,333,000	89,784,000
a.	Right-of-Way	120,000,000	115,000,000	87,996,000	242,000,000
b.	Payment for Completed Pinatubo	110,525,000	97,705,000		
c.	Payment for Financial Losses	5,881,000	97,705,000		
d.	Other Urgent Flood Control and Drainage Projects	234,119,000	248,171,000	354,900,000	320,000,000
	Total	283,694,000	1,058,414,000	2,576,807,000	2,159,969,000

Note: Budget for 2000 was reenacted for 2001.

The budget for flood control projects (locally funded) has been suddenly decreased 2001 to 2002 and 2003. For the regional level, Regions IV-B, VIII and XII+ARMM have maintained the budget for flood control projects. The allocation to other regions dropped sharply.

3.2.2 Budget of Local Government Units

As it is figured out in Sub-section 4.2.2: Local Government Code in 1991, the Local Government Code in 1991 was enacted in 1992 aiming at decentralization, devolution and development of the country. In line with the Code, it devolved to the local government units' responsibility for the delivery of various aspects of basic services that earlier were the responsibility of the national government. The basic services include health, social services, environment, agriculture, public works (funded by local funds), education, tourism, telecommunication services and housing projects, and other services such as investment support.

The Code increased the financial resources available to local government units by:

(1) Broadening their taxing powers;

(2) Providing them with a specific share from the national wealth exploited in their area; e.g. mining, fishery, and forestry charges; and

(3) Increasing share from the national taxes, i.e. internal revenue allotments (IRA), from previously low of 11% to as much as 40%.

The Code also increased the elbowroom of local governments to generate revenues form local fees and charges. Finally, the Code also laid the foundation for the development and evolution of more entrepreneurial oriented local governments. For instance, it provided the foundations for local

governments to enter into build-operate-transfer arrangement with the private sector, float bond, obtain loans from local private institutions, etc.

Although the share in national budget: IRA has increased abruptly, it is generally observed that IRA has been unable to cover the costs of devolution. Therefore, the budgeting to the flood control works by LGUs is rarely affordable, while minor drainage projects of the LGUs are undertaken using their regular budget for infrastructure.

Outside Metro Manila, flood control, urban drainage and other urban infrastructure projects of the LGUs are implemented through credit facilities provided by the Land Bank of the Philippines (LBP), Development Bank of the Philippines (DBP), and the Municipal Finance Corporation (MFC, formerly Municipal Development Fund Office of the Department of Finance) under the following WB-, ADB- and JBIC-assisted projects:

Project	**Executing Agency**
Philippine Regional Municipal Development Project (PRMDP)	DILG
Subic Bay Area Municipal Development Project (SBAMDP)	DILG
Clark Area Municipal Development Project (CAMDP)	DILG
Mindanao Basic Urban Sector Services (MBUSS)	DILG
Local Government Finance and Development Project (LOGOFIND)	DOF
LGU Urban Water and Sanitation Projects 1 and 2 (LGUUWSP)	DBP
Mindanao Rural Development Project - Coastal Marine Project (MRDP-CMP)	DA
Water Districts Development Project (WDDP)	LBP
Local Government Units Support Credit Program	LBP

These credits are usually called as “Two-step Loan”, where the LGUs may borrow funds for infrastructure projects through the guarantee of the national governments or national funding institutions. Generally the interest rate for amortization may be added by 9% to 10% on the original rate of the foreign funding institutions so that the LGUs could not afford to repayment for the said “Two-step Loan”.

On the other hand, the LGUs may request for financial assistance from the PDAF of congressmen.

3.2.3 Foreign Assistance

Budgeting for the foreign funded projects also included in the general appropriation for the national agencies, the DPWH. The MTPIP is the primary basis for identification of country program projects to ensure that the projects supportive of the MTPDP are given due priority in funding. The project study shall also specify the cash flow requirements, such as:

- Payment of principal and interest;
- Peso component of capital costs and project preparation;
- Infrastructure and support facilities to be financed by the government;
- Operating and other expenditures for which General Fund support is required; and
- Peso requirements needed as counterpart.

The budgeting for the foreign assisted projects requires (1) ICC Evaluation and NEDA Board Approval and (2) Donor Appraisal and Approval through their evaluation panel and appraisal meetings.

(1) Funding Institutions for Flood Control Works

The flood control projects are, in the recent years, funded by mostly Japanese Government through Japan International Cooperation Agency (JICA), Japan Bank for International Cooperation (JBIC, formerly Overseas Economic Cooperation Fund = OECF) and other institutions for findings and preliminary studies. Other funding institutions such as WB and ADB usually finance to water resources developments except for flood control, transportation, urban development, environmental conservation, etc. while the US-Aid financed for rehabilitation works of Mt. Pinatubo Hazard in the recent years.

JICA is the main institution which has been conducting most of the surveys, investigations and studies for flood control nation-wide in the Philippines on the grant basis. Starting with "the Study on Pampanga Delta Development Project" in 1975, either master plan or feasibility study of flood control works were conducted by JICA for more than 1/3 of 18 major river basins. Further, the sabo (sediment control) master plans were prepared for Mayon Volcano and Mt. Pinatubo Hazard Mitigation projects.

Delegating to Japanese Government, JICA has undertaken grant-aid projects for flood control; such as Pampanga River Basin Flood Forecasting and Warning System, Ormoc City Flood Mitigation Project and Metro Manila Flood Operation and Warning System Project. In January 2000, JICA has provided project type technical cooperation: Project ENCA, which is on-going now.

On the other hand, JBIC has provided loans for flood control projects, usually on the basis of JICA master plans and feasibility studies. From the beginning of ODA loan operation in 1972, JBIC (OECF) has committed the first flood control project "Manila and Suburbs Flood Control and Drainage Project" in 1973. As of December 1998, JBIC has provided ODA loan for the following flood Control projects.

- Metro Manila (Mangahan Floodway and Drainage)
- Pasig (Marikina) River (Flood Operation and Warning System)
- Pampanga River (including Flood Forecasting and Warning System)
- Bicol River (Dredging and Flood Forecasting and Warning System)
- Cotabato River (River Dredging only)
- Agusan River (Lower Reaches)
- Cagayan River (Flood Forecasting and Warning System)
- Agno River (including Flood Forecasting and Warning System)
- Mt. Pinatubo Hazard Prevention

In the recent years, the expanded budget deficit is a real problem. With debt service accounting for over one third revenues there is insufficient to finance necessary infrastructure to meet the needs of the growing population – estimated at over 81 million at year end 2002 and growing by 2.3% annually.

Another indicator flashing warning signs is the debt service ratio where the steady growth of the external debt has this to rise from 12.8% in 1998 to 19.4% at the end of 2002. Therefore, the government has started to limit the external debt: loan for financing and spending for the infrastructure development, including flood control projects.

(2) Allocation to Flood Control Projects

As the foreign loan is also counted in an annual national budget, the budgetary allocations to the flood control projects in 1999 to 2003 are shown in table below:

No.	Project Title	Location	Funding Source	1999 Appropriation (million pesos)			2000 Appropriation (million pesos)			2002 Appropriation (million pesos)			2003 Appropriation (million pesos)		
				Loan Proceed	Peso Counterpart	Total	Loan Proceed	Peso Counterpart	Total	Loan Proceed	Peso Counterpart	Total	Loan Proceed	Peso Counterpart	Total
1.	Metro Manila Flood Control Project II, Balut, Vitas and San Andres Pumping	Metro Manila	OECF 14th Loan	12.5	6.5	19.0									
2.	Lower Agusan Development Project, Stage 1, Phase I	Butuan City	OECF 14th Loan	66.4	55.3	121.7	66.4	55.3	121.7						
3.	Pampanga Delta Development Project, Flood Control Component	Pampanga and Bulacan	OECF 16th Loan	288.5	80.0	368.5	155.6	65.4	221.0						
4.	Agno and Allied Rivers Urgent Rehabilitation Project	Pangasinan	OECF 20th Loan	208.3	38.0	246.3	197.8	60.7	258.5	340.5	122.4	462.9	38.9	75.9	114.8
5.	Mount Pinatubo Hazard Urgent Mitigation Project, Flood Control Component	Tarlac and Pampanga	OECF 21th Loan	570.0	296.4	866.4	0.0	103.1	103.1						
6.	Metro Manila Flood Control Project, West of Mangahan Floodway	Metro Manila and Rizal	OECF 21th Loan	104.7	82.6	187.3	147.9	185.8	333.7	431.4	74.0	505.4	80.2	46.7	126.9
7.	Lower Agusan Development Project, Stage 1, Phase II	Butuan City	OECF 21th Loan	85.9	47.1	133.0	184.3	138.5	322.8	448.1	185.3	633.4	150.1	100.1	250.2
8.	Iloilo Flood Control Project	Iloilo City	OECF 22nd Loan	44.5	5.5	50.0	87.0	11.4	98.4	44.5	5.5	50.0	24.0	96.0	120.0
9.	Agno and Allied Rivers Urgent Rehabilitation Project, Phase II	Pangasinan	OECF 22nd & 24th Loan	35.6	14.4	50.0	106.9	140.5	247.4	340.4	113.0	453.4	224.8	96.4	321.2
10.	Flood Mitigation Project in Ormoc City	Ormoc City	Japanese Grant-aid	0.0	81.7	81.7	0.0	43.7	43.7	91.0	81.7	172.7			
11.	San Roque Multi-purpose Project (Flood Control Component)	Pangasinan	Reimbursable of Funds				0.0	22.3	22.3	0.0	22.3	22.3	0.0	15.4	15.4
12.	Pasig-Marikina River Channel Improvement Project	Metro Manila	OECF 23th Loan				0.0	8.5	8.5	60.7	34.8	95.5	61.7	6.8	68.5
13.	Mt. Pinatubo Hazard Urgent Mitigation Project (Flood/Lahar Control Works in Pasig Potrero River and Pasac Delta Area)	Tarlac and Pampanga	OECF 23th Loan				0.0	28.0	28.0	380.4	203.8	584.2	497.4	155.2	652.6
14.	KAMANAVA Flood Control and Drainage System Improvement Project	Metro Manila	JBIC Special Yen Loan				0.0	37.3	37.3	249.6	159.8	409.4	191.8	82.2	274.0
15.	Pinatubo Hazard Urgent Mitigation Project	Pampanga	JBIC Special Yen Loan							56.5	27.9	84.4			
16.	Restoration/Rehabilitation in the Pinatubo Pilot Area	Pampanga, Bataan and Zambales	Finish Assistance							40.0	4.7	44.7	20.0	5.9	25.9
17.	Laoag River Basin Flood Control and Sabo Project	Ilocos Norte	JBIC 24th Loan							62.0	6.1	68.1	86.4	57.6	144.0
18.	Rehabilitation of the Flood Control Operation and Warning System in Metro Manila	Metro Manila	Japanese Grant-aid							0.0	8.1	8.1			
	TOTAL			**1,416.4**	**707.5**	**2,123.9**	**945.9**	**900.5**	**1,846.4**	**2,545.1**	**1,049.4**	**3,594.5**	**1,375.3**	**738.2**	**2,113.5**

On average 2.4 billion pesos are allocated to the flood control projects, of which foreign loan is counted at 1.6 billion pesos.

CHAPTER 4. ORGANIZATIONS AND LAWS/REGULATIONS

4.1 Organizations

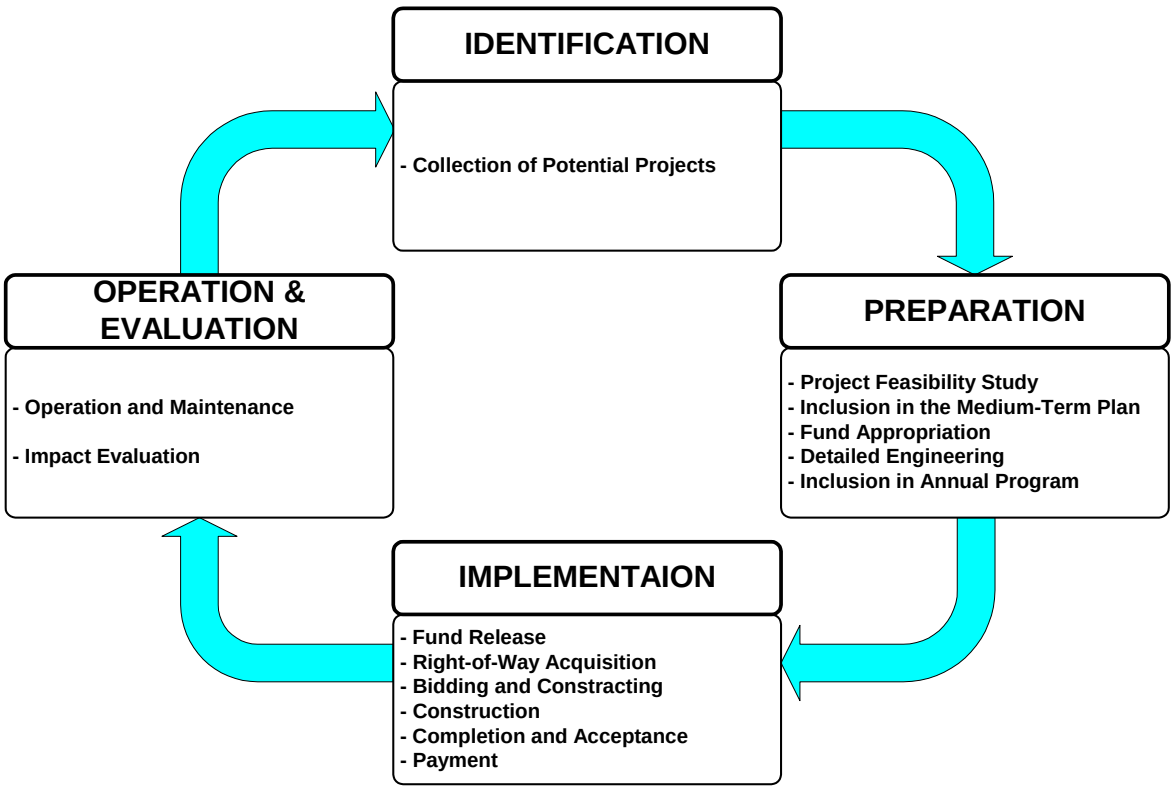
4.1.1 Department of Public Works and Highways

Department of Public Works and Highways (DPWH) is one of the three departments of the government undertaking major infrastructure projects. The DPWH is mandated to undertake (a) planning of infrastructure, such as roads and bridges, flood control, water resources projects and other public works, and (b) design, construction, and maintenance of national roads and bridges, and major flood control systems. These activities are undertaken in support of the national objectives of (a) alleviating rural poverty and attaining food security, and (b) expanding industries for greater productivity and global competitiveness as envisioned in the MPDP 2001-2004.

The DPWH functions as the engineering and construction arm of the Government tasked to continuously develop its technology for the purpose of ensuring the safety of all infrastructure facilities and securing for all public works and highways the highest efficiency and quality in construction.

(1) Functions

The functions are presented in the order of a process for the Infrastructure Development Cycle, which the development of infrastructure projects (e.g. roads, bridges, flood control facilities and water supply) follows a cycle process consisting of four phases as follows:



PROJECT IDENTIFICATION

It is the process of collecting potential projects with expected return of investments.

PROJECT PREPARATION

a. Project Feasibility Study

The feasibility study consists of various investigations and tests necessary to determine whether the project can and should be carried out and if, so, how and when?

b. Inclusion in the Medium-Term

If the project meets the above feasibility criteria, it is considered for inclusion in the medium-term infrastructure program for the period of six years.

c. Fund Appropriation

Based on the medium-term infrastructure program, appropriations for the projects are authorized thru legislation.

d. Detailed Engineering

Detailed engineering of a project under the medium-term program is undertaken in preparation for actual implementation under the annual infrastructure programs.

e. Inclusion of Project in Annual Program: Programming

Projects proposed for inclusion in the annual infrastructure program are a) those rank high in priority within the medium-term program, and b) those are technically ready for actual implementation during the year (i.e. with substantially completed detailed engineering).

PROJECT IMPLEMENTATION

a. Fund Releases

Immediately after the NEDA Board approves the annual infrastructure program in early November, the DBM issues the Advice's of Allotment (AAs) for the projects in the program on a comprehensive basis.

b. Right-Of-Way Acquisition

The right-of-way of any infrastructure project, such as road, should be acquired ahead of construction in order not to impede the work.

c. Bidding and Contracting

In line with the policy of the government to rely on the private sector as the main engine of economic development, infrastructure projects are generally undertaken by contract after public bidding.

d. Construction

Actual construction work is carried out through the Project Management Offices (PMO) and the Regional/District Engineering Offices.

e. Completion and Acceptance

Project completion is the transition from the development to the operational stage. Completion reports and as-built plans are prepared for the submission to the implementing office heads, to management, and to funding institutions.

f. Payment

Due and demandable claims are processed by the DPWH either at the Central, Regional or District level, in accordance with existing government budgeting, accounting and auditing rules

PROJECT OPERATION AND EVALUATION

a. Operational and Maintenance

National roads and bridges, major flood control structures, and related facilities of national importance remain under the responsibility of the DWPH during the operational phase. The Regional and District Engineering Offices undertake the maintenance of the facilities generally by administration

b. Impact Evaluation

Impact evaluation or post-project appraisal is an attempt to assess the results of a project and, as a function of the results, of the means employed to achieve them.

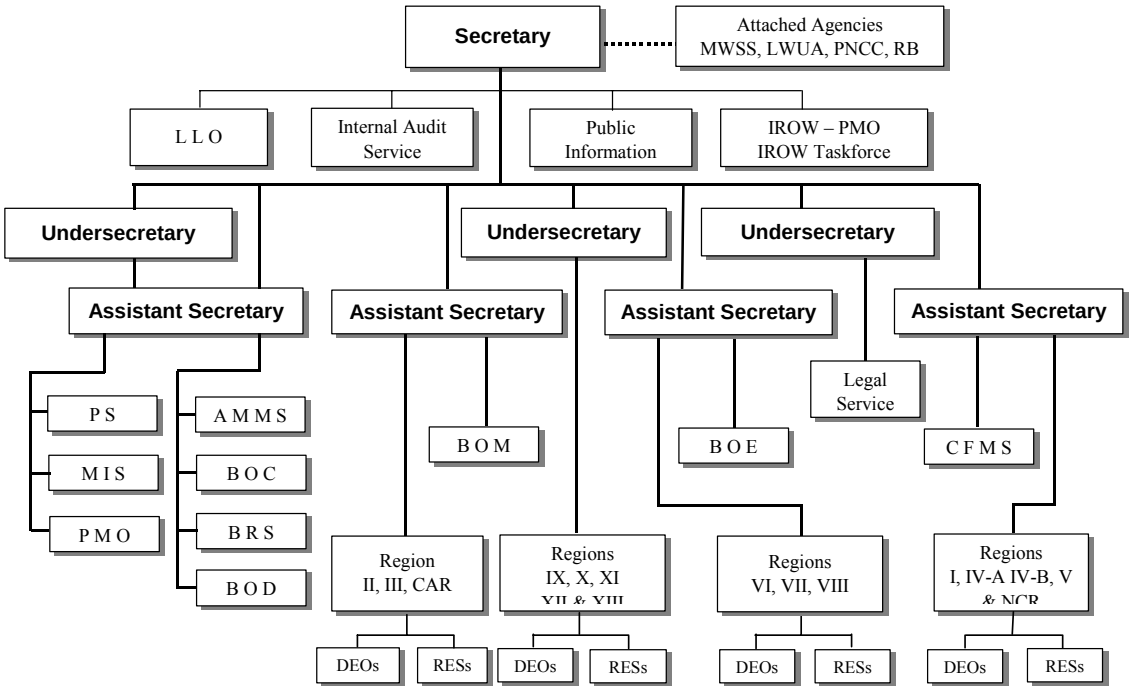
(2) Organization

Organizational structure of the Department of Public Works and Highways is pursuant to Executive Order No. 124 dated 30 January 1987. The authorities and areas of responsibilities are based on the Department Orders No. 114, 127 & 149 Series of 2003.

Central Office

As of August 2004, there are 10 bureau level offices and seven project management offices (PMOs) in the Central Office of DPWH. (Organizational Charts of Bureaus are detailed in **Annex 10**)

Office	Regular	Contractual	Daily	Total
Department Proper	1,299		196	1,495
Bureau Staff	1,138		79	1,217
Regional Offices	18,524		13,582	32,106
PMOs	112	1,229	510	1,851
Total	21,073	1,229	14,367	36,669



Among seven PMOs, PMO-Major Flood Control Projects (MFCP) and Mount Pinatubo Emergency mainly undertake flood control and sabo projects, which are usually under foreign assisted. Their on-going projects for flood control and sabo are as follows:

(a) PMO-MFCP – Project Management Office for Major Flood Control Projects

(i) Cluster I

On-going major flood control projects nationwide funded by any or all of the lending agencies.

Name of Project	Location (Region)	Year Started	Funding Source
Metro Manila Flood Control Project - West Mangahan Floodway	NCR	Construction 1997	JBIC
KAMANAVA Flood Control and Drainage System Improvement Project	NCR	Construction 2003	JBIC
Iloilo Flood Control Project	VI	Construction 2005	JBIC
Pasig-Marikina River Channel Improvement Project	NCR	Construction 2006	JBIC
Project ENCA: Flood Control and Sabo Engineering Center (FCSEC)	Nationwide		JICA

(ii) Cluster II

On-going major flood control projects nationwide funded by any or all of the lending agencies

Name of Project	Location (Region)	Year Started	Funding Source
Lower Agusan Flood Control Project	CARAGA	Construction 1997	JBIC
Agno and Allied Rivers Urgent Mitigation Project	CAR, I & III	Construction 2003	JBIC
Laoag River Basin Flood Control and Sabo Project	I	Construction 2005	JBIC

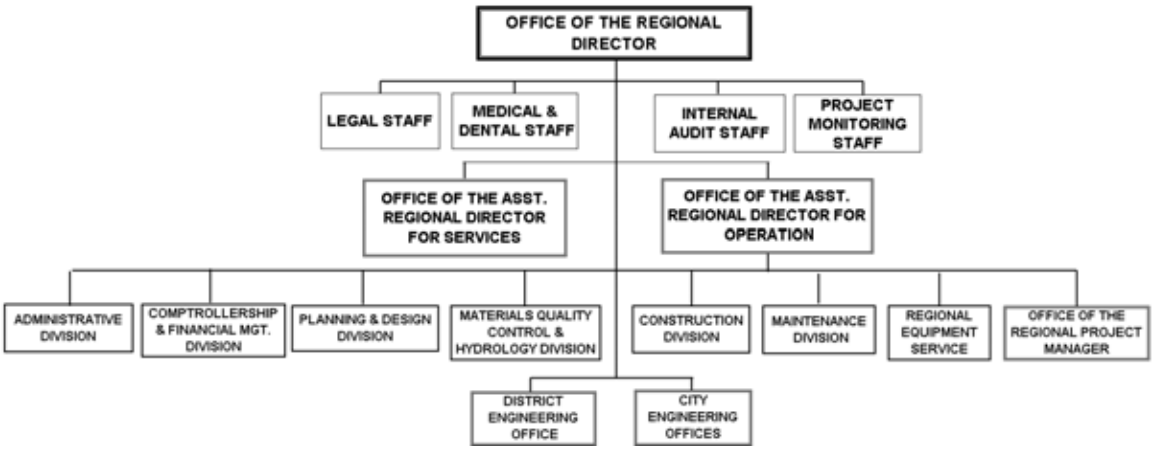
(b) MPE-PMO (Mount Pinatubo Emergency-Project Management Office)

This PMO is located in San Fernando, Pampanga and executing some rehabilitation and improvement works in devastated areas due to the eruption of Mt. Pinatubo. The on-g0ing projects are mainly funded by JBIC, as follows:

Name of Project	Location (Region)	Year Started	Funding Source
Mt. Pinatubo Hazard Urgent Mitigation Project	III	Construction 1996	JBIC
Mt. Pinatubo Hazard Urgent Mitigation Project (II)	III	Construction 1999	JBIC

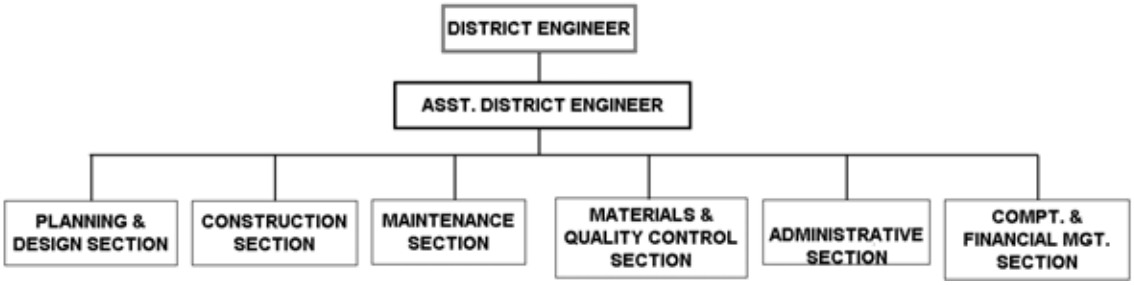
Regional Office

There are 16 regional offices nation-wide to mainly undertake the locally funded infrastructure projects, 176 district engineering office under the regional office. Typical organizational structure of regional office is shown below:



In the Regional Office, there are usually six divisions and one regional equipment service, of which the Engineer V [5] is placed as the division chief except for Administrative and Comptrollership & Financial Management Divisions. Further, 75 to 80 engineers are assigned to conduct the service and operation for the infrastructure projects, under the engineering division.

In a region or under the Regional Offices, there are 10 to 15 District Engineering Offices, with an organization as below:



Engineer V is usually assigned as the District Engineer and Engineer IV is for Chief of engineering sections. About 10 to 25 engineers are assigned to the engineering sections and working for the implementation of locally funded projects as well as special projects under Country-wide Development Fund (CDF).

As of 2002, the total number of DPWH engineers in the Regional Offices nation-wide is estimated at around 7,000 to 8,000 for permanent employees.

[5] One of the positions for ranking technical officials in the DPWH. Starting with Engineering Aid, Engineer I to V, and above which Project Manager I to IV.

(3) History of DPWH Organization

Chronology

The development of the Department of Public Works and Highways (DPWH) into its present structure underwent a long process of evolution spanning a century of significant events in laying the groundwork for the physical foundation of the country.

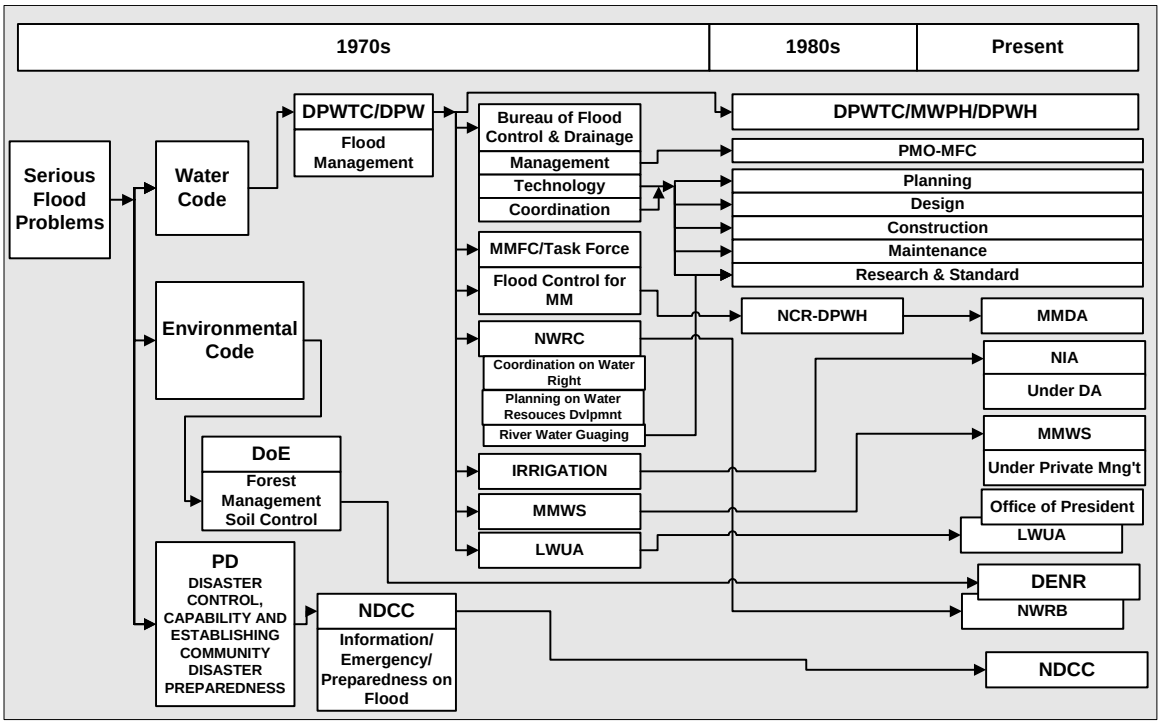
The Department is considered as old as the Philippine Government, its existence dates back to about four centuries at the time of the Spanish colonial era. It emerged from its embryonic form in 1565 when the first settlement roads were constructed by forced labor. It was in 1868 when the Bureau of Public Works and Highways (Obras Publicas) and Bureau of Communications and Transportation (Communicationes y Meteologia) were organized under a civil engineer known as "Director General".

Since then, the Department underwent various stages of development and evolution that largely depended upon the change in government shift of administration policies, and reorganization in its structure and responsibilities to suit the demands of times.

Finally after a long process of evolution by virtue of Executive Order No. 124, dated January 30, 1987, the agency is now known as the Department of Public Works and Highways (DPWH) with five bureaus, six services, 16 regional offices, 24 project management offices, 16 regional equipment services and one-hundred eighteen 118 district engineering offices.

Undertakings of Flood Control Works by DPWH

In the early 1970s many typhoons and floods of which the biggest was by Typhoon Dading in October 1971 attacked Central and Southern Luzon. The flood control works was started as one of the significant infrastructure by the Philippine Government delegated to DPWH, as below:



4.1.2 National Governments related to Flood Control

(1) Department of Environment and Natural Resources (DENR)

As provided for under Section 4 of E.O. 192, the DENR is mandated to be the primary government agency responsible for the conservation, management, development and proper use of the country's environment and natural resources, including those in reservations, watershed areas and lands of the public domain, as well as the licensing and regulation of all natural resources utilization as may be provided by law in order to ensure equitable sharing of the benefits derived therefrom for the welfare of the present and future generations of Filipinos.

Functions

The powers and functions of the DENR, per Section 5 of E.O. 192, are as follows:

- Advise the President on the enactment of laws relative to the development, use, regulation and conservation of the country's natural resources and the control of pollution;
- Formulate, implement and supervise the government's policies, plans and programs pertaining to the management, conservation, development, use and replenishment of the country's natural resources.
- Promulgate rules and regulations in accordance with law governing the exploration, development, conservation, extraction, disposition, use and such other commercial activities tending to cause the depletion and degradation of our natural resources;
- Exercise supervision and control over forest lands, alienable and disposable lands, and mineral resources and impose appropriate payments, fees, charges, rentals and any such form of levy and collect such revenues for the exploration, development, utilization or gathering of such resources;
- Undertake exploration, assessment, classification and inventory of the country's natural resources using ground surveys, remote sensing and complementary technologies;
- Promote proper and mutual consultation with the private sector involving natural resources development, use and conservation;
- Undertake geological surveys of the whole country including its territorial waters;
- Establish policies and implement programs for the:
    - Accelerated inventory, surveys and classification of lands, forest and mineral resources using appropriate technology, to be able to come up with a more accurate assessment of resource quality and quantity;
    - Equitable distribution of natural resources through the judicious administration, regulation, utilization, development and expansion of natural resource-based industries;
    - Promotion, development and expansion of natural resource-based industries;
    - Preservation of cultural and natural heritage through wildlife conservation and segregation of national parks and other protected areas;
    - Maintenance of a wholesome natural environment by enforcing environmental protections laws; and
    - Encouragement of greater people's participation and private initiative in natural resource management.
- Promulgate rules and regulations necessary to:

- Accelerate cadastral and emancipation patent surveys, land use planning and public land titling:
- Harness forest resources in a sustainable manner, to assist rural development, support forest-based industries, and provide raw materials to meet increasing demands, at the same time keeping adequate reserves for environmental stability; and
- Expedite mineral resources surveys, promote the production of metallic and non-metallic minerals and encourage mineral marketing.

- Regulate the development, disposition, extraction, exploration and use of the country's forestland and mineral resources;
- Assume responsibility for the assessment, development, protection, conservation, licensing and regulation as provided for by law, where applicable, of all natural resources; the regulation and monitoring of service contractors, licensees, lessees, and permittees for the extraction, exploration, development and utilization of natural resource products; the implementation of programs and measures with the end in view of promoting close collaboration between the government and the private sector; the effective and efficient classification and sub-classification of lands of the public domain; and the enforcement of natural resources laws, rules and regulations;
- Promulgate rules, regulations and guidelines on the issuance of co-production, joint venture or production sharing agreements, licenses, permits, concessions, leases and such other privileges and arrangement concerning the development, exploration and utilization of the country's natural resources and shall continue to oversee, supervise and police our natural resources; to cancel or cause to cancel such privileges and arrangements upon failure, non-compliance or violations of any regulations, orders, and for all other causes which are in furtherance of the conservation of natural resources and supportive of the national interest;
- Exercise exclusive jurisdiction on the management and disposition of all lands of the public domain and shall continue to be the sole agency responsible for the classification, sub-classification, surveying and titling of lands in consultation with appropriate agencies;
- Implement measures for the regulation and supervision of the processing of forest products, grading and inspection of lumber and other forest products and monitoring of the movement of timber and other forest products.
- Promulgate rules and regulations for the control of water, air and land pollution; Promulgate ambient and effluent standards for water and air quality including the allowable levels of other pollutants and radiations;
- Promulgate policies, rules and regulations for the conservation of the country's genetic resources and biological diversity, and endangered habitats; which will be presented to the Cabinet for the President's approval;
- Formulate an integrated, multi-sectoral, and multi-disciplinary National Conservation Strategy, which will be presented to the Cabinet for President's approval;
- Exercise other powers and functions and perform such other acts as may be necessary, proper or incidental to the attainment of its mandates and objectives.

Organization

The present DENR organizational structure is headed by the Secretary of Environment and Natural Resources, assisted by three (3) Undersecretaries and three (3) Assistant Secretaries, each assigned to a key functional office. Six (6) bureaus represent the staff sectoral bureaus, namely:

- Forest Management Bureau (FMB)

- Lands Management Bureau (LMB)
- Environmental Management Bureau (EMB)
- Ecosystems Research and Development Bureau (ERDB)
- Protected Areas and Wildlife Bureau (PAWB)
- Mines and Geosciences Bureau

At the operational level, DENR organization reflects a line structure under the direct supervision of the Field Operations Office. The line functions are decentralized down to three levels, namely:

- Regional level - Regional Environment and Natural Resources Offices
- Provincial level - Provincial Environment and Natural Resources Offices (PENROs)
- Community level - Community Environment and Natural Resources Offices (CENROs)

A Regional Office is established in each of the fifteen (15) administrative regions, namely: DENR - Regional Offices Nos. 1 to 13, the DENR - National Capital Region (NCR) and DENR - Cordillera Autonomous Region (CAR). It is headed by a Regional Executive Director (RED), supported by four Regional Technical Directors (RTD) each heading a major services. The regional technical services are:

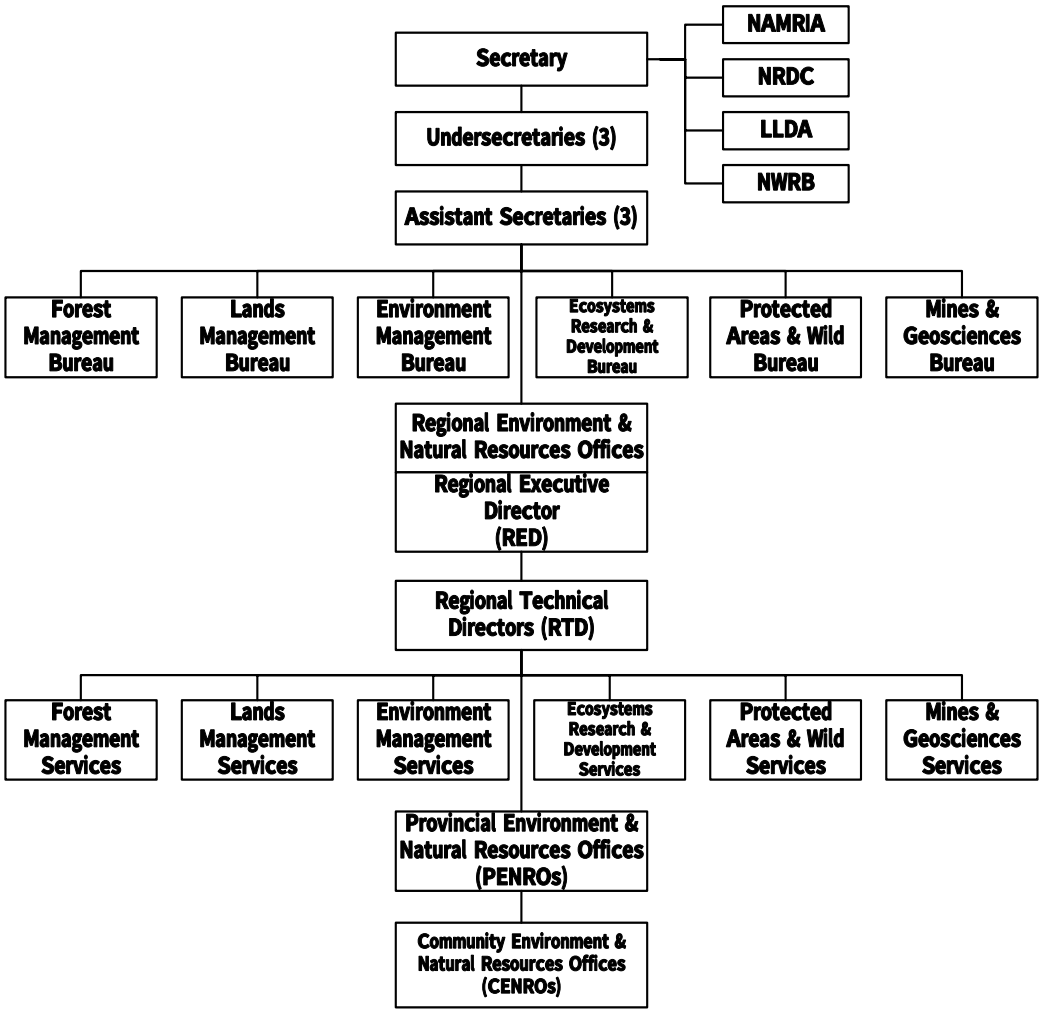
- Forest Management Services (FMS)
- Lands Management Services (LMS)
- Environmental Management Services (EMS)
- Ecosystems Research and Development Services (ERDS)
- Protected Areas and Wildlife Services (PAWS)
- Mines and Geosciences Services

There are at present 73 Provincial Environment and Natural Resources Offices (PENROs), one PENRO for almost every province. There are also 171 Community Environment and Natural Resources Offices (CENROs), each covering several municipalities in a province, presently existing in provinces with PENROs. This excludes the transferred four PENROs and eight CENROs to the Autonomous Region of Muslim Mindanao (ARMM) by virtue of R.A. 6733. The DENR provincial office is headed by a Provincial Environment and Natural Resources Officer (PENRO). The district office is headed by the Community Environment and Natural Resources Officer (CENRO). In the case of small province, the PENRO also acts as the CENRO in the province.

There are also four attached agencies/corporations, namely:

- National Mapping and Resource Information Authority (NAMRIA)
- Natural Resources Development Corporation (NRDC)
- Laguna Lake and Development Authority (LLDA)
- National Water Resources Board (NWRB)

The organizational chart is shown as follows;



(2) National Economic Development Authority (NEDA)

The National Economic and Development Authority (NEDA), as mandated by the Philippine Constitution, is the country's independent economic development and planning agency. It is headed by the President as chairman of the NEDA board, with the Secretary of Socio-Economic Planning, concurrently NEDA Director-General, as vice-chairman. All Cabinet members, as well as the Central Bank Governor, are members of the NEDA Board.

Functions

The powers and functions of the NEDA reside in the NEDA Board. It is the country's premier social and economic development planning and policy coordinating body.

The Board is composed of the President as chairman, the Secretary of Socio-Economic Planning and NEDA Director-General as vice-chairman, and the following as members: the Executive Secretary and the Secretaries of Finance, Trade and Industry, Agriculture, Environment and Natural Resources, Public Works and Highways, Budget and Management, Labor and Employment, and Interior and Local Government.

Pursuant to Sec. 4 of EO 230, empowering the President to modify the membership of the Board whenever deemed necessary, the following members have been added:

The Secretaries of Health, Foreign Affairs, and Agrarian Reform (per Memorandum Order No. 164, dated 21 March 1988); the Secretary of Science and Technology (per Memorandum Order No. 235, dated 19 May 1989); and the Secretary of Transportation and Communications (per Memorandum Order No. 321, dated 26 September 1990). In addition, the Secretary of Energy (per R.A. No. 7638, approved Dec. 9, 1992) and the Deputy Governor of the Bangko Sentral ng Pilipinas (per Section 124 of R.A. No. 7653, approved June 14, 1993) have been added as members of the NEDA Board.

Organization

Assisting the NEDA Board in the performance of its functions are five cabinet-level interagency committees. These are as follows:

(a) Development Budget Coordination Committee (DBCC)

The DBCC is composed of the Secretary of Budget and Management, as chairman; the Director-General of the NEDA Secretariat, as co-chairman; and the Executive Secretary, Secretary of Finance and the Governor of the Central Bank of the Philippines, as members. The DBCC recommends to the President the following:

- Level of annual government expenditures and the ceiling of government spending for economic and social development, national defense, and government debt service;
- Proper allocation of expenditures for each development activity between current operating expenditures and capital outlays; and;
- Amount set to be allocated for capital outlays broken down into the various capital or infrastructure projects.

(b) Infrastructure Committee (InfraCom)

The InfraCom is composed of the Director-General of the NEDA Secretariat, as chairman; Secretary of Public Works and Highways, as co-chairman; and the Executive Secretary and Secretaries of Transportation and Communications, Finance, and Budget and Management, as members. The InfraCom does the following:

- Advise the President and the NEDA Board on matters concerning infrastructure development, including highways, airports, seaports and shore protection; railways; power generation, transmission and distribution; telecommunications; irrigation, flood control and drainage, water supply and sanitation; national buildings for government offices; hospitals and related buildings; state colleges and universities elementary and secondary school buildings; and other public works;
- Coordinate the activities of agencies, including government-owned or controlled corporations involved in infrastructure development; and
- Recommend to the President government policies, programs and projects concerning infrastructure development consistent with national development objectives and priorities.

(c) Investment Coordination Committee (ICC)

The ICC consists of the Secretary of Finance, as chairman; the NEDA Director-General, as cochairman; and the Executive Secretary, the Secretaries of Agriculture, Trade and Industry, Budget and Management and the Governor of the Central Bank of the Philippines, as members. The ICC has the following functions:

- Evaluate the fiscal, monetary and balance of payments implications of major national projects, and recommends to the President the timetable of their implementation on a

regular basis;

- Advise the President on matters related to the domestic and foreign borrowings program; and
- Submit a status of the fiscal, monetary and balance of payments implications of major national projects.

(d) Social Development Committee (SDC)

The Committee is composed of the Secretary of Labor and Employment, as chairman; the Director-General of the NEDA Secretariat as cochairman; and the Executive Secretary, and the Secretaries of Education, Culture and Sports, Health, Interior and Local Government, Agrarian Reform, Agriculture, Social Welfare and Development, and Budget and Management, as members.

The SDC performs the following functions:

- Advise the President and the NEDA Board on matters concerning social development, including education, manpower, health and nutrition, population and family planning, housing, human settlements, and the delivery of other social services.
- Coordinate the activities of government agencies concerned with social development; and
- Recommend appropriate policies, programs and projects consistent with the national development objectives.

(e) Committee on Tariff and Related Matters (CTRM)

The CTRM is composed of the Secretary of Trade and Industry, as chairman, with the Director-General of the NEDA, as co-chairman. Its members are the executive Secretary, the Secretaries of Foreign Affairs, Agriculture, Transportation and Communications, Environment and Natural Resources, Budget and Management, and Finance, the Governor of the Central Bank, and the Chairman of the Tariff Commission.

The CTRM does the following:

- Advise the President and the NEDA Board on Tariff and related matters and on the effects on the country of various international developments;
- Coordinate agency positions and recommends national positions for international economic negotiations; and
- Recommend to the President a continuous rationalization program for the country's tariff structure.

(f) NEDA Board Executive Committee

Created under Memorandum Order No. 222 (dated 26 July, 1994), the NEDA Board Executive Committee resolves policy issues without the necessity of convening the entire NEDA Board. It facilitates the decision-making process at the NEDA Board to ensure that projects or issues requiring NEDA Board discussion and decision are immediately acted upon.

The NEDA Board ExCom is composed of the Executive Secretary as Chairman; the Secretary of Socio-Economic Planning and NEDA Director-General as Co-Chairman; Chairpersons of the Development Budget Coordination Committee, Investment Coordination Committee, Committee on Tariff and Related Matters, Social Development Committee; Co-Chairperson of the Infrastructure Committee; and the Governor of the

Bangko Sentral ng Pilipinas.

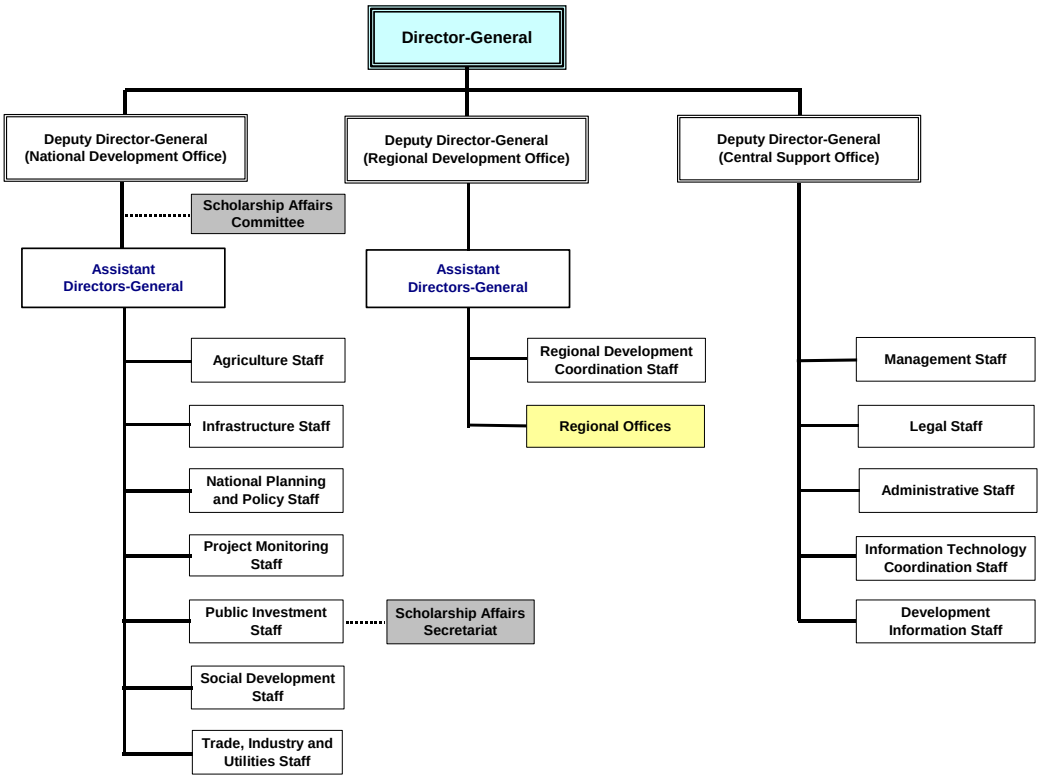
(g) NEDA Secretariat

The NEDA Secretariat serves as the research and technical support arm of the NEDA Board. It also provides technical staff support and assistance, including the conduct of studies and formulation of policy measures and other recommendations on the various aspects of development planning and policy formulation, and coordination, evaluation and monitoring of plan implementation.

The Secretariat is headed by a Director-General who carries the rank and title of Secretary of Socio-Economic Planning and Development and who exercises general supervision and control over the technical and administrative personnel of the Secretariat.

The NEDA Director-General is assisted by three deputy director-generals, each of whom is responsible, respectively, for the three major offices of NEDA, the National Development Office (NDO), the Regional Development Office (RDO) and Central Support Office (CSO). Assisting the deputy directors-general in their task of coordinating and supervising their respective Offices are three assistant director-generals.

Each of the Central Office Staffs is headed by a staff director, assisted by an assistant director, while each Regional Office is headed by a regional director, assisted by an assistant regional director. The organizational set-up is shown below (Functions and roles of NEDA Secretariat with its offices are presented in **Annex 7**):



(3) National Irrigation Administration (NIA)

NIA was established in 1963 as a government agency charged with the development, operation and maintenance of irrigation systems all over the country.

Functions

NIA aims to development water resources for irrigation and provide corollary services in line with the agricultural development program of the national government. In particular, NIA is to develop irrigation systems in support of the national food production program, whose level of service should be adequate to enhance the economic and social growth in the rural areas. Consequently, NIA is to ensure their stability through the proper maintenance and operation of these systems.

In the course of implementation of irrigation systems, NIA sometimes constructs flood control facilities like dike to protect the systems, in case they are developed flood prone areas.

Organization

Its organizational set-up consists of a seven-man Board of Directors and a Management hierarchy headed by and an administrator. He is assisted by a deputy administrator and four assistant administrators who are: (a) Project Development and Implementation; (b) Systems Operations and Equipment Management; (c) Finance and Management; and Administrative Services.

It has 13 regional irrigation offices (RIO) nationwide, 67 provincial irrigation offices (PIO) and 101 irrigation systems offices (ISO).

(4) Laguna Lake Development Authority (LLDA)

The Laguna Lake Development Authority was organized in 1966 by virtue of Republic Act 4850 as a quasi-government agency with regulatory and proprietary functions. By virtue of Presidential Decree 813 in 1975 and Executive Order 927 in 1983, its powers and functions were further strengthened to include environmental protection and jurisdiction over surface waters of the lake basin. In 1993, the administrative supervision over LLDA was transferred to the Department of Environment and Natural Resources (DENR) through Executive Order 149.

Functions

Its functions are described as follows;

- Lead, promote and accelerate the development and balanced growth of the Laguna de Bay basin within the context of national and regional plans and policies for social and economic development and to carry out the development of the basin with due regard and adequate provision for environmental management and control, preservation of the quality of human life and ecological systems, and the prevention of undue ecological disturbances, deterioration and pollution.
- Catalyze Integrated Water Resource Management in the Laguna de Bay Region, showcasing the symbiosis of Man and Nature for sustainability, with focus on preserving ecological integrity and promoting economic growth with equitable access to resources.

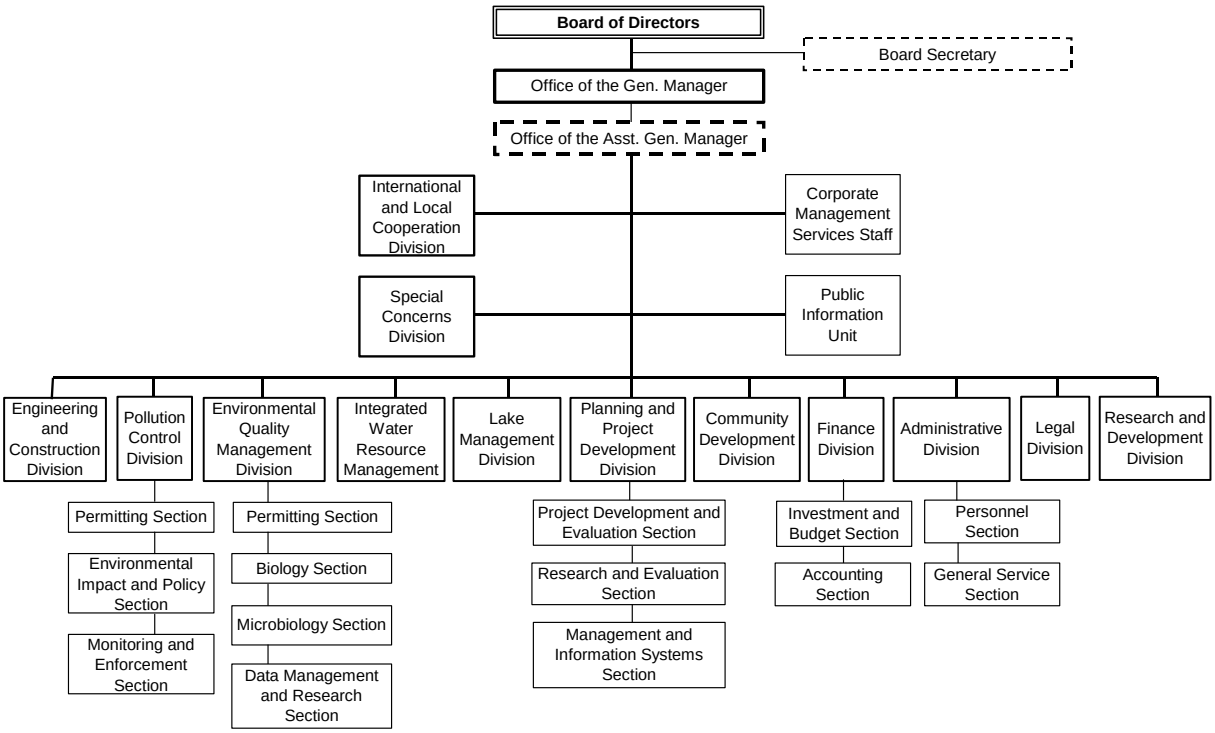
Organization

LLDA management and operation is carried out through its Technical, Administrative and Corporate Management Divisions under the direct supervision of a General Manager and an Assistant General Manager.

A group of professionals in the field of limnology and environmental management, specifically, water quality monitoring, pollution control, hydrology water/wastewater analysis, regional development planning, resource economy, among others form part of LLDA's staff complement.

A Board of Directors, composed of ten (10) members representing the central and local government units and the private sector, serves as the highest policy-making body of LLDA. It is specifically tasked to formulate, prescribe, amend and repeal policies, rules and regulations to

direct the corporate affairs and conduct of business of the Authority. The organization of LLDA is shown below:



Flagship Programs

In line with its thrust and priorities, the following Flagship Programs are envisioned to pave the way for the transformation of the LLDA from a dominantly regulatory to a market/client-driven developmental agency:

- *Environmental User Fee Program* as the centerpiece of LLDA's Environmental Management Program;
- *River Rehabilitation Program* with strong community organizing and information, education and communication (IEC) components to form partnerships among LLDA, LGUs, POs and NGOs to sustain the program;
- Lake Fishery Management Program with emphasis in the full implementation of the *Revised Zoning and Management Plan (ZOMAP)* for Laguna de Bay and the deconcentration of LLDA's administrative functions over the Seven Crater Lakes; and
- *Laguna de Bay Shoreland Management* to be highlighted by the demarcation of the 12.50 m elevation around the lake and intensified IEC Campaign.
- River Rehabilitation Program

One of the country's premiere development corridors, CALABARZON (Cavite - Laguna - Batangas - Rizal - Quezon); is located within the watershed of Laguna de Bay, the largest inland body of water in the Philippines. The presence of these vital resources has contributed largely to the zone's significant economic success. This success brought with its rapid population expansion, urbanization and industrialization.

However, as rapid as the rate of this economic zone's development is the destruction of the rivers and streams flowing through them, which ultimately drain into Laguna de Bay. Indiscriminating dumping of domestic and industrial waste, and contamination of hazardous run-off from

agricultural lands have resulted into the threatened extensive of these tributaries and the life forms they sustain.

With the escalating need to arrest the further deterioration of Laguna de Bay and its tributaries, and to undertake rehabilitation efforts for these waterways, the Laguna Lake Development Authority launched the *River Rehabilitation Program***.**

In 1996, the Laguna Lake Development Authority launched its River Rehabilitation Program and placed it under its *Community Development Division* for implementation. The flagship utilizes an integrated approach to watershed management. It takes into account both water quality and quantity in the continuum to the downstream areas of thriving urbanization all the way to the lake basin. (Refer to **Annex 8** as a summary of Sustainable Development of Laguna de Bay Environment (SDLBE) Project)

(5) Philippine Climate Authority (PAGASA)

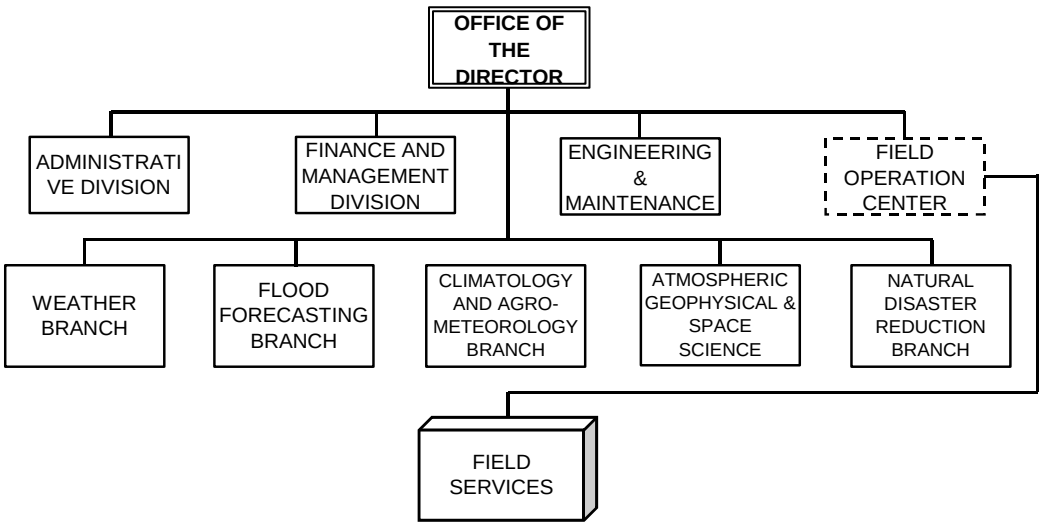
PAGASA's mandate is to provide protection against natural calamities and utilize scientific knowledge as an effective instrument to insure the safety, well-being and economic security of all the people, and for promotion of national progress.

Functions

PAGASA, presently existing, is hereby reorganized and shall have the following functions:

- Maintain a nationwide network pertaining to observation and forecasting of weather and other climatologically conditions affecting national safety, welfare and economy;
- Undertake activities relative to observation, collection, assessment and processing of atmospheric and allied data for the benefit of agriculture, commerce and industry;
- Engage in studies of geophysical and astronomical phenomena essential to the safety and welfare of the people;
- Undertake researches on the structure, development and motion of typhoons and formulate measures for their moderation; and
- Maintain effective linkages with scientific organizations here and abroad, and promote exchange of scientific information and cooperation among personnel engaged in atmospheric, geophysical and astronomical studies.

Organization



PAGASA's organization chart is presented as follows. Functions of Flood Forecasting Branch and Natural Disaster Reduction Branch are closely related with flood control works conducted by DPWH. The other branches are also important role for flood control because they provide basic information and data on meteorology.

(a) Flood Forecasting Branch Functions

Office of Weather Services Chief (OWSC):

- Formulate, administer and review the implementation of the agency's operational hydrology plans, programs and policies.
- Coordinate the operations of the River Flood Forecasting and Warning Centers with the Field Operation Center.
- Coordinate the public information/education drive and investigation on floods with the other unit
- Maintain local/international water-related linkages/cooperation

Flood Forecasting and Warning Section (FFWS)

- Undertake meteorological and hydrological conditions monitoring for flood forecasting and disaster mitigation
- Coordinate the monitoring operation activities of the river flood forecasting and warning centers.
- Collaborate with other water-related government agencies of the hydrological aspect of the various inter-agency flood protection activities.
- Develop/improve methods, procedures and techniques in flood forecasting.

Hydrometeorological Investigations and Special Studies Sections (HISSS)

- Undertake basic hydro-meteorological data measurements, processing and publication.
- Establish, operate and maintain hydro-meteorological station network.
- Coordinate the primary data processing of the river flood forecasting and warning centers.
- Develop/improve methods, procedures and techniques in hydrometeorological prediction and other applications.

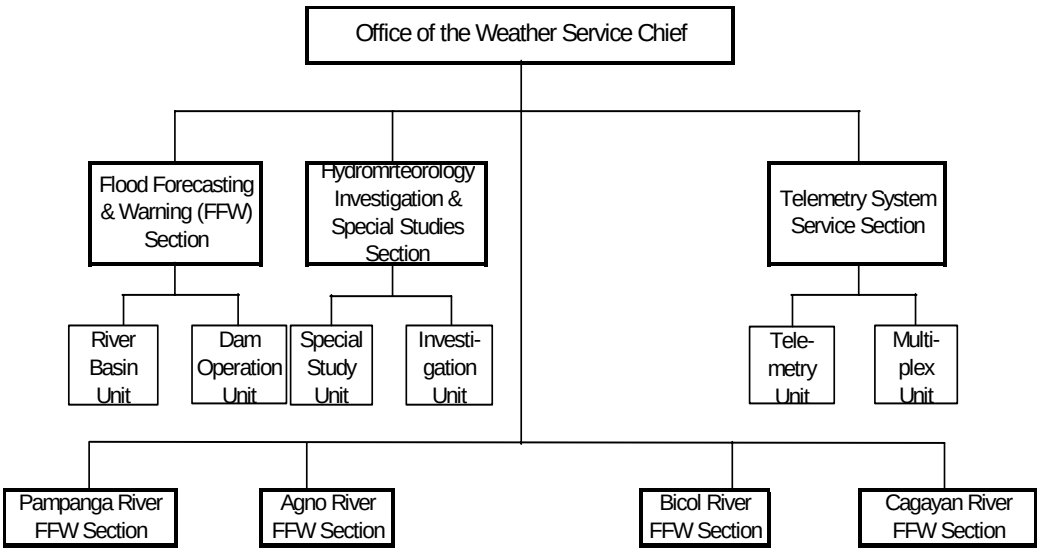
Telemetry System Services Section (TSSS)

- Take charge in the overall operation and maintenance of telemetry/ telecommunication system networks, and electronic-mechanical and gauging equipment.
- Collaborate with other water-related government agencies on the telemetry/ telecommunication aspect of the various inter-agency flood protection activities.

Pampanga/Agno/Bicol/Cagayan River Flood Forecasting and Warning Centers

- Monitor the basin's meteorological and hydrological conditions for hydrological (flood) forecasting (Flood Forecasting and Warning System for Dam Operation: FFWSDO, Refer to **Annex 9**).
- Conduct/participate in hydrologic/hydrographic data measurement and processing, and post-flood investigation for the basin.

- Operate and maintain the basin's telemetry system, electro-mechanical and gauging equipment, observing station and other facilities under its jurisdiction.



FLOOD FORECASTING BRANCH ORGANIZATION STRUCTURE

(b) National Disaster Reduction Branch Function

- Undertake researches on tropical cyclones and other disaster causing phenomena and on weather modification; undertakes comprehensive hazards and vulnerability assessments;
- Study measures to reduce risk of damage and casualties due to meteorological hazards such as tropical cyclones, thunderstorms and monsoons; conducts impact assessment of weather parameters on diseases, human comfort and changes on coastal zones;
- Undertake information, education and communications (IEC) program of activities to increase the level of awareness of the population, the decision and policy-makers on natural hazards, disaster preparedness, mitigation and prevention (PMP); and
- Recommend relevant policy options pertaining to strategies for adaptation and mitigation of impacts of natural hazards.

(6) National Water Resources Board (NWRB)

NWRB was created by virtue of PD 424 and renamed from Council to Board through EO 124-A with powers to coordinate and integrate water resources development activities. It is the agency mandated to administer and enforce PD 1067, otherwise known as the Water Code of the Philippines, with the functions of regulating the utilization, exploitation, development, control, conservation or protection of water resources; including the Economic Regulation of water utilities operation under PD 1206 and CA146 on the Public Service Law.

Functions

In particular, the jurisdictional powers, functions and duties of NWRB include:

- Formulate policies and guidelines on water resources development and management;
- Effect cross-sectoral and inter-departmental coordination of water resources development activities;
- Grant issue water permits and certificates of public convenience and necessity;

- Advise NEDA on matters relating to water resources development plan, programs and projects, and
- Exercise jurisdiction over disputes concerning water allocation and utilization.

Reorganization

(a) Recent Reorganization

EO No. 123 stipulated for reorganization as follows;

- NWRB shall to immediately initiate a review of the Implementing Rules and Regulations (IRR) of the Water Code, and amend the same as may be necessary to effectively implement and enforce the provisions of the Code. NWRB shall likewise formulate a new/revised organization structure for its Secretariat to effectively and efficiently carry out its mandate under PD 424 and PD 1067.
- Upon approval by the President of the new/revised organization and manpower structure of the NWRB Secretariat, the NWRB shall then be transferred to DENR as a bureau for purposes of administrative control and supervision.
- DENR shall ensure that the NWRB Secretariat is managed effectively, efficiently and economically. For this purpose, DENR shall:
  - Rationalize/harmonize its organization structure, together with that of NWRB, to eliminate duplication of functions and facilitate integration and coordination;
  - Ensure the effective and continuous implementation of NWRB's policies and programs without unduly expanding its personnel and resource requirements.
  - Enjoin NER to utilize existing DENR structures and facilities to effectively perform its functions; and
  - Streamline the systems and procedures and/or decentralization of functions with the end view of rendering faster service without surrendering appropriate controls

(b) Composition of the Board

NWRB previously under the DPWH has been transferred to the Office of the President. The membership of the Board is reconstituted with EO No. 123 to exclude those with direct claims on water resource. The present composition of the Board is shown as follows;

Chair	:	Secretary of Environment and Natural Resources
Vice-Chair	:	Secretary of Socio-Economic Planning
Members:	Secretary of Justice	
		Secretary of Finance
		Secretary of Health
		Director, National Hydraulic Research Center
(NHRC), UP		
		Executive Director, NWRB Secretary

(7) National Disaster Coordination Council (NDCC)

NDCC was created under PD No. 1566 for "Strengthening the Philippines Disaster Control, Capability and Establishing the National Program on Community Disaster Preparedness".

Functions and Role

Its functions and role are presented as follows;

- Advise the President on the status of disaster preparedness programs, disaster operations and rehabilitation efforts undertaken by the government and the private sector;
- Advise the lower-level Disaster Coordinating Councils and Disaster Control Groups through the Office of Civil Defense in accordance with the guidelines on disaster management;
- Formulate policy guidelines on emergency preparedness and disaster operations involving relief and rehabilitation;
- Formulate priorities in the allocation of funds, services, disaster equipment and relief supplies;
- Formulate a comprehensive disaster management plan based on various calamities/disaster that often hit the country (i.e. drought, flooding, typhoon, earthquake, etc.);
- Recommend to the President the declaration of a state of calamity in areas extensively damaged; and submits proposals to restore normalcy in the affected areas, subject to the provision of RA 8185;
- Constitute a technical Working Group composed of permanent representatives from the member-Departments and other government agencies with the Executive Officer as head; and
- Utilize the facilities and services of the Office of Civil Defense in Camp Aguinaldo, Quezon City, in discharging its functions.

Members of NDCC

Members of NDCC are composed of the following governmental agencies;

Department of Agriculture (DA)
Department of Budget and Management (DBM)
Department of Education , Culture and Sports (DECS)
Department of Environment and Natural Resources (DENR)
Department of Finance (DOF)
Department of Health (DOH)
Department of Interior and Local Government (DILG)
Department of Labor and Employment (DOLE)
Department of National Defense (DND)
Department of Public Works and Highways (DPWH)
Department of Social Welfare and Development (DSWD)
Department of Tourism (DOT)
Department of Trade and Industry (DTI)
Department of Transportation and Communication (DOTC)

Department of Science and Technology (DOST)

National Economic and Development Authority (NEDA)

National Housing Authority (NHA)

Philippine Information Agency (PIA)

Philippine National Red Cross (PNRC)

Other Agencies

Role of DPWH

DPWH is a one of the members of NDCC, bearing some components for disaster mitigation using its capacity and facility as describing as follows;

- Organize reaction teams in the department proper as well as in all bureaus and offices under it;
- Prepare and identifies buildings/infrastructures and facilities for appropriate use as possible evacuation shelter in future emergencies;
- Provide warning to the public on impending releases of water from dams under its control;
- Assist in providing transportation facilities to transport relief supplies, personnel and disaster victims;
- Make available existing communications facilities for disaster operations;
- Provide heavy and light equipment for rescue and recovery operations; and
- Restore destroyed public works such as flood control, national/secondary roads and bridges, central and regional offices of the national government agencies and their public buildings.

Flood Prone Areas

NDCC has published the locations of Flood Prone Areas in units of municipality through its web-site. There are 954 locations (cities/municipalities) presented as follows:

Region I	130
Region II	64
Region III	88
Region IV-4	111
Region V	64
Region V	55
Region VI	31
Region VII	199
Region VIII	70
Region IX	70
Region X	46
Region XI	42
Region XII	16
Region CARAGA	28
ARMM	10
Total	954

(8) National Hydraulic Research Center (NHRC-UPERDFI)

The NHRC is an attached research center to University of the Philippines Engineering Research and Development Foundation, Inc. (UPERDFI), which was formally organized in 1972 as a private, non-stock, non-profit corporation based in the University of the Philippines, Diliman Campus.

Objectives

The objectives of UPERDFI are to promote and support engineering research and development in the country, in furtherance and enhancement of its economic development. More details are:

- Assist the development and growth of a core of engineering educators in the country in general and at the University of the Philippines in particular;
- Support scholarships and other forms of academic endeavors and achievements in the field of engineering;
- Serve as a private institutional medium for research and innovation, technology development and utilization, strategic studies, continuing education, technological services and information dissemination in the various fields of engineering or areas where engineering knowledge is applied; and
- Engage in advocacy that would contribute towards the country's economic and technological development.

Functions and Roles

The UPERDFI maintains the earlier established capacity for research and development in the College of Engineering, in the National Engineering Center, and in the National Hydraulic Research Center. Especially, the NHRC has developed into a regional center of excellence in water resources researches in Southeast Asia.

Not limited to flood control sector, the NHRC has been conducting some hydraulic researches and tests for nation's major water resources development projects such as Mangahan Floodway, Magat Multipurpose Dam, Iloilo Flood Control Project and Laoag River Basin Flood Control and Sabo Project in the last two decades.

(9) Philippine Institute of Volcanology and Seismology (PHIVOLCS)

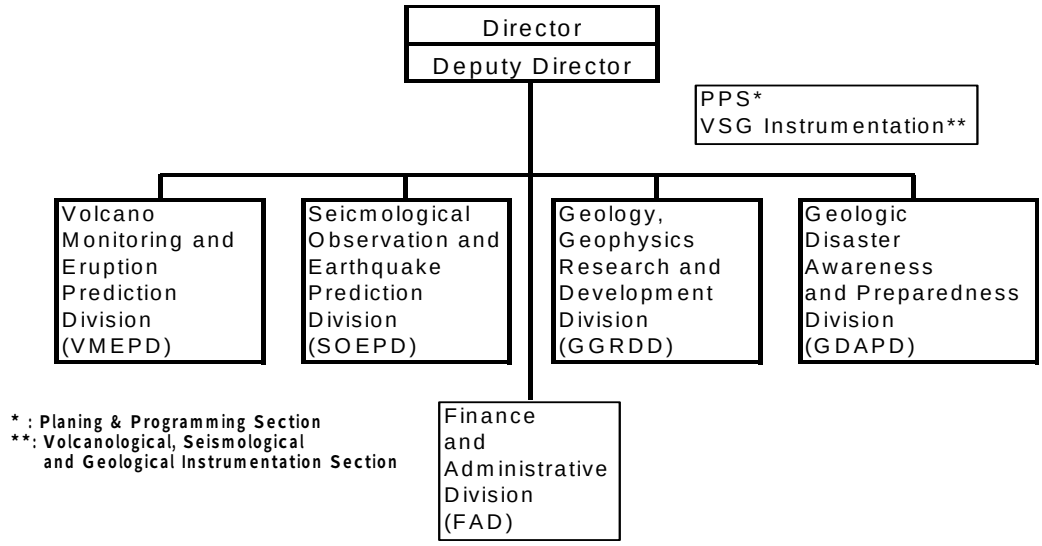
Functions and Roles

As specified in Executive Order No. 128, PHIVOLCS has been mandated to perform the following functions:

- Predict the occurrence of volcanic eruptions and earthquakes and their geotectonic phenomena;
- Determine how eruptions and earthquakes shall occur and also areas likely to be affected;
- Exploit the positive aspects of volcanoes and volcanic terrain in furtherance of the socio-economic development efforts of the government;
- Generate sufficient data for forecasting volcanic eruptions and earthquakes;
- Formulate appropriate disaster-preparedness and mitigation plans; and
- Mitigate hazards of volcanic activities through appropriate detection, forecast and warning system.

Organization

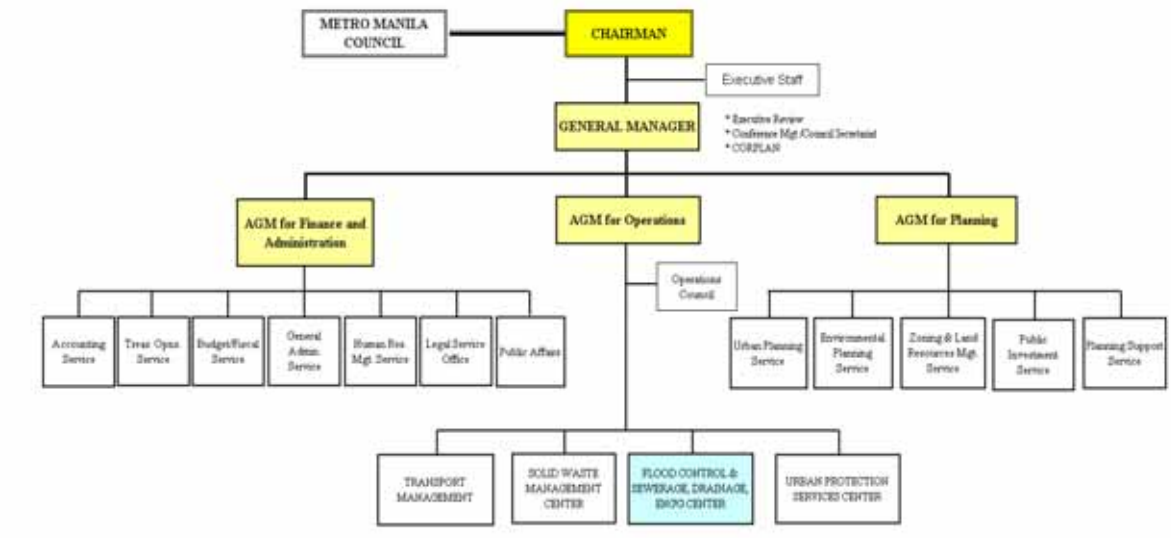
Organizational structure of PHIVOLCS is presented below. Geologic Disaster Awareness and Preparedness Division (GDAPD) includes debris or lahar disaster, which is closely related to the field of Sabo Engineering.



The Philippne Institute of Volcanology and Seismology Organization Chart

(10) Metro Manila Development Authority (RA 9724)

On 24 July 1994 by virtue of RA 9724, "An Act Creating the Metropolitan Manila Development Authority, Defining its Powers and Functions, Providing Funding therefor and for Other Purposes", the former Metro Manila Authority (MMA) was replaced by Metro Manila Development Authority (MMDA). The organizational structure is shown below:



Organizational Structure of MMDA

Scope of Services

Under the law, the MMDA shall perform planning, monitoring and coordinative functions, and in the process exercise regulatory and supervisory authority over the delivery of metro-wide services

within Metro Manila without diminution of the autonomy of the local government units concerning purely local matters. Tasks to perform are as follows:

(a) Preparation of Development Plan

- Medium and long-term development plans: development evaluation and packaging of projects; and
- Investment programming and coordination and monitoring of plan, program and project implementation.

(b) Transport and Traffic Management

- Formulation, coordination and monitoring of policies, standards, programs and projects to rationalize the existing transport operations, infrastructure requirements, the use of thoroughfares, and promotions of safe and convenient movement of persons and goods;
- Provision for the mass transport system and the institution of a system to regulate road users;
- Administration and implementation of all hirer enforcement operations, traffic engineering services and traffic education programs, including the institution of a single ticketing system in Metropolitan Manila.

(c) Solid Waste Disposal and Management

Formulation and implementation of policies, standards, programs and projects for proper and sanitary waste disposal

It shall likewise include the establishment and operation of sanitary landfill and related facilities and the implementation of other alternative programs intended to reduce, reuse and recycle solid waste.

(d) Flood Control and Sewerage Management

Formulation and implementation of policies, standards, programs and projects for an integrated flood control, drainage and sewerage system.

(e) Urban Renewal, Zoning and Land Use Planning, and Shelter Services

Formulation, adoption and implementation of policies, standards, rules and regulations, programs and projects to rationalize and optimize urban land use and provide direction to urban growth and expansion.

- Rehabilitation and development of slum and blighted areas;
- Development of shelter and housing facilities and the provision of necessary social services thereof.

(f) Health and Sanitation, Urban and Pollution Control

Formulation and implementation of policies, rules and regulations, standards, programs and projects for:

- Promotion and safeguarding of the health and sanitation of the region and
- Enhancement of ecological balance and the prevention, control and abatement of environmental pollution.

(g) Public Safety

- Formulation and implementation of programs and policies and procedures to achieve public safety, especially preparedness for preventive or rescue operations during times of calamities and disasters such as conflagrations, earthquake, flood and tidal waves; and
- Coordination and mobilization of resources and the implementation for rehabilitation and relief operations in coordination with national agencies concerned.

Functions and Powers

Functions and powers of MMDA are defined as follows:

- Formulate, coordinate and regulate the implementation of medium and long-term plans and programs for the delivery of metro-wide services, land use and physical development within Metropolitan Manila, consistent with national development objectives and priorities.
- Prepare, coordinate and regulate the implementation of medium term investment programs for metro-wide services which shall indicate sources and uses of funds for priority programs and projects, which shall include the packaging of projects and presentation to funding institutions;
- Undertake and manage on its own metro-wide programs and projects for the delivery of specific services under its jurisdiction subject to the approval of the Council. For this purpose, MMDA can create appropriate project management offices;
- Coordinate and monitor the implementation of such plans, programs and projects in Metro Manila; identify bottlenecks and adopt solutions to problems of implementation; and
- The MMDA shall set the policies concerning traffic in Metropolitan Manila, and coordinate and regulate the implementation of all programs and projects concerning traffic management specifically pertaining to enforcement, engineering and education. Upon request, it shall be extended assistance and cooperation, including but not limited to, assignment of personnel, by all other government agencies and offices concerned.

Metro Manila Council

As the governing board and policy making body of the MMDA, Metro Manila Council is placed, composed of the mayors of thirteen (13) cities and four (4) municipalities as of 2004, and representatives from DOTC, DPWH, DOT, DBM, HUDCC and PNP as non-voting members. The functions of the Council are:

- It shall approve metro-wide plans, programs and projects and issue rules and regulations and resolutions deemed necessary by the MMDA to carry out the purposes of this Act.
- It may increase the rate of allowances and per diems of the members of the Council to take effect during the term of the succeeding Council; it shall fix the compensation of the officers and personnel of the MMDA, and approve the annual budget thereof for submission to the DBM.
- It shall promulgate rules and regulations and set policies and standards for metro-wide application governing the delivery of basic services, prescribe and collect service and regulatory fees, and impose and collect fines and penalties.

4.1.3 Other Organizations

The consulting firms and construction companies are examined if they are well capable for carrying out the flood control projects.

(1) Consulting Firms

(a) Consultant's Organization: COFILCO

The Confederation of Filipino Consulting Organizations (COFILCO) was organized in 1988 in response to Executive Order 164, signed in 1986, which was to guide all government Departments, Government Corporations, Agencies, and Bureaus and attached agencies in the purchase of services for government projects. The Implementing Rules and Regulations of the Republic Act No. 9184 recognize COFILCO as the Umbrella of Consulting Organizations.

Under the RA 9184, the Umbrella Organization shall prepare and certify a list of fields and expertise in such fields available with the local consultants, which shall be updated annually. Further, the organization shall accredit its members on the types of services and fields of professions where their members are technically and financially qualified to offer their services. It shall likewise police its members for the development of the industry. Lastly, the government may consult and deal with this Umbrella Organization on matters relating to the industry.

The Confederation of Filipino Consulting Organizations (COFILCO) is presently composed of ten member-organizations (MEM'O) of Consultants. Three of which are mainly engaged in civil engineering:

- **Council of Engineering Consultants, Inc. (CECOPHIL)** – composed of corporations, which include Domestic and Foreign Consultants.
- **Council of Filipino Consultants, Inc. (COFIC)** – the composition is a conglomeration of corporation, partnership and sole proprietorship of various professional fields.
- **Association of Consultants Civil Engineers of the Philippines Inc. (ACCEP)** – the association is composed of consulting firms principally engaged in the various branches of Civil Engineering like Roads, Bridges, Ports, Water Supply, Irrigation, Drainage, Flood Control, Geotechnical, Structural Engineering and the like.

(b) Capacity for Flood Control

From the list of members shown in **Annex 12a**, 19 members of CECOPHIL and COFIC were surveyed to evaluate their qualifications as consultants for flood control project implementation. Those firms not surveyed mostly specialize in only one discipline, like topographic surveying, geotechnical investigation, structural design or construction management. The 19 surveyed firms offer consulting services in feasibility study, design, construction supervision, topographic survey and geotechnical investigation.

Only two surveyed firms have more than 100 million pesos average annual revenue and more than 200 full time employees. As shown in **Annex 12b**, the 19 firms indicated that they are stronger in flood control, urban drainage and irrigation than in sabo engineering and watershed management. This is also shown in **Annex 12c** by the lesser number of sabo engineers and watershed management specialists as compared with flood control engineers, drainage engineers, irrigation engineers, etc. This is understandable since the number of sabo engineering and watershed management projects has been very few.

In **Annex 12d**, experience in locally funded projects is gained mostly from urban drainage followed by flood control, with the least coming from watershed management. This is also true with foreign assisted projects, as shown in **Annex 12e**. Note that the 19 firms are more exposed to foreign assisted projects, involving major projects, than locally funded projects. Local consultants have the capability in terms of engineers and experience to undertake flood control projects.

Summarizing the capability of the local consultants in flood control works, major points are enumerated as follows:

- Local consultants are well experienced and capable in detailed design for flood control structures and construction supervision since they had worked as partners of joint-venture in the consulting services for foreign assisted flood control projects;
- Local consultants have been still developing their capabilities in preparation of master plans and their structure plans of large-scale flood control projects;
- Engineers of local consultants are less experienced with studies for formulation of flood control plans, particularly knowledge of hydrologic/hydraulic engineering since there have been very few colleges/universities holding hydrologic/hydraulic subjects in their civil engineering course; and
- Local consultants maintain some high-grade specialists for economy and sociology rather than engineers, as most of them had trainings in the abroad.

(2) Construction Companies

(a) Organizations of Construction Company

There are more than 3,000 construction companies in the country. The Philippine Constructors Association (PCA), at 53 years, is the oldest trade organization in the country. The PCA has been at the forefront for the continued development of the construction industry, domestic and overseas. Aside, there are two organizations of constructors such as the National Constructors Associations of the Philippines (NCAP) and National Confederation of Constructors Association in the Philippines (NCCAP).

In order to overview about the capacity of Filipino Construction Company, the PCA is analyzed in the following:

Number of the member construction companies of PCA is summarized as follows: in terms of membership, classification and category:

Membership

Membership	Number of Company
Regular	166
Associate	92
Chapter	16
Total	374

Classification of Lines of Business

Classification	Number of Company*
Road, Highway, Pavement & Bridge	130
Irrigation and Flood Control	75
Dam, Reservoir and Tunneling	52
Port, Harbor and Offshore Engineering	55

*: There are many construction companies covering multiple lines of business.

Among the regular member of PCA, their categories are,

Category	Track Record*	Number of Company
AAA	Above ₱25.0M	69
AA	Above ₱15.0M to ₱25.0M	11
A	Above ₱7.5M to ₱15.0M	52
B	Above ₱1.5M to ₱7.5M	19
C	Less than or equal to ₱1.5M	4
D	Less than or equal to ₱1.5M	3
Trade	Less than or equal to ₱0.5M	2
Others		8
Total		166

*: Present value of single largest relevant project completed

(b) Leading Construction Company

Among the construction companies with the category AAA, there are 38 companies holding the irrigation and flood control for their lines of business. Among them, there three big companies, those are: (1) D.M.Consunji, Inc., (2) EEI Corporation, and (3) F.F. Cruz & Co., Inc. as shown below:

Company Name	Year Established	Average Annual Gross Sales* (₱ billion/year)	Number of Staff (Regular)	Experience in Flood Control Works**
(1) DMCI	1954	2.3	410	F
(2) EEI Corp.	1931	3.0	872	F
(3) FF. Cruz	1956	1.4	n.a.	E

*: Average of last five years.
**: E = Enough Experience, F = Few Experience

(c) Construction Capacity for Flood Control Works

Among three leading construction companies, FF. Cruz has relatively more experiences of participating large-scale flood control projects than other two. However, the three companies may be evaluated to have enough capacity to undertake the construction works of flood control structures and facilities on account of their construction works experiences. The capacity of Filipino construction company is evaluated as follows referring to the data and information obtained through the survey.

- So-called "General Contractor" (large construction company) has enough capability to undertake infrastructure projects including flood control works in the aspects of financing, manpower and management;
- Machineries and equipment for construction works may adequately available in Metro Manila but some modern equipment in the provinces;
- Some construction methods such as tunneling, long-spanned bridge, etc. may also undertaken by the Contractor with proper guidance and advises by the experienced engineer;
- Particularly, river diversion works or dewatering works shall require an instruction and guidance by the experienced engineers; and
- Further, management skills for construction shall be graded up for effective construction and time savings.

4.2 Laws and Regulations

4.2.1 Water Code

The Water Code of the Philippines (Presidential Decree No. 1067, issued on December 31, 1976) is the basic water law of the Philippines.

The objectives of the Water Code are stipulated in the Article 2 as follows:

- Establish the basic principles and framework relating to the appropriation, control and conservation of water resources to achieve the optimum development and rational utilization of these resources;
- Define the extent of the rights and obligation of water users and owners including the protection and regulation of such rights;
- Adopt a basic law governing the ownership, appropriation, utilization, exploitation, development, conservation and protection of water resources and rights to land related thereto; and
- Identify the administrative agencies, which will enforce this Code.

The underlying principles of the Code are in Article 3 as follows:

- All waters belong to the States.
- All waters that belong to the state cannot be subject to acquisitive prescription.
- The state may allow the use or development of waters by administration concession.
- Utilization, exploitation, development, conservation and protection of water resources shall be subject to the control and regulation of the government through the National Water Resources Council, hereinafter referred to as the Council (presently NWRB).
- Preference in the use and development of waters shall consider current usages and be responsive to the changing needs of the country.

As an ownership of waters, the Code stipulates: "Rivers and Their National Beds' belong to the State in Article 5. Flood control aspect is stipulated in Chapter V, 'Control of Waters' as follows:

Art. 53. To promote the best interest and the coordinated protection of flood plain lands, the Secretary of Public Works, Transportation and Communications[6] may declare flood control areas and promulgate guidelines for governing flood plain management plans in these areas.

Art. 55. The government may construction necessary flood control structures in declared flood control areas, and for this purpose it shall have a legal easement as wide as may be needed along and adjacent to the river bank and outside the bed or channel of the river.

Regarding cost sharing, Article 45 stipulates: "When a drainage channel is constructed by a number of persons for their common benefit, cost of construction and maintenance of the channel be borne by each in proportion to the benefits derived."

It is significant that the Water Code has presented the idea of flood plain management in an early stage that such idea has come up to the international flood control field only recently. Unfortunately, DPWH has conducted several mater plan studies including flood plain management but not exercised authority stipulated in the Article 53[7] to implement the flood plain management plan and to promulgate such guidelines yet.

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[6] Department of Public Works, Transportation and Communications (DPWTC) is now DPWH.

[7] NWRB is on the process of amending the IRR of the Water Code and the proposal of the Study on the creation of National Flood Management Committee (under 7.3.3) can be considered in the said amendment.

4.2.2 Local Governmental Code in 1991

(1) Policy

The Local Government Code of 1991 has effected as RA 7160 declaring the policies:

- It is hereby declared the policy of the State that the territorial and political subdivisions of the State shall enjoy genuine and meaningful local autonomy to enable them to attain their fullest development as self-reliant communities and make them more effective partners in the attainment of national goals. Toward this end, the State shall provide for a more responsive and accountable local government structure instituted through a system of decentralization whereby local government units shall be given more powers, authority, responsibilities, and resources. The process of decentralization shall proceed from the national government to the local government units.
- It is also the policy of the State to ensure the accountability of local government units through the institution of effective mechanisms of recall, initiative and referendum.
- It is likewise the policy of the State to require all national agencies and offices to conduct periodic consultations with appropriate local government units, non-governmental and people's organizations, and other concerned sectors of the community before any project or program is implemented in their respective jurisdictions.

(2) Basic Services and Facilities of LGUs Stipulated in Local Government Code

LGUs has a responsibility to deliver basic services including flood control facilities, which are intended primarily to service the needs of residents of the municipality or province and funded out of municipality or province.

In case of national fund given to LGUs for infrastructure projects, which of National Government or LGUs shall render such services is not specified in the Code or in any other laws or regulations.

DPWH has a rule as an interim measure for such projects to be handed over to LGUs with acceptance agreement when the project was completed. Some of LGUs, however, declined to accept. Such cases cause problems of operation and maintenance of the facilities.

(a) Infrastructure in LGUs

Flood control and drainage are included in the following section:

SEC. 17. Basic Services and Facilities. - Local government units shall endeavor to be self-reliant and shall continue exercising the powers and discharging the duties and functions currently vested upon them. They shall also discharge the functions and responsibilities of national agencies and offices devolved to them pursuant to this Code.

Local government units shall likewise exercise such other powers and discharge such other functions and responsibilities as are necessary, appropriate, or incidental to efficient and effective provision of the basic services and facilities, as enumerated in **Table 4.2**.

While, the public works and infrastructure projects and other facilities, programs and services funded by the National Government or those wholly or partially funded from foreign sources are not covered under this Section, except in those cases where the local government unit concerned is duly designated as the implementing agency for such projects, facilities, programs, and services.

(b) Maintenance of Infrastructure in LGUs

Councils of LGUs shall enact ordinances, approve resolutions and appropriate funds for the general welfare of the LGUs and its inhabitants and to ensure the efficient and effective delivery of the basic services and facilities as provided above item (a) shown in **Table 4.3**.

(3) Technical Assistance

As Operative Principles of Decentralization in Section 3, it is stipulated that the realization of local autonomy shall be facilitated through improved coordination of national government policies and programs and extension of adequate technical and material assistance to less developed and deserving local government units.

4.2.3 Presidential Decree for NDCC

Presidential Decree for Disaster Control, Capability and Establishing Community Disaster Preparedness, so-called "PD for NDCC" was created under PD 1566 in 1978 for "Strengthening the Philippines Disaster Control, Capability and Establishing the National Program on Community Disaster Preparedness", creating National Disaster Coordinating Council, enhancing the survival capability and economic stability against all types of disasters whether natural or man-made, and responding to a cogent requirement for pre-disaster planning, community disaster preparedness and positive, precise disaster control action for rescue evacuation, relief and rehabilitation to insure the survival of the country.

(1) Policy

- Self-reliance shall be developed by promoting and encouraging the spirit of self-help and mutual assistance among the local officials and their constituents;
- Each political and administrative subdivision of the country shall utilize all available resources in the area before asking for assistance from neighboring entities or higher authority;
- The primary responsibility rests on the government agencies in the affected areas in coordination with the people themselves;
- It shall be the responsibility of all government departments, bureaus, agencies and instrumentalities to have documented plans of their emergency functions and activities;
- Planning and operation shall also be done on the barangay level in an inter-agency, multi-sectoral basis to optimize the utilization of resources;
- On the absence of a duly constituted regional government, national government offices at the regional level shall be led and operationally controlled by the Regional Commissioner or by the official so designated by the President;
- Responsibility for leadership rests on the Provincial Governor, City Mayor and Municipal Mayor, (and Barangay Chairman), each according to his area of responsibility;
- When an emergency affects an area covering several towns and cities, the city mayors and their personnel and facilities shall be placed under the operational control of the Provincial Governor for the duration of the emergency;
- The national government exists to support the local government. In time of emergencies and according to their level of assignment, all national government offices in the field shall support the operations of the local government; and
- To ensure that operational activities become automatic and second nature to all concerned, exercises and periodic drills shall be conducted at all levels, principally at the Barangays.

(2) Organization of the Regional Level

At the regional level, there shall be constituted Regional Disaster Coordinating Council with Regional Commissioner or the official so designated by the President as Chairman. The Council shall be composed of the executives of regional offices and field stations at the regional level. The Council shall establish an operating facility to be known as the Regional Disaster Operations Center.

(3) Organization of the Local Government Level

The organizations for coordination or disaster and/or emergency operations in all local political and administrative subdivisions are hereby prescribed as follows:

(a) In Metropolitan Manila, there is hereby constitutional a Metropolitan Manila Disaster Coordinating Council. The Metro Manila Governor shall determine the composition of the Council and may designate as action officer for disaster operations. The Council shall establish an operating facility to be known as the Metropolitan Manila Disaster Operations Center.

(b) At the provincial level, there is hereby constituted the Provincial Disaster Coordinating Council, with the Provincial Governor as Chairman. The Provincial Superintendent of the Integrated National Police shall be the Vice-Chairman and Action Officer of the Council. The Council shall be further composed of all organic provincial officials as well as National Officials assigned to the province. The Council shall establish on operating facility to be known as the Provincial Disaster Operations Center; and

(c) At the City/Municipal level, there shall be constituted the City/Municipal Disaster Coordinating Councils, with the City/Municipal Mayor as Chairman. The Station Commander of the Integrated National Police shall be the Vice-Chairman and Action Officer of the Council. The Council shall be further composed of organic City/Municipal officials as well as National Officials assigned to the City/Municipality.

4.2.4 Agriculture and Fisheries Modernization Act of 1997

(1) Policy

The State shall promote industrialization and full employment based on sound agricultural development and agrarian reform, through industries that make full and efficient use of human and natural resources, and which are competitive in both domestic and foreign markets. In pursuit of these goals, all sectors of the economy and all regions of the country shall be given optimum opportunity to develop. Private enterprises, including corporations, cooperatives, and similar collective organizations, shall be encouraged to broaden the base of their ownership.

Thus, it is hereby declared the policy of the State to enable those who belong to the agriculture and fisheries sectors to participate and share in the fruits of development and growth in a manner that utilizes the nations resources in the most efficient and sustainable way possible by establishing a more equitable access to assets, income, basic and support services and infrastructure.

(2) Role of DPWH

All units and agencies of the government shall support the Department of Agriculture (DA) in the implementation of the AFMP.

In particular, the DPWH shall coordinate with the DA with respect to the infrastructure support aspect of the plan order to accomplish networking of related infrastructure facilities.

The DPWH, DOTC, DTI and the LGUs shall coordinate with the DA to address the infrastructure requirements in accordance with this Act provided, that the DA and the LGU shall also strengthen its agricultural engineering support in carrying out the smooth and expeditious implementation of agricultural infrastructure projects.

The DPWH shall coordinate with the DA for the purpose of determining the order of priorities for public works funded under the Public Works Act directly or indirectly affect agriculture and fisheries.

4.2.5 Environmental Code

The Environmental Code of the Philippines was issued as Presidential Decree No. 1152 on June 6, 1977. The Code is composed of five (5) Titles such as,

- Air Quality Management;
- Water Quality Management;
- Land Use Management;
- Natural Resources Management; and
- Conservation, Waste Management.

Flood Control aspect concern is stipulated in Title IV, Natural Resources Management and Conservation, with Forestry and Soil Conservation in Chapter III and Flood Control and Natural Calamities in Chapter IV along with the other sectors such as Fisheries and Aquatic Resources, Wildlife, Energy Development, Conservation and Utilization of Surface Ground Waters, Mineral Resources. Those chapters present to promote watershed management including flood control and soil conservation which is appreciated as a forerun of recent idea of river basin management.

(1) Flood Control

Flood control aspect is stipulated in Section 34 Measures in Flood Control Program of Chapter IV, Flood Control and Natural Calamities, as follows:

In addition to the pertinent provisions of existing laws, the following shall be included in soil erosion, sediment and flood control program:

- The control of soil erosion on the banks of rivers, the shores or lakes and the sea-shores;
- The control of flow and flooding in and from rivers and lakes;
- The conservation of water which, for purposes of this Section shall mean forms of water, but shall not include captive water;
- The needs of fisheries and wildlife and all other recreational uses of natural water;
- Measures to control the damming, diversion, taking, and use of natural water, so far as any such act may affect the quality and availability of natural water for other purposes; and
- Measures to stimulate research in matters relating to natural water and soil conservation and the application of knowledge thereby acquired.

(2) Soil Conservation

Soil conservation is the similar concept to the Sabo Works stipulated in Section 32 Management Policy on Soil Conservation of Chapter III, Forestry and Soil Conservation, as "The National Government, through the Department of Environment and Natural Resources and the Department Agriculture, shall likewise undertake a soil conservation program including therein the identification and protection of critical watershed areas, encouragement of scientific farming

techniques, physical and biological means of soil conservation, and short-term and long-term researches and technology for effective soil conservation".

4.2.6 Recent Proposed Bill

(1) Water Resources Authority Bill

The bill of "*An Act to Address the National Water Crises, Creating the Water Resources Authority of the Philippines, Abolishing the National Water Resources Board, Rationalizing the Organization and Functions of Government Agencies related to Water, and for Other Purposes*" was read on First Reading in 12th Congress and referred to the Committees on Public Works, Local Government and Finance on July 24, 2001, status of which has been pending since then.

The policy of the act is proposed to adopt urgent and effective measures to address the national water crises as well as measures for the long-term sustainable management of scarce water resources. To achieve this purpose, the utilization and development of water resources must be rationalized and optimized through an integrated approach to planning, development and regulation of the water sector.

Sustainable management of water resources shall take into consideration the following principles:

(a) Water is a limited and vulnerable resource not only indispensable for the sustenance of life but also of vital importance to all socio-economic sectors. The sustainable management of water resources demands an integrated approach linking social and economic development with protection of natural water sources and ecosystems.

(b) Water has an economic value in all its competing uses and shall be treated as an economic good.

(c) Water Resources management shall be decentralized, participatory and community based and conducted ant the lowest appropriate level.

(d) Women play a central part in the provision, management and safeguarding of water resources and shall be represented in decision-making processes with regard to water resources management.

(e) Private sector participation shall be encouraged in all levels of water resources management, utilization and development.

(f) Licensing shall be the mechanism to ensure that public interest is protected in the provision of drinking water, sanitation, irrigation or other water services by monopoly suppliers.

As its powers and functions, the act proposes the authority shall be the source of authorization and power to form and maintain the bodies like form basin or watershed authorities.

(2) Metropolitan Flood Control Authority Bill

The bill of "*An Act Creating the Metropolitan Flood Control Authority and for Other Purposes*" was read on First Reading in 12th Congress and referred to the Committees, Environment and Natural Resources, Ways and Means and Finance, status of which has been pending since then.

The Policy of the act is proposed as that:

(a) Ensure the safety of Metro Manila and other urban residents from floods and its negative effects.

(b) Encourage the participation of the private sector and non-governmental organizations in the promotion of the objectives of this Act.

(c) Encourage the adoption of a comprehensive development plan for Metro Manila and other urban centers to address the perennial flood problem.

Purpose of the Authority is also proposed in the act as that, the Authority shall be the sole agency to formulate and implement all development efforts relative to Metro Manila and other urban flood control activities with the end in view of alleviating.

Functions of the Authority are proposed in the act as follows:

(a) Review all existing flood control projects under national or local government agencies;

(b) Formulate an integrated flood control plan for Metro Manila and other flood-prone centers in consultation with other concerned agencies;

(c) Formulate and enforce programs and campaigns against flooding such as anti-littering, anti-squatting along waterways, dredging and cleaning of esteros and the like;

(d) Encourage the active involvement and participation of local government units, national government agencies, non-governmental organizations, private sector and other interest groups by adopting a process of consultation with these concerned groups and agencies in formulation and integration of the flood control plan;

(e) Solicit financial assistance, obtain loans and grants from any entity, including but not limited to Official Development Assistance funds.

(3) River Basin Development Authority Bills

There have been several bills recently proposed to the Congress to create authority for development with river basin approach. While a number of laws for the preservation and development of rivers have been enacted, effective enforcement by local government units is weak due to the absence of a local agency with which coordination can be made. What must be created is efficient institutional machinery in each local government unit not only to implement such laws, but also to promote development of rivers, river systems, and natural waterways.

Title, status and some other information of those bills are shown in **Table 4.1**.

(4) Agno River Basin Development Authority Bill

Among the several bills on river basin development authority, briefing of the bill on the Agno River Basin Development Authority is presented as follows:

The bill proposes as the policy to promote the integrated management and development of resources in the country's river basins, within the context of a river basin approach to optimize economic and social welfare without compromising the sustainability of environmental systems and to ensure a fair sharing of the national patrimony between upland and lowland peoples. Purposes and objectives of this act are proposed as follows:

- Consolidate and harmonize all development initiatives within the river-basin under the over-all framework of a unified river-basin management and development approach;
- Maximize the participation of all stakeholders in the area, establishing the most effective approach to effect and active and sustainable collaboration among stakeholders from

government agencies, non-government agencies/peoples' organizations and the private sector.

- Promote equitable sharing of costs and benefits from the basin's natural resources across sectors, groups of communities, across apace and time; and
- Negotiate local and external investment in the area, thereby increasing livelihood opportunities for the people within the Basin.

As the special functions the authority is to exercise and perform the following powers and functions:

- Prepare, review, evaluate and update the Agno River Basin Comprehensive Master Plan (ARBMP) in the interest of the Regional Development Plans;
- Provide the machinery for extending the necessary technical assistance to local government units, line agencies, public corporations, the private sector and affected indigenous cultural communities/indigenous peoples;
- Provide the machinery for extending the necessary technical assistance for the maintenance, repair and rehabilitation, as may be necessary of the Binga Dam, Ambuklao Dan and San Roque Multi-Purpose Dam, including the resolution of problems on siltation and flooding;
- Establish a functional basin information and database system, including computer-generated planning tools such as GIS;
- Commission or undertake integrated studies, researches and other such undertakings to determine appropriate measures to carry out the development of the River Basin;
- Coordinate the integration of all proposed plans, programs and projects of the local government units, line agencies, public corporations and the private sector where such plans, programs and/or projects;
- Coordinate and monitor all planning, studies, design and implementation of various programs and projects for the development;
- Initiate, receive and recommend project proposals for the development, conservation and management of the basin's water resources;
- Receive grants, donations and other forms of development assistance in the discharge of its duties;
- Plan, program and/or undertake infrastructure projects such as river, flood, waste water and sewerage works, water supply, roads, irrigation, housing and related works when so required within the context of its development plans and programs including readjustment, relocations or settlement by population within the Basin as may be deemed necessary and beneficial by the authority.

CHAPTER 5. PAST FLOOD CONTROL WORKS

5.1 Flood Control Projects

DPWH has implemented flood control projects by its Central Office through Project Management Office for Major Flood Control Projects (PMO-MFCP) for the foreign assisted project, and Regional Offices and District Engineering Offices for the locally funded projects of which costs are less than 30 million pesos. As of now, a lot of studies on flood control and drainage improvement have been carried out for the specific basins at a study level of master plan and/or feasibility, as tabulated in *Water and Floods* (*DPWH, 2004*).

As shown in **Table 5.1**, the 2004-2009 Medium-Term Public Investment Program (MTPIP) of DPWH[8] shows that the Government intends to implement a number of flood control and drainage projects placing priority on major river basins and Metro Manila. The total budget for these priority projects nominated in the DPWH-MTPIP is estimated at about 41.3 billion pesos, excluding locally funded projects.

This chapter presents the results of the Survey on Flood Control Implementation Conditions carried out for 40 national and regional government offices (DPWH, DENR, DA, etc.) and around 70 local government offices (province, city/municipality and barangay). **Annex 12** lists the flood-related projects being undertaken by the surveyed national government offices.

5.1.1 Major Rivers

Existing flood control measures depend largely on the type of flood problem and physical characteristics of the area being protected. Similarly, the density and magnitude of such structures depend on the intensity of the problem in terms of flood damage of the area under protection. Hence, major river basins with high damage potential such as the Agno, Pampanga, and Pasig-Laguna Lake Basins usually require basin-wide flood control schemes involving considerable investment.

Localized flood problems are remedied by local protection measures without regard to the overall flood problem in a river basin. Such situation usually occurs on minor river basins where demands for protection are implemented on a case-to-case basis. However, the most complex schemes may not succeed in preventing all losses. At most, it may only reduce the frequency of large floods. **Table 5.2** presents the status of flood control programs of major river basins from 1980 to present.

Among the 18 major rivers, either a basin-wide study or master plan study for flood control has been prepared for 11 rivers or the actual implementation has been made for five rivers. The target flood control scales are mostly proposed at 20 to 30 years return period depending on economic viability. A few locally funded projects currently being implemented by PMO-MFCP Clusters 1 and 2 are as follows:

	Project	Cluster	Budget	Project Description
1.	Davao River Project	2	0.6 million	Dredging
2.	Tagum-Libuganon River Project	2	1.5 million +	Dredging
3.	Cotabato River Project	2	1 million +	Dredging
4.	Pasig River Rehabilitation Project	1	2 billion +	Revetment Works

Besides DPWH, there are other national government agencies currently implementing projects related to flood management and sabo engineering.

[8] Based on the on-going preparation of Medium-Term Philippine Development Plan (2005-2010), this MTPIP will accordingly revised.

(1) PAGASA

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) disseminates atmospheric, geophysical and astronomical data for use by economic sectors, the engineering and scientific community and the general public. PAGASA is involved in three activities related to flood management, namely: flood forecasting and warning; flood hazard mapping; and public awareness and emergency preparedness.

Through its Flood Forecasting Branch, it issues flood forecasts and warnings in the form of basin flood bulletins to telemetered major or non-major river basins throughout the country (most of these are located on the islands of Visayas and Mindanao).

Flood hazard mapping is undertaken by the Natural Disaster Reduction Branch of PAGASA in line with the government's call for the implementation of programs on disaster preparedness and mitigation.

As an integral part of its mandate and operational functions, PAGASA plays a significant role in minimizing the effects of natural disasters through appropriate public education and emergency preparedness. It's Public Information and International Affairs Staff (PIAAS) coordinates all activities pertaining to information, education and communication - including the production of awareness/information packs for individuals and communities.

PAGASA now carries out the following flood management-related projects/activities:

- Strengthening of Flood Forecasting and Warning Section (FFWS), Pampanga, Agno, Bicol and Cagayan rivers
- Hydrological study of E.B. Magalona's waterways, Madalag River/Malogo River
- Partnership for sustainable disaster prevention, mitigation and preparedness
- Community-Based Flood Forecasting and/or Warning System (CBFF/WS), Sinocalan and allied river basins, Iloilo Province
- Community-Based Flood Forecasting and/or Warning System (CBFF/WS), Municipality of Dumangas, Iloilo Province

(2) DENR

World Bank is financing the DENR's River Basin and Watershed Management Project (RBWMP). The Project would comprise two components: a Bicol Basin Development Program to pilot a basin planned, watershed based rural development and water resources management program; and a Water Resources Management component to develop WRM Action Plans in the Philippines' two most critical water areas.

The Bicol Basin Development Program component covers the Bicol river basin in Region V of the Philippines, situated in south Luzon, the Philippines' main island. It is based on the Bicol River Basin Water Resources Management Plan, which is currently being prepared under Region V's Project Preparation Steering Committee (PSC) headed by the DENR and NEDA regional directors, with participation of line agencies and LGUs and with assistance from PHRD financed consultants. Bicol river basin comprises 3,771 km^2, 90% of which is in the provinces of Albay and Camarines Sur involving a total of 28 municipal LGUs and three cities. The basin contains about 44% of the region's total population.

The Bicol River Basin Development Program would consist of the following sub-components: (a) Institution building; (b) Community driven LGU development activities; (c) Irrigation improvement and management transfer; and (d) Basin infrastructure and flood mitigation.

(3) MGB

When adequate information and data is made available to various stakeholders, mitigation and preventive measures to forestall tragedies can best be formulated. MGB issued Special Order No. 4396 dated January 5, 2004 creating an MGB Special Task Force on Geohazard Map Preparation. The geohazard maps will cover disaster and hazard prone areas of the Philippines. Subsequently, MGB and PHIVOLCS agreed to jointly generate and standardize geohazard maps. It was also agreed that Landslide Geohazard Maps would be prepared by PHIVOLCS while Flashflood Geohazard Maps will be prepared by MGB. These maps will be disseminated to various stakeholders. Other cooperating agencies are NAMRIA, PAGASA and NDCC.

5.1.2 Principal Rivers

The following ten principal rivers were surveyed for flood control project implementation conditions:

Name of River	City/Municipality, Province and Region		DA* (km^2)	Surveyed Section	IA**	Existing Flood Control Structures/Projects/ Activities
Amburayan	Bangar, La Union	I	1,386	Lower	DPWH	Dikes
Talisay	Balanga City, Bataan	III	144	Lower	DPWH	Dikes, Desilting
Sta. Rita	Olongapo City, Zambales	III	95	Whole	DPWH	Desilting, Flood Gate Weir, Revetments, Sabo Dam
Bucao	Botolan, Zambales	III	734	Lower	DPWH	Dikes, Dredging
Angat	Calumpit, Bulacan	III	781	Lower	DPWH	Dikes; River Bank Slope Protection
Pansipit	Lemery, Batangas	IVA	656	Lower	DPWH	River Bank Slope Protection, Parapet Walls, Dredging
Imus	Bacoor, Cavite	IVA	105	Lower	DPWH	Dredging, Revetment Walls
Camatian	Lucban, Quezon	IVA	269	Lower	DPWH	River Walls
Quinali	Malinao, Albay	V	103	Lower	DPWH	Dredging, Dikes
Yawa	Legaspi City, Albay	V	70	Lower	DPWH	Dredging, Dikes

*: DA = Drainage Area
**: IA = Implementing Agency

Flood problems in most principal rivers especially the minor ones are localized, and structural measures are usually employed to existing situations thereat. There are a number of river control projects existing in the 10 principal river basins surveyed, as summarized in **Table 5.3**. The majority of the flood control plans in the 10 principal river basins are proposed or implemented to be of the flood protection dikes or flood walls. Some projects consist of river dredging works (excavation works) to mitigate the flood damages in the lower reaches.

5.1.3 Urban Drainage

The DPWH and LGUs implement urban drainage projects as described below:

(1) DPWH

Major components of the flood control and drainage program in Metro Manila have been built, particularly additional drainage mains, pumping stations, estero improvement works, dredging and related facilities. Operation and maintenance works were also responsible by DPWH with its National Capital Region, although MMDA shall undertake all flood control works composed of formulation, implementation and O&M of the works in accordance with RA 9724 in 1994.

However, a memorandum of agreement entered into between DPWH and MMDA on July 9, 2002 that aimed at an orderly transfer of powers and functions, policy directions and programs, officials and employees, assets and liabilities. Through the several discussions between DPWH and MMDA, all flood control works in Metro Manila shall eventually be transferred to MMDA, details are as follows with some pending items for which both parties agreed.

- Implementation of flood control projects in Metro Manila, particularly under the local fund shall be transferred to MMDA.
- Operation and maintenance works for all completed flood control structures and facilities, including those, which were constructed by foreign, assisted shall be the responsibility of MMDA.
- On-going foreign assisted flood control projects shall be implemented by the DPWH, while the engineers of MMDA may participate in the implementation for their technical training.
- New projects including surveys and studies of flood control in Metro Manila will be principally implemented by MMDA with a technical assistance of DPWH.

In conformity with the agreement, about 1,600 engineers and technicians of DPWH-NCR have transferred to MMDA and annual budget for O&M cost of flood control facilities was also reallocated to MMDA starting from 2004 annual budget.

The on-going urban drainage projects in Metro Manila and its surroundings to be implemented by the DPWH are:

- Metro Manila Flood Control Project – West of Mangahan Floodway
- KAMANAVA Area Flood Control and Drainage System Improvement Project
- Pasig-Marikina River Channel Improvement Project

Further, in the 2004-2009 DPWH MTPIP, the *Valenzuela-Obando-Meycauayan (VOM) Area Drainage Improvement and Related Works Project* is the major urban drainage project proposed in Metro Manila. JICA and DPWH are now conducting the *Study on Drainage Improvement in Core Area of Metropolitan Manila*, wherein a master plan and feasibility study will be prepared to solve perennial flooding in Manila and Suburbs.

(2) LGUs

There have been a few urban drainage projects with covering a LGU area undertaken by LGU itself such as:

No.	Name of City	Title of Project	Finance Source
1	Laoag	Flood Control and Drainage Project	City/DPWH
2	Ilagan	n.a.	n.a.
3	Olongapo	n.a.	n.a.
4	Batangas	Flood Control and Drainage Project	PREMIUMED*
5	Lucena	Iyam River Control Project	City/DPWH
6	Puerto Princesa	Flood Control and Drainage Project	PREMIUMED
7	Legaspi	City Flood Control Project	City
8	Iloilo	Master Plan of Iloilo Drainage Project	City
9	Cebu	Central Visayas Urban Project	World Bank (Grant)
10	Ormoc	1991 Flood Rehabilitation Plan	DPWH
11	Tacloban	Overall Drainage Master Plan Study	City
12	Davao	Davao City Storm Drainage Project	City/NEDA
13	Zamboanga	Flood Control and Drainage Project	City

Source: Study on Flood Control for Rivers in the Selected Urban Centers, JICA 1995

* = Program for Essential Municipal Infrastructure Utilities, Maintenance and Engineering Development (financed by World Bank for DPWH)

Urban drainage projects are usually with small-scale structures implemented by the respective LGUs with a technical assistance in accordance with Local Government Code –1991 which cites to devolve to LGUs responsibility for the delivery of various aspects of basic services including programs and projects.

However, common and serious drainage problems in the LGUs were addressed by the national government with a financial assistance of foreign funding institutions, so called PREMIUMED, of which program was implemented by the DPWH.

5.1.4 Sediment Control (Sabo) Works

Most of the sediment control (Sabo) works have been implemented under the foreign technical and financial assistances, while the Sabo projects were undertaken by the DPWH. Inclusive of the studies, the previous and on-going Sabo projects are enumerated below:

	Name of Project/Study	Location	Year Completed	Funding Source
1	Pasig-Potrero River Flood Control and Sabo Project	Pampanga	1978	JICA
2	Master Plan for Mayon Volcano Sabo and Flood Control Project	Bicol	1981	JICA
3	Re-Study of Mayon Volcano Sabo and Flood Control Project	Bicol	1983	JICA
4	Study on Flood Control and Mudflow Control for Sacobia-Banban/Abacan River Basin Darining from Mt. Pinatubo	Pampanga	1995	JICA
5	Study on Sabo and Flood Control in the Laoag River Basin	Ilocos	1997	JICA
6	Study on Comprehensive Disaster Prevention around Mayon Volcano	Bicol	2000	JICA
7	Mt. Pinatubo Hazard Urgent Mitigation Project	Pampanga	2002	JBIC
8	Study on Sabo and Flood Control for Western River Basins of Mt. Pinatubo	Zambales	2003	JICA
9	Study on Camiguin Island Disaster Prevention Project	Camiguin	2003	JICA
10	Mt. Pinatubo Hazard Urgent Mitigation Project (II)	Pampanga	2003	JBIC
11	Laoag River Basin Flood Control and Sabo Project	Ilocos	On-going	JBIC

Source: "Water & Floods", DPWH March 2003

Other than the projects with a tile of "Sabo", flood control projects implemented under the foreign technical and financial assistances were provided with sediment control aspects. Those flood control projects for rivers of steep slopes such as Agno River and Anilao/Malbasag Rivers in Ormoc City are also considered as Sabo Projects.

Therefore, the Sabo projects have been implemented by the DPWH, while the related works such as soil conservation and reforestation projects have been implemented by NIA and DENR, respectively.

On the other hand, mud/debris flows and land slides in the mountainous area, which have usually brought catastrophic damages claiming human lives and cutting lifelines but small scale are not clearly investigated and studied. The sediment damages brought by landslides in Southern Leyte and Northern Surigao in December 2003 should have some preventive works, even identified as natural hazardous area. The rehabilitation works of sediment disasters require more manpower and longer time.

For the localized sediment disasters such as mud/debris flows and land slides, the sabo plans shall be formulated emphasizing on (1) Mitigation of dangers on human lives, (2) Preventive measures to be provided by both structural and non-structural methods, and (3) Stage-wise implementation of sabo plans covering nation-wide.

5.2 Other Related Projects

Table 5.3 also lists watershed management and irrigation projects being undertaken in surveyed principal river basins. The following subsections described the watershed management and irrigation projects being implemented by the surveyed national government agencies.

5.2.1 Watershed Management

The Forest Management Bureau (FMB) of the DENR formulates and recommends policies and programs for the effective protection, development, management and conservation of forestlands and watersheds including grazing and mangrove areas.

Forestry Sector Project (FSP) is one of the projects of the DENR, which underscores the government's thrust on giving local communities in the upland and mangrove areas broader role in the management and conservation of the country's finite resources. The main goal of the FSP is to attain Sustainable Forest Resource Management by the People's Organizations (POs). Funded by JBIC and GOP, the project aims to rehabilitate a total of 68,748 ha, covering 57,573 ha of watershed area and 11,175 ha of mangrove area.

Watershed rehabilitation was implemented on 24 pre-selected subproject sites nationwide. The sites were identified to be adjacent or supportive of other investments related to irrigation systems, water impoundment, flood control, hydroelectric power and other energy related projects. Mangrove rehabilitation was implemented in 12 pre-selected sites in selected regions.

The DENR carries out other watershed management programs; among them are Soil Conservation and Watershed Management. The program's main concern is the conservation, management and development of water resources and watershed areas in consonance with the provisions of R.A. No. 8041. It also involves the rehabilitation of the critical watershed areas through the establishment of vegetative measures, construction of structural measures, plantation establishment, and other activities to prevent soil erosion and sedimentation in the area.

The LLDA's thrust and priorities reflect the emerging focus of water resources management to ensure the sustainability of the lake water resources as source of domestic and industrial water supply without sacrificing its other beneficial uses especially fishery. In line with this, LLDA is now implementing several programs; among them is watershed management.

5.2.2 **Forestry Sector Project** (Project Summary in **Annex 11**)

(1) Organization and Implementing System

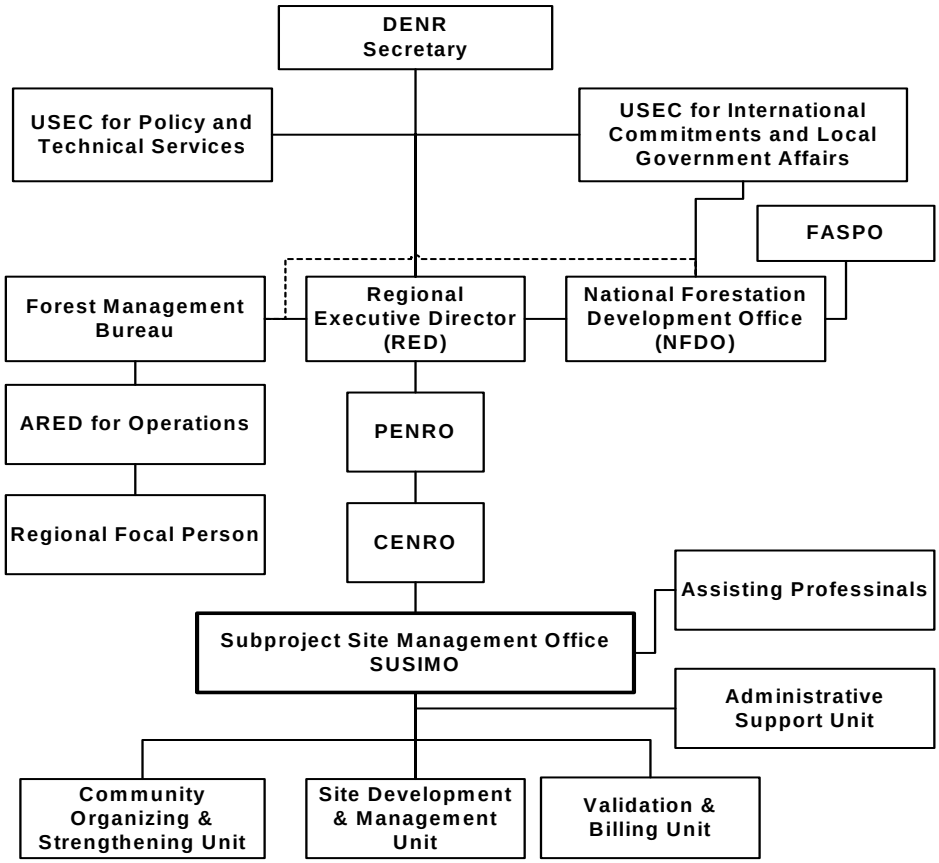
Promoting forest land use planning as an integral activity of comprehensive land use planning to determine the optimum and balanced use of natural resources to support local, regional and national growth and development, DENR and DILG concluded JOINT MEMORANDUM CIRCULAR NO. 98-01 (JMC98-01) to stipulate LGU's sharing responsibility with DENR in the sustainable management and development of the forest resources within their territorial jurisdiction.

In this regard, responsibility of Community Environmental and Natural Resources Office (CENRO) and Provincial Environmental and Natural Resources Office (PENRO) provided by LGUs and Regional environment and Natural Resources Office (RENRO) is stipulated as follows:

- Community Environment and Natural Resources Office (CENRO) refers to the DENR Office, headed by a Community Environment and Natural Resources Officer Appointed by the Secretary of DENR, which is responsible for the implementation of DENR policies, programs, project and activities and the enforcement of ENR laws and regulations in the community level (JMC98-01, 4.2).

- Provincial Environment and Natural Resources Office (PENRO) refers to the DENR office, headed by the Provincial Environment and Natural Resources Officer appointed by the Secretary of the DENR, which is responsible for the implementation of DENR policies, programs and projects in the province (JMC98-01, 4.12).
- Regional Environment and Natural Resources Office (RENRO) refers to the DENR Office headed by a Regional Executive Director (RED) appointed by the President that is responsible for the coordination and implementation of all policies, programs and projects on environmental and natural resources development and conservation of DENR in the region (JMC98-01, 4.14).

Organization Chart for CBFM



Jointly implementation with LGUs and DENR is stipulated as follows:

Implementation of new CBFM projects shall be undertaken jointly by DENR and concerned communities/beneficiaries as provided for under DENR DAO 96-29.

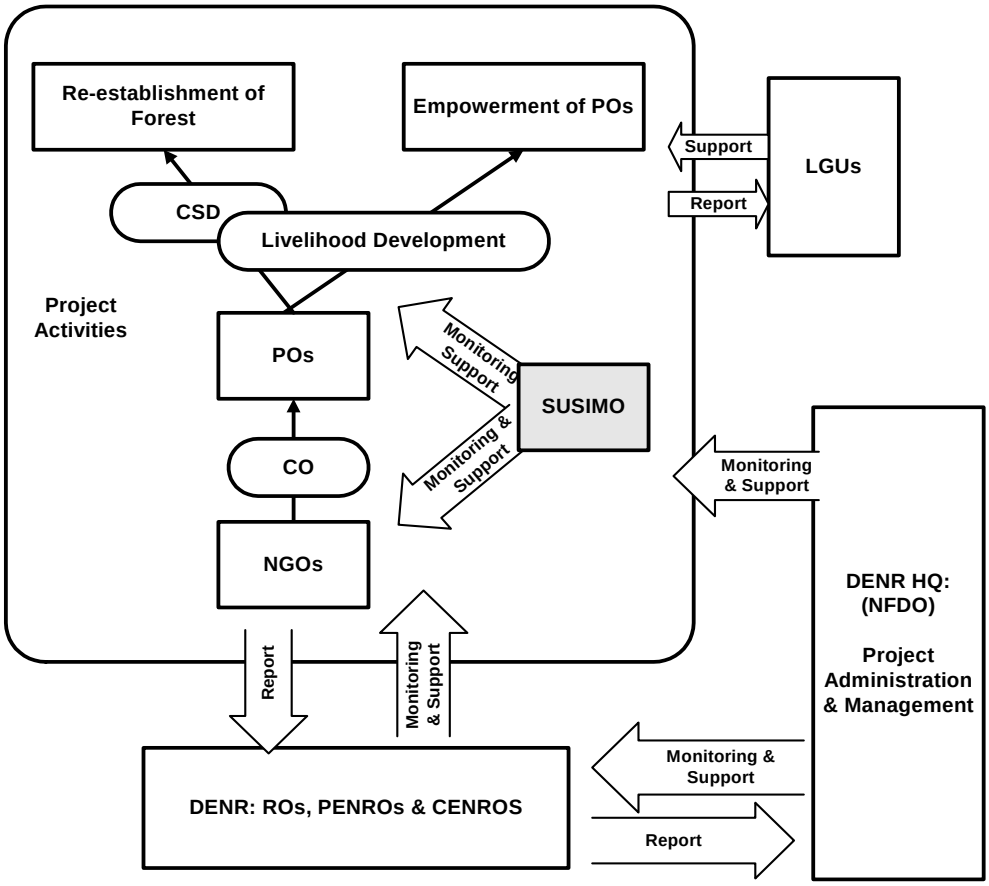
- DENR through its regional, provincial and community field offices shall consult and coordinate with concerned provincial, municipal or city governments for their participation in the implementation of CBFM projects in their respective territorial jurisdiction.
- Formulation of action plans for CBFM that will include, among others:
  - Definition of specific roles/responsibilities of DENR and concerned LGUs consistent with DENR DAO 96-29 and other pertinent rules and regulations;
  - Creation of teams composed of representatives from both offices to undertake the various phases of CBFM;

- Commitments of financial and other resources needed in CBFM implementation;
- Monitoring and evaluation system;
- Schedule of activities; and
- DENR-LGUs phase-out plan for project management.

(2) Monitoring and Evaluation

Monitoring and evaluation for CBFM projects are conducted according to the stimulation of JMC98-01, 7.5 that, the DENR and the concerned DILG office and/or LGU shall conduct periodic monitoring of activities for the DENR-DILG-LGU partnership in devolved and other forest management functions. The organization chart and Implementing System of DENR for a Community-Based Forestation Management are shown as follows.

Implementing System for CBFM



The People's Organizations (POs) are the centers of development assisted by NGOs; Assisting Organization (AO); DENR through the Sub-project Site Management Office (SUSIMO), DENR Field Offices and NFDO; and LGUs for empowerment and re-establishment of forest with the objective of Sustainable Forest Resource Management of the Project area by PO.

5.2.3 Irrigation

There are two agencies of the Department of Agriculture involve in irrigation:

(1) National Irrigation Administration (NIA)

NIA undertakes program-oriented and comprehensive water resources projects for irrigation purposes, as well as concomitant activities such as flood control, drainage, land reclamation, hydraulic power development, watershed management, etc.

As of the end of 2000, according to the Medium-Term Philippine Development Plan 2001-2004, the total area provided by NIA with irrigation facilities reached about 1.366 million ha, benefiting about 1 million farm-families. This represents 43.69% of the total potential irrigable area of 3.126 million ha that are primarily devoted to rice and corn.

Operation and maintenance (O&M) costs of National Irrigation Systems (NIS) are recovered through the collection of Irrigation Service Fee (ISF) from the farmer-beneficiaries. The farmer-beneficiaries through their Irrigators Associations (IAs) amortize direct construction costs of Communal Irrigation Systems (CIS) on terms agreed upon by IA and NIA. Full cost recovery of O&M remains a government policy.

For years 1999 and 2000, targets for irrigation were 77,500 ha in new areas generation and the rehabilitation of 273,905 ha of existing irrigation systems. Actual accomplishments were 21,707 ha new areas generation and 220,199 ha rehabilitated. The high accomplishment on rehabilitation compared to the target in 1999 was due mainly to the implementation of the El Niño program, which involved mostly CIS. **Annex 11** details all the irrigation projects presently being undertaken by NIA.

Moreover, the Water Resources Development Project (WRDP) assists the Government in developing an appropriate policy and institutional framework to improve water resources planning, development and management; initiating an integrated and comprehensive approach to watershed management to sustain water sources; improving existing irrigation system efficiency, thereby increasing agricultural production, and alleviating rural poverty; improving irrigation services in the long term by accelerating management turnover of irrigation systems to water users and by increasing the National Irrigation Administration's (NIA's) institutional effectiveness; and improving the environment in irrigated areas.

The five-year project includes the following components:

(a) Improved water resources planning and management - preparation of a national water resources plan, improvement of national data collection networks, establishment of a national water information network (NWIN) and strengthening of the National Water Resources Board (NWRB);

(b) Improved watershed management - formulation of a national watershed management strategy and investment and institutional strengthening program, investments for improved management; and staff training/study watershed management tour;

(c) Improvement and repair of National Irrigation System (NIS) - system improvement, repairs in major structures, strengthening of Masiway dam, and construction of sediment inclusion structures;

(d) Institutional strengthening of NIA and Irrigators Associations (IAs) - staff training, consultancies, computers and incremental operating costs to facilitate progressive management; and

(e) Environmental improvement - control of schistosomiasis, erosion control works; sediment monitoring, and establishment of an Environmental Unit within NIA and provision of training and consultancy to the unit.

(2) Bureau of Soils and Water Management (BSWM)

BSWM undertakes assessment, development and conservation of existing and potential soil and water sources for agriculture. It also conducts cloud seeding activities. BSWM undertakes planning, design, construction, of locally-funded and foreign assisted small water impounding project, small farm reservoir, and small diversion dams for irrigation and flood control purposes.

On the other hand, the total area provided with irrigation facilities by BSWM is 153,099 ha. The total picture therefore shows a total of 1,519,132 ha with irrigation facilities, representing 48.59% of the total irrigable area[9].

5.2.4 Agrarian Reform Infrastructure Support Project

The Department of Agrarian Reform (DAR) has approved Agrarian Reform Communities (ARCs) in over 900 locations nationwide. Using ARCs as the basic unit of development, it has promoted integrated support for services such as the provision of basic infrastructure, organization of farmers and finance, which are required for the improvement of agricultural productivity.

The ODA loans supported agrarian reform in its 20th Loan Package of JBIC to the Philippines with projects including the Agrarian Reform Infrastructure Support Project and the Rural Farmers and Agrarian Reform Support Credit Program. This project follows the Agrarian Reform Infrastructure Support Program: Phase I (ARISP-I), which provided basic infrastructure and organizational support to ARCs in 78 locations. It will provide the basic economic infrastructure (irrigation, post-harvest processing equipment, farm roads and water supply) needed for agriculture to ARCs in about 150 locations nationwide. In addition, it will support the organization of farmers and strengthening of local governments, and aims to contribute to improvements in agricultural productivity and increased living standards for agricultural families. Further, this project also includes some minority ethnic group and remote area ARCs.

In the implementation of the project, the Department of Agrarian Reform will be the lead executing agency with the NIA and DPWH as collaborating executing agencies to supervise civil works. In addition, NGOs will participate in the organization of farmers, the consolidation, organization, formation and strengthening of agricultural cooperatives and training.

The proceeds of the loan will be used for civil works, procurement of machinery and equipment, organizational reinforcement and consulting services (bid assistance, supervision of construction, training for local government employees, support for the organization of farmers and agricultural cooperatives, environmental monitoring, etc.).

(1) Infrastructure Development

The development of systems is indispensable if the projects that have been tackled under ARISP-I are to be appropriately effected. The aims of system development are threefold, to increase agrarian productivity, to realize autonomous/functional organizations, and to establish basic companies in agricultural communities. The key program for undertaking this development has been formulated to cover the following four fields. To wit, 1) infrastructure development, 2) agrarian development, 3) development of cooperatives, and 4) project development/ management. The following details the results that have been achieved in these areas.

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[9] Source: Medium-Term Philippine Development Plan 2001-2004

It goes without saying that ensuring the sustainability of project results through the maintenance/repair activities of related parties, in addition to promoting more satisfactory utilization of the infrastructure provided under ARISP-I by the farmer-beneficiaries, is indispensable. Finding ways to incorporate the related parties into the framework of the ARISP-I project remains an issue.

Regarding infrastructure, there are cases in which it is necessary for the local governments of the ARBs (municipalities <towns> and barangays <villages>) to bear the burden of equity for ARISP-I. This is similar to the World Bank's Agrarian Reform Community Development Project (ARCDP), and there is optimism within local governments. Specifically, most local governments divert the appropriation of the Internal Revenue Allotment (IRA) development budget that is distributed by the central government as subsidies. Breaking local government dependency on IRA is currently under discussion; however, this will be difficult in light of the need to enhance the profits of local government enterprises and develop independent sources of tax revenue.

In terms of the maintenance of infrastructure that has been fully transferred, as has been evidenced in the case of the construction of farm-to-market roads, the infrastructure is being managed on the basis of the exchange of memorandum circulars between the DPWH and the local barangays. In reality, barangays have meager development budgets, and within individual ARISP-ARCs, damage/repairs are carried out according to the Bayanihan method (mutual cooperation), which involves joint operations by mobilizing the community. There are some questions concerning how to eliminate free riders, for example, and the effectiveness of introducing the method in terms of the ambiguities inherent in its execution.

The amortization of construction costs is applicable to irrigation facilities, and in this instance the role of the Irrigation Associations (IA) is crucial. Even when Development Contingency Costs (DCC) are born by the work force, funds are required to maintain and conduct partial repairs to irrigation facilities, and thus the effective levying of Irrigation Service Fees (ISF) is crucial. However, the collection ratio of ISF in the La Union and Iloilo ARISP-ARCs is low. Ensuring the sustainability of irrigation will be problematic if such basic problems cannot be overcome.

(2) Sustainability of Infrastructure

The infrastructure facilities provided under the ARISP-I project have fulfilled a definite role. Ensuring the sustained viability of these gains so that they do not end up as merely a temporary phenomenon will contribute to the development of autonomous agricultural communities.

Calls are being made for the beneficiary organizations to take responsibility for the sustainability of the infrastructure. The organizations will thus need to take up their financial obligations. While the ARISP-II project is moving in this direction, conscientious efforts will be needed in order to solicit the involvement of the provincial governments in the more complex aspects and so forth. Utility rates for post-harvest facilities were particularly low. The warehouse in the ARISP-ARC in Iloilo is predominantly unused.

While there are various problems in terms of storage capacity, location, and the shouldering of storage costs (interest rate arrangements), the fundamental issue at stake is trader/middleman intervention in rice production and distribution. Capital build up is needed to undertake projects.

It is necessary to establish conditions that will energize the business activities of the cooperatives. In this case, it is necessary to give the cooperatives a competitive edge over existing traders and rice polishing traders, and to investigate new methods of ensuring the sustainability of the infrastructure support services that are to be provided under the ARISP-II project. This method involves the cooperatives purchasing unpolished rice, having it polished at highly efficient,

privately owned rice mills that have been authorized by the local governments, transporting it to the markets, then engaging in retail sales. In this instance, the local governments (municipality) will become the base for the cooperative federations, and it will be their role to organize the loans to fund rice purchasing. This system is currently under development in the province of Ilocos Norte. Memorandum of Circulars between DPWH and barangays for implementation of infrastructure

5.2.5 Municipal Water Supply

In the provincial urban areas, the total population served as of December 2000 is 18.3 million. This means 88.13% of the total urban households have safe drinking water through Level III Systems provided by Local Water Utilities Administration (LWUA)-WDs/private operators/LGUs. This was attributed to the new projects as well as the upgrading of water system facilities implemented by LWUA-WDs, LGUs and private subdivisions. LWUA as a specialized government lending institution has been primarily responsible in the development of water supply systems in areas outside Metro Manila.

The rural population, on the other hand, is served primarily with Level I systems and in some cases, Levels II and III systems. The total rural population served with these water systems by LGUs, BWSAs and RWSAs under the jurisdiction of DILG, DPWH and LWUA is about 35.76 million representing 84.77% of the country's rural population.

Moreover, the Water Resources Management (WRM) component of World Bank-funded River Basin and Watershed Management Project (RBWMP) of the DENR supports the creation of two Water Resources Management Task Forces (WRMTFs) and the subsequent development of integrated, Water Resources Management Action Plans by these WRMTFs for the Philippines' two most pressing water problem areas, Manila and Cebu and their surrounding catchments.

Metropolitan Manila and Cebu are the two largest cities and economic centers in the Philippines, and suffer acute water problems, including shortages, resource depletion and poor water quality. While studies on these cities exist, they need to be translated into Action Plans that represent the stakeholders concerned as a basis for future investments and water resources management. The WRMTFs are comprised primarily of the concerned local government officials, water related agencies, private sector and civil society, with small full-time core teams of technical specialists.

5.3 Review and Evaluation

Localized flood problems are remedied by local protection measures without regard to the overall flood problem in a river basin. Such situation occurs on the surveyed principal river basins where demands for protection are implemented on a case-to-case basis. In the minor projects identified during the survey, the use of appropriate standard plans prepared by DPWH is usually the basis of construction of these projects. No surveys and investigations were undertaken to determine whether these standard plans are really appropriate for the project site.

As shown by the results of the survey conducted, major concerns in the flood control project implementation are technically the following:

- Deficiencies in technical standards and regulations,
- Organization and budget for continuous O&M, and
- Rehabilitation and improvement of existing facilities and natural channels.

Basically, the laws and regulations are not clear for DPWH to implement the flood control projects of principal rivers nor really reflects the actual conditions as well as requirements of other related laws, as follows:

- DPWH mandates in EO 124 are not well implemented;

- Implementation rules and regulations of Water Code shall be prepared in compliance with actual conditions; and
- Implementation rules and regulations of Local Government Code shall be revised to clarify the jurisdictions of river areas.

The government has long recognized these concerns. The table below shows the status of the existing flood control/river structures in the ten (10) principal rivers surveyed.

Name of River	Existing Flood Control Structures/Projects/Activities	River and Flooding Conditions	Problems of the Existing Flood Control Structures
Amburayan	Dikes	Siltation; Overbanking	Deterioration of structures; scouring of foundations
Talisay	Dikes, Desilting	Encroachment; Siltation; Overbanking; Tidal flooding	Collapsed sections; piece-meal
Sta. Rita	Desilting, Flood Gate Weir, Revetments, Sabo Dam	Siltation; Overbanking; Tidal flooding	Piece-meal
Bucao	Dikes, Dredging	Heavy siltation due to Lahar; Overbanking	Total collapse
Angat	Dikes; River Bank Slope Protection	Bank erosion; Overbanking	Piece-meal; collapsed sections
Pansipit	River Bank Slope Protection, Parapet Walls, Dredging	Garbage dumping; Heavy siltation	Piece-meal
Imus	Dredging, Revetment Walls	Garbage dumping; Encroachment; Tidal flooding	Piece-meal
Camatian	River Walls	Overbanking	Scouring of foundations; piece-meal; low and ineffective
Quinali	Dredging, Dikes	Garbage dumping; Siltation; Overbanking	Piece-meal
Yawa	Dredging, Dikes	Garbage dumping; Siltation; Overbanking	Piece-meal; low and ineffective; collapsed sections

5.3.1 Engineering and Quality

In minor projects identified during the survey, the use of appropriate standard plans prepared by DPWH is usually the basis of construction of these projects. No surveys and investigations were done to determine whether these standard plans are really appropriate for the project site. Other issues gathered during the survey regarding planning and design are:

- Lack of flood control data such as discharge, catchments area and/or survey work on all flood-prone areas
- Needs further study on the river flow behavior especially on the effect of floodwater backflows and quarrying
- Design insufficient relative to physical condition of the river and flooding condition
- Lack of consultation and coordination with other related agencies during planning period
- Improper river dike alignment
- No comprehensive study

5.3.2 Implementation

Funding constraints; perennial lack of funds discourages or hampers initiatives for undertaking bigger projects and often resulting to piece-meal project implementation. Other issues gathered during the survey regarding implementation are:

- Choice of projects and priority in implementation are dictated more by political expediency rather than by actual project appropriateness and capability of the municipality to undertake;
- Wrong construction method being adopted;
- Lack of continuity of the system (piece-meal implementation); and
- Lack of cooperation and coordination during construction period.

5.3.3 Operation and Maintenance

Lack of regular maintenance is a big factor in the rapid deterioration of existing flood control structures. Other issues gathered during the survey regarding operation and maintenance are:

- No funds and no manpower at the LGU level to undertake O&M;
- Responsibility of the LGU in operation and maintenance is not clear;
- No clear agreement exist between LGU and DPWH regarding operation and maintenance; and
- No operation and maintenance budget and no O&M team that would monitor all flood control structures in the district engineering office.

CHAPTER 6. PROBLEMS IN IMPLEMENTATION SYSTEM

6.1 Problems and Issues by PCM Workshop

6.1.1 Project Cycle Management (PCM) Workshops

Participation of all stakeholders in the entire cycle of the Study/Project (i.e. planning, implementation to monitoring/evaluation) is necessary for an "effective and sustainable implementation system of flood control projects for principal rivers" to be developed. PCM method was adapted in the Study to encourage and facilitate active participation of stakeholders, particularly to identify the problems/issues in flood control project implementation for beneficiaries and the affected.

The PCM method, which is a tool for managing the entire cycle of a development project by means of a project format termed the Project Design Matrix (PDM), has the following advantages:

(1) Through the workshop discussions, all stakeholders (i.e. direct beneficiaries, negatively affected groups, community leaders, potential opponents, supporting groups, implementing agencies, funding agencies, and decision-makers) and other relevant organizations could have equal opportunities to participate/play role in project planning;

(2) In the formulation of the Project Design Matrix (PDM), an effective implementation system may be developed in a logical manner based on "cause-effect" and "means-ends" relationships in the flood control project implementation; and

(3) Through the Objectively Verifiable Indicators and Means of Verification in the PDM, the performance/status of the project can be regularly monitored/evaluated against target achievements for Outputs, Project Purpose, and Overall Goal such that timely remedial actions can be undertaken if shortfalls in the target achievements occur.

To facilitate active participation of all stakeholders in the study/project planning, three levels of workshops were conducted, as follows:

PCM Workshop of the Study Team

This PCM workshop was conducted amongst the members of the Study Team to formulate the draft PDM-0, and the basic concept and methodology of the Study. The Stakeholders Analysis, the first step of the PCM method, was also conducted in this workshop wherein, among others, the number of succeeding PCM workshops to be conducted and the participants of each workshop were determined.

PCM Workshop 1

PCM Workshop 1 was intended for decision-makers, funding agencies, implementing agencies, and other relevant agencies in the national level/central offices. The purpose of the workshop was "To identify current conditions of laws/regulations, institutions, roles of relevant organizations, and problems in the existing flood control implementation system of principal rivers". The process for PCM Workshop 1 is outlined in **Annex 13**.

PCM Workshop 2

PCM Workshop 2 was designed for decision-makers, funding agencies, implementing agencies, and other relevant agencies in the regional, district, provincial, and municipal levels; and direct beneficiaries, negatively affected groups, community leaders, potential opponents, and supporting groups in areas affected by selected principal rivers.

The purpose of PCM Workshop 2 is to "Identify problems in the existing flood control project implementation system through attitude survey with relevant government officers and local residents". PCM Workshop 2 were conducted at six times: one each in Regions I, III and V, and three in Region IV-A.

Annex 14 is a copy of the information regarding PCM Workshop 2 (i.e. duration, schedule, venue, grouping of participants, methodology, etc.) attached to the Letters of Invitation delivered to different stakeholders. The results of the PCM workshop are discussed in the following sections.

6.1.2 Identification and Analysis of Problems and Issues

The main purpose of the PCM workshops was to "Identify and analyze the causes and effects of current problems in the existing flood control project implementation system".

To attain this objective, the Problem Analysis in the Participatory Planning of the PCM method was employed. Problem analysis involves the selection of a core problem, which is analyzed to identify the causative factors as well as consequent effects. It is usually diagrammatically presented in the form of a cause-effect tree or problem tree. The effects of the core problem indicate its wider dimensions and impacts on flood mitigation and the economy. The causative factors identify the variables influencing the problem and provide the basis for solutions.

As the main consequence of problems/deficiencies in the existing flood control project implementation system for principal rivers, "Flood control projects for principal rivers are not effectively implemented" was chosen/validated as the core problem. In every PCM workshop conducted, each participant identified at least one problem/deficiency in the existing implementation system that may have caused/affected the core problem. These problems/deficiencies were analyzed as to their causative factors and consequent effects, to come-up with a problem tree. The problem tree developed by each group of workshop participants in the selected regions is presented in **Annex 15**. These were analyzed further to come-up with a consolidated problem tree for the Study (**Figure 6.1**).

The identified problems/deficiencies in the existing flood control project implementation system for principal rivers can be categorized under the four direct causes of the core problem, as follows:

(1) No comprehensive implementation program of flood control is prepared for principal rivers

Since the 1970's, the Government of the Philippines (GOP) has prepared basin-wide flood control master plans for 13 out of the 18 major rivers in the Philippines. Most of the projects recommended in the master plans were formulated and/or implemented with technical and financial cooperation of the Japanese Government through its ODA programs (i.e. JICA and JBIC). As part of the technical assistance, some standards and criteria for formulation and implementation (i.e. design and construction) were transferred to engineers/ officers of the DPWH central offices such as the Planning Services, Bureau of Design and Project Management Office for Major Flood Control Projects (PMO-MFCP).

However, no master plans for principal rivers were prepared up to the present, except for Jaro and Iloilo Rivers in Iloilo Province, Panay Island, of which master plan was formulated under "Study on Flood Control for Rivers in the Selected Urban Centers" with the technical assistance of JICA in 1995. The following are the causative factors to this problem:

(a) Technical standards and guidelines for flood control plans are not well established nor disseminated among DPWH offices.

Some standards and guidelines (particularly those for planning) that were developed and applied to specific flood control projects in major rivers are only filed in the archives of the DPWH Central Offices, and not disseminated to regional and district offices. Limited

efforts were made to review, evaluate and utilize this information to formulate technical standards and guideline for flood control planning that can be adapted for principal rivers.

(b) Inadequate manpower to prepare flood control master plan in DPWH regional and district engineering offices.

Since, generally, DPWH's 16 Regional Offices and/or 176 District Engineering Offices only undertake some rehabilitation or remedial works after the occurrence of floods, the engineering experience and technologies that they have acquired are limited/inadequate to undertake flood control master planning for principal rivers. In addition, the more experienced engineers hardly stay with the regional and district offices due to relatively low working conditions.

(c) Only limited basic data gathering/surveys/investigations are conducted for project planning, and processed and stored basic data/information are inadequate for use.

Hydrologic data gathering, ground/river survey, and geological investigation are not continuously conducted. Therefore, data/information, which are indispensable in the preparation of effective and accurate flood control plans, are neither updated nor renewed. Furthermore, since data gathering, survey and investigation are conducted by different agencies, data/information are scattered among these agencies and hence difficult to access. Particularly, these data are not properly collated for principal rivers.

The factors contributory to this problem are:

- Hydrologic gauging stations are not properly operated and maintained;
- Inadequate and less systematic processing and storage of data/ information (database); and
- Inadequate budget for basic data gathering, survey and investigation.

Generally, the data/information required for flood control plan preparation, and the government offices responsible for their collection/upkeep/documentation are indicated in table below:

Basic Data/Information for Flood Control Planning and Responsible Office

Data/Information	Responsible Office	Relevant Office	Status of Data/Information
Climate (Rainfall, etc.)	PAGASA	PHIVOLCS	Collected and processed for long time. Number of stations is inadequate.
Topography	NAMRIA-DENR	-	Map of 1/50,000 & 1/250,000 are available. They are not updated.
Geology	MGB-DENR	-	Digitalizing is started but only for damaged areas.
River Flow (Water Level/Discharge)	BRS-DPWH	NWRB and NIA	Few field survey. Annual report is only until 1980's.
Flood Damage	OCD-DND	DSWD	Damage records are well filed.
River Survey	DEO & RO-DPWH	LGU	Almost no conduct.

(d) Too much attention/emphasis is given to structural measures in addressing flooding.

Based on the records of flood control works implemented in principal rivers, it appears that most of the flood control works are structural flood mitigation measures. Non-structural measures (i.e. reforestation, solid waste management, etc.), which are equally important in the mitigation of floods, are not adequately provided.

(e) Planning is not participatory.

Involvement of beneficiaries, negatively affected groups, etc. in planning is neglected.

(2) Roles and functions in the implementation of flood control projects for principal rivers are not clearly delineated

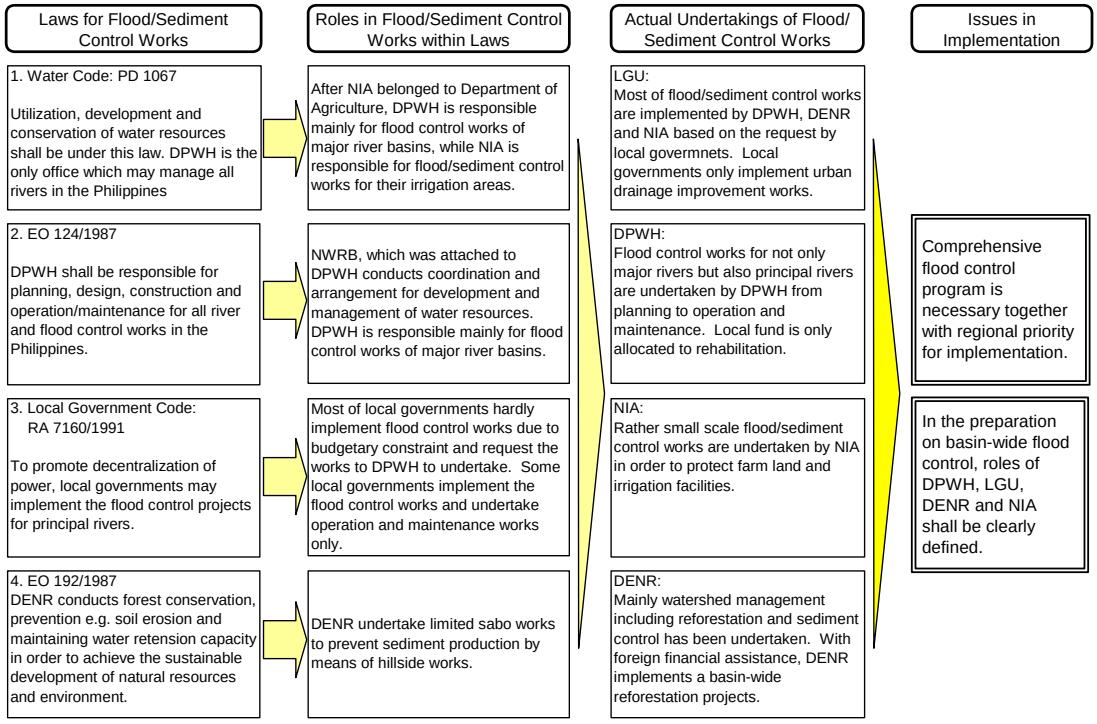
The problem of overlapping or absence of roles and functions of relevant agencies in the implementation of flood control projects for principal rivers is due to the following:

(a) Relevant laws and regulations hardly meet actual conditions.

As shown below, there are conflicts in jurisdictions between relevant agencies in regard to implementation of flood control projects and management of rivers in their watersheds.

The Water Code: PD 1067, and EO 124 designated DPWH as the responsible agency to manage all rivers in the country. The Local Government Code: RA 7160 (1991), however, allows the LGUs to implement flood control projects for principal rivers. Furthermore, the National Irrigation Administration (NIA) has implemented flood control works to protect farmlands as well as irrigation facilities, the DENR is undertaking flood/sediment control works through watershed management and reforestation projects.

This situation has not been corrected, as there has been no constant coordination among these government agencies (i.e. DPWH, LGU, DENR and NIA). Particularly for flood control works of principal rivers, the plans are formulated without any coordination with the agencies concerned.



(b) Inadequate Information & Education Campaign (IEC), and consultation with beneficiaries, negatively affected group, and other stakeholders.

Since IEC and consultation with beneficiaries, negatively affected group, community leaders, NGOs, LGUs, etc. are not adequate, these stakeholders do not know their roles and functions in the flood control projects, especially in the maintenance of the flood control works.

(c) There is neither exchange nor transfer of data/information between DPWH and other relevant agencies.

There is no constant information exchange between DPWH and other relevant agencies, and between DPWH's central office and regional offices. Other than in major rivers, where comprehensive studies on flood control projects have been conducted, it is difficult to align the roles of relevant agencies for flood control projects of principal rivers. This is mainly because of the absence of systematic information system that results in limited/inadequate basic information and plans that can be obtained from these agencies.

Presented in the following is a list of planning conditions and the respective responsible agencies, necessary for the formulation of effective flood control plans.

Plans and Relevant Organizations to Flood Control Projects

Plans Related to Flood Control Projects	Organizations to Prepare Plans	Planning Conditions
Land Use (Urban Plan)	LGU	Flood prone area Flood damage to be mitigated Urban drainage discharge River improvement alignment
Irrigation Development	NIA	Flood prone area Flood damage to be mitigated Urban drainage discharge River improvement alignment
Road & Bridge	DPWH & LGU	River improvement alignment New bridge construction
Watershed Management	DENR	Design flood runoff discharge & sediment discharge
Municipal Water Supply	LGU	Water extraction volume and quality
Regional Development	NEDA	Planning scale and frame
Large-Scale Private Development	LGU	Land acquisition and compensation

(3) Importance of flood control projects for principal rivers is not well recognized/ understood by the government as well as the people

Flood control projects for principal rivers undertaken as of now are not sufficient for mitigating flood damages there both in quality and quantity. There are some causes other than financial restriction as follows:

- Flood inundation scale and its damages are relatively smaller than those in major rivers. Therefore, the flood control works for the principal rivers are given lesser priority in government policies as compared to those for major rivers.
- Since each principal river generally affects a province or a city/municipality only, investment in flood control works in principal rivers by the national government may be perceived to result in inequality in government funding among regions.

- Flooding, particularly in principal rivers, is understood as a momentary phenomenon, and reduction in flood damages attributable to flood control works is considered to be negligible. Therefore, the concerns to floods, especially by the central offices, which are located far from the damaged area, do not last.

Consequently, the central office of DPWH provides PMO for Major Flood Control Projects and implement flood control projects for 18 major rivers, while the flood control works for principal rivers have been left to the regional offices or district engineering offices. As a consequence, flood control projects undertaken for principal rivers are not sufficient (both in quality and quantity) for mitigating flood damages.

(4) Funds for flood control projects for principal rivers are not adequate

Due to the present economic situation of the Philippines, budget for most projects in the country is less than what is desired/required. This is aggravated by the fact that flood control projects in principal rivers have low priority in the national budget for infrastructure projects. Flood control infrastructure development is also beyond LGU's affordability/ budget.

6.1.3 Other Issues

During each PCM Workshop 2, a perception/attitude survey regarding the following issues was also conducted.

(1) What should be done in order to enhance coordination between agencies regarding flood control project implementation? What should be the role of your agency in the coordination?

(2) Who should be responsible for the O&M of flood control structures/works? What should be your role as an agency/stakeholder in the O&M of flood control structures/works?

(3) What are the specific impacts of flooding in your living conditions?

(4) What are the causes of flooding in your area?

(5) What are the flood control projects that should be done in order to mitigate flooding in your area?

The responses of the workshop participants to the preceding questions are presented in **Annex 16**, and summarized/analyzed below:

Issue no. 1

Almost all participants indicated that in order to enhance coordination between flood control project implementing agencies, a coordinating body (i.e. Inter-agency Technical Working Group, Technical Committee or Multi-sectoral Task Force) should be established/operationalized.

As to their respective agency's roles in enhancing coordination, the participants identified the following:

- Provide relevant data/information being gathered by their respective agencies;
- Provide funds for flood control projects that are within their agencies' scope of responsibilities;
- Participate in the planning, design, implementation and monitoring of flood control projects; and
- Participate in the Information and Education Campaign.

Based on the above viewpoints, it appears that the proposed coordinating body can be explored/mobilized in addressing the problems/deficiencies in the existing flood control project implementation system through its active participation in: (i) formulation of comprehensive flood control plan for principal rivers; (ii) clarification and delineation of roles and functions of relevant agencies; (iii) IEC such that

necessity for flood works for principal rivers will be recognized; and (iv) ensuring that flood control projects in principal rivers are implemented according to the comprehensive plan.

Issue no. 2

The participants perceived the DPWH (the implementing agency of most flood control works), and the LGU and direct beneficiaries as the responsible agencies/stakeholders who should be responsible for the operation and maintenance of flood control projects.

As indicated by participants from relevant agencies, their roles in the O&M of flood control projects include: (i) provision of technical assistance, (ii) conduct of information and education campaign regarding the importance of flood control works; (iii) training of direct beneficiaries in the O&M of flood control works; and (iv) monitoring and feedback.

Close cooperation amongst DPWH, LGUs and direct beneficiaries in the O&M of flood control works along/in principal rivers appears reasonable. However, close cooperation of DENR, DA, DAR, NIA and LGUs and other stakeholders (especially residents in the catchment area) in the management of the watershed areas is also necessary.

Issue no. 3

The specific impacts of flooding in the living conditions of participants who are directly affected by flooding can be generally classified into:

- Direct damages/losses, which include:
  - Damage to buildings, equipment, furniture, and inventories.
  - Damage to infrastructures including roads, bridges, river facilities, etc.
  - Damage/losses to agricultural production particularly to crops.
- Indirect damages/losses, which include:
  - Damages/losses to household economy.
  - Damages/losses to business activities.
  - Damages/losses to public services due to stoppage or slow down of activities.

By bringing out the impacts of flooding in their living conditions, the participants intend to substantiate their expressed need for flood control projects in their areas.

The benefits of flood control projects are the reductions in the aforementioned damages/ losses resulting from the implementation of the projects.

Issue nos. 4 and 5

The common causes of flooding in the selected study areas, based on those identified by the participants, are: (i) reduction in river carrying capacity due to siltation, (ii) erosion of river banks, (iii) insufficient internal drainage, and (iv) improper waste disposal.

The responses of the participants to these issues show that stakeholders, especially those directly affected by flooding, are not only able to identify the causes of flooding in their areas but also come-up with proposals on the flood control projects that should be implemented to mitigate flooding. Their participation in the whole project cycle is therefore important.

6.2 Summary of Problems in Flood Control Works for Principal Rivers

In order to examine the problems in the implementation system for the principal rivers, problems and/or issues are extracted from:

- National development plans and policies for flood control;
- Survey results of past flood control projects; and
- PCM workshops conducted with relevant national governments, local governments and beneficiaries.

Further, all problems and issues are summarized into main themes and categorized based on the Infrastructure Development Cycle in order to find the solutions.

6.2.1 Requirements in National Development Plans and Policies

Problems are firstly extracted from the requirements of the national development plans and policies in the flood control works are summarized as follow:

(1) MTPDP 2001 - 2004

- Pursue proper O & M of flood control and drainage facilities including an effective garbage collection and disposal in coordination with other concerned government agencies and LGUs;
- Relocate and prevent informal settlers living along the banks of rivers/esteros/creeks;
- Implement sabo projects for the prevention/mitigation of sediment-related disasters, debris and lahar flow/landslide;
- Study and formulate guidelines leading to sustainable development/land use in sediment-related disaster-prone areas, and
- Implement comprehensive measures consisting of construction, warning/evacuation, livelihood programs in coordination with concerned agencies and LGUs

(2) MTIDP – DPWH 2001 - 2004

- Comprehensive planning and identification of inundation areas in major and principal rivers;
- Provide flood control facilities and sabo works, and pursue non-structure measures in flood/sediment disaster-prone areas;
- Strengthen the FCSEC for research and studies, information center and sabo engineering program; and
- River management in coordination with LGUs.

(3) Requirement of NFPP 2001 - 2030

- Prioritize and implement infrastructure projects that support the policy of national dispersal through regional concentration;
- Ensure compatibility of infrastructure with local land use and development plans, giving priority to projects with the most strategic impacts;
- Compatibility with NIPAS (National Integrated Protected Area System) and other production areas; and
- Incorporate disaster mitigation principles in infrastructure development.

(4) IWRM

- Evaluate properly the efficiency of flood control strategies;
- Improve data collection systems and access to information by users;
- Establish policy instruments and the legal and regulatory framework;
- Establish mechanisms for consultation and public participation and conduct intensely information/education campaign;
- Enhance capacity building of not only governmental agencies but also non-governmental organizations;
- Adopt the philosophy of flood management and create management agencies (including river basin organizations); and
- Establish mechanisms to achieve financial sustainability.

6.2.2 Problems Identified by Survey on Flood Control Projects

Throughout the survey on past flood control projects for principal rivers, the following problems are identified.

(1) Engineering

- Lack of flood data/information and survey works for rivers and flood-prone area;
- Deficiencies in technical standards and regulations;
- Lack of consultation and coordination with other related agencies; and
- No comprehensive study.

(2) Implementation

- Choice of works and priority in implementation are dictated by political expediency rather than by actual appropriateness;
- Wrong construction method being adopted;
- Lack of continuity of the project (piece-meal implementation);
- Lack of cooperation and coordination with relevant agencies and LGUs concerned during the construction period.

(3) Operation and Maintenance

- Responsibility of the LGU in O&M is not clear;
- No clear agreement made between LGU and DPWH regarding O&M;
- No funds and no manpower at the LGU level to undertake O&M; and
- No O&M budget and team that would monitor all flood control structures in the DEO.

(4) Rules and Regulations

- DPWH's mandate to be "tasked to carry out ensuring the safety of all infrastructure facilities – " in EO 124 is not well implemented;
- Implementation rules and regulations of Water Code shall be prepared in compliance with actual conditions; and
- Implementation rules and regulations of Local Government Code shall be revised to clarify the jurisdiction of river areas.

6.2.3 PCM Workshop

Selecting the core problem to be "Flood control projects for principal rivers are not effectively implemented", four direct causes were recognized in the PCM workshops as follows:

(1) No comprehensive implementation program

- Technical standards and guidelines for flood control plans are not well established nor disseminated among DPWH offices;
- Inadequate manpower to prepare flood control master plan in DPWH regional and district offices
- Basic data gathering/surveys/investigations are limited, and processed and stored data are inadequate for planning;
- Attention/emphasis is only given to structural measures in addressing flood control; and
- Planning is not participatory.

(2) Roles and functions are not clear

- Relevant laws and regulations hardly meet actual conditions;
- In adequate information and education campaign and consultation with beneficiaries, negatively affected group, and other stakeholders; and
- No exchange nor data/information between DPWH and other relevant agencies.

(3) Importance of Flood Control Projects

- Importance of flood control projects for principal rivers is not well recognized/understood by the government as well as the people; and
- Funds for flood control projects of principal rivers are not adequate.

(4) Coordination between implementing agencies

- Relevant data/information gathered by respective agencies shall be provided among them;
- Funds for flood control projects that are within their agencies' scope of responsibilities shall be provided;
- Relevant agencies shall participate in the planning, design, implementation and monitoring flood control projects; and
- Relevant agencies shall participate in the information and education campaign.

(5) Operation and maintenance

- DPWH shall technical assistance to the responsible agency for O&M;
- Information and education campaign regarding importance of flood control works shall be intensely conducted;
- Training for O&M of flood control works shall be given to the direct beneficiaries; and
- DPWH shall monitor and feed back of the flood control project implementation.

6.2.4 Integration of Problems and Issues

Through the analysis and grouping all problems and issues, they are integrated into eight main agenda as follows and Summary Matrix is shown in **Table 6.1**.

(1) Jurisdiction of River Areas

- No definition on the jurisdiction for rivers and their areas under the law.
- No coordination among governmental agencies to undertake river works.

(2) Coordination and Cooperation between DPWH and LGUs

- Importance of flood control is not well recognized.
- Choice of projects and priority in implementation shall be dictated by actual project appropriateness.
- Study to formulate sabo projects is urged for sustainable development/land use in sediment-related disaster-prone areas.

(3) Proper Management System of Data/Information

- No comprehensive implementation of flood control including non-structural measures as well as livelihood program.
- No management body covering river basin.

(4) Flood Control Project Identification

- Basic data gathering/surveys/investigations are limited including processing and storing.
- No proper data collection systems, and access to information by users.
- No proper monitoring and feedback mechanism for project implementation.

(5) Planning Resources/Capability

- Technical standards and guidelines are not well disseminated among DPWH offices.
- Hydraulic/hydrologic analytical capacities are not well developed.
- Inadequate manpower to prepare master plan of river basin flood control.

(6) River Basin approach and Flood Management

- No data/information exchange between DPWH and relevant agencies.
- No coordination and cooperation during construction.
- No clear arrangement for O & M between DPWH and LGUs.

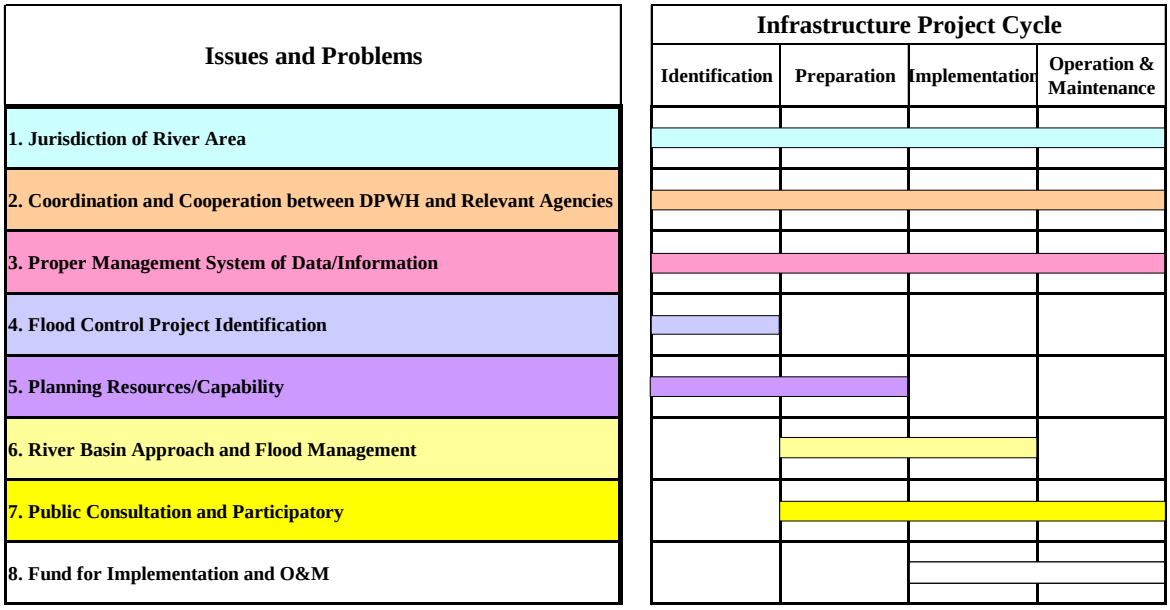
(7) Public Consultation and Participatory

- Inadequate information & education campaign, and consultation with stakeholders.
- Participation of beneficiaries and stakeholders is not well practiced in the planning, design, implementation and O&M.

(8) Fund for Implementation and O&M

- Funds for flood control projects for principal rivers are not adequate.
- No funds and no manpower at the DPWH DEOs as well as LGU level to undertake O&M.
- No mechanisms to achieve financial sustainability is established.

Summarized eight main agenda are categorized into the respective stages of Infrastructure Development Cycle as follows:



The problems and issues concerning all stages of the Cycle shall be counteracted and solved in the long-term with all the efforts of the government, while those concerning one to three stages are tackled by mainly DPWH and related agencies.

CHAPTER 7. IMPROVEMENT PLAN OF FLOOD CONTROL PROJECT IMPLEMENTATION SYSTEM

7.1 Possible Solutions

7.1.1 PCM Objective Tree

Based on the initial Objectives Analysis (**Figure 7.1** – Objective Tree) performed on the Problem Tree and other issues, the draft PDM is prepared as shown in **Table 7.1**.

Output 1: Comprehensive plan of principal rivers flood control works will be proposed.

a) Establishment of technical standards and guidelines for flood control master planning.

b) Enhancement of technical capacity of engineers/officers in DPWH regional and district engineering offices.

c) Rehabilitation/establishment of hydrologic gauging stations, and enhancement of capacity of personnel in the operation and maintenance of these stations.

d) Establishment of systematic processing and storage of data/information (database).

e) Identification of funding sources.

f) Provision of adequate non-structural flood mitigating measures (i.e. reforestation, solid waste management, etc).

g) Participatory approach to be employed in the whole project cycle.

Output 2: Roles and functions in flood control project of relevant organizations will be clarified.

a) Revision of laws and regulations to meet actual conditions.

b) Formulation of IEC and consultation strategies.

c) Establishment of systematic information system.

Output 3: Necessity of flood control works for principal rivers will be recognized.

a) Establishment of extensive IEC.

Output 4: Optimal utilization of funds for flood control projects.

a) Explore the viability of establishing an agency/body that will regulate the implementation of flood control projects in principal rivers, and assure that these projects are implemented according to the comprehensive plan.

b) Identification of funding sources.

7.1.2 Methods for Solution of Problems/Issues

Including possible solutions to problems and issues from PCM Objective Tree, the directions/actions and concerned agencies (except DPWH) are recognized as follows:

(1) Jurisdiction of River Areas (Legislative Body, NRWB, LGUs)

- Revise IRR of Water Code
- Clarify jurisdiction and obligation of LGUs in Local Government Code

(2) Coordination and Cooperation between DPWH and Relevant Agencies (DENR, LGUs)

- Basically, DPWH shall control river flow and river area of the channel sections in the developed area, and other area of river basin could be controlled by DENR.
- Create an organization for Flood Management for river basin

(3) Proper Management System of Data/Information (PAGASA, NWRB, NAMRIA, OCD)

- Enhancement/rehabilitation of observation system of PAGASA and BRS
- Establish information network for DPWH
- Add the function of information center to FCSEC

(4) Flood Control Project Identification (DENR, OCD, NWRB)

- Conduct inventory survey for flood and sediment disasters
- Conduct inventory survey for rivers and river basins
- Ranking or prioritizing the river basin for flood control works

(5) Planning Resources/Capability (DENR, NWRB, NHRC, PHIVOLCS, LGUs)

- Continue and strengthen the activities of FCSEC
- Recruit more engineers to FCSEC
- Reorganization of planning sector in DPWH
- Exchange information among the related agencies

(6) River Basin Approach and Flood Management (DENR, NWRB, NEDA)

- Capacity development for planning in DPWH
- Expansion of FCSEC's function
- Close coordination among agencies through an organization of flood management

(7) Public Consultation and Participatory (LGUs, NEDA)

- Develop the methodology for participatory planning
- Employ the results into the project evaluation
- Conduct general IEC of flood control nation-wide

(8) Fund for Implementation and O&M (NEDA, DBM, DOF)

- Establish the rules for cost sharing between national agency and LGUs for implementation and O&M
- Develop the financial sources for flood control works

7.1.3 Actions by DPWH

By DPWH, the following actins shall be taken in connection with the above agencies and actions.

Problems and Issues	Action to be Taken by DPWH
1. Jurisdiction of River Area	Agreement on jurisdiction of rivers shall be drafted by DPWH relation to LGUs and the other governmental agencies.
2. Coordination and Cooperation between DPWH and Relevant Agencies	Technical assistance shall be extended to LGUs. General coordination will be made through an organizarion of flood management.
3. Proper Management System of Data/Information	Capacities for hydrological data and its analysis shall be developed.
4. Flood Control Project Identification	Criteria (draft) shall be prepared for sediment hazard risk. Inventory survey for flood, sediment and river shall be conducted.
5. Planning Resources/Capability	FCSEC shall be continued and expanded with increasing engineers 1) in FCSEC and 2) for training. Engineers in planning sector shall be increased.
6. River Basin Approach and Flood Management	Functions of FCSEC shall be expanded especially for the concepts of flood management.
7. Public Consultation and Participatory	Public consultation and participatory planning shall be intensively employed in project formulation stage in coordination with LGUs.
8. Fund for Implementation and O&M	Projects under CDF (PADF) shall be controlled by DPWH in compliance with the MTDIP.

Focusing on the actions to be taken by DPWH, it is emphasized that 1) Planning Section (Service) and 2) FCSEC shall play an important roles in DPWH's actions required to solve the problems and issues.

(1) Planning Section

(a) Jurisdiction of River Area

The Planning Service will draft the concepts and guidelines for jurisdiction river area in consultation with NERB and DENR. Accordingly the implementation rules and regulations of Water Code will be drafted and submitted to the legislative body.

Particularly, the ownership of river flow and river area shall be clarified to be under the state (the national government). The authority of LGUs to alter river area and river flow shall be limited or with consent of the national government responsible for them, i.e. DPWH and DENR.

(b) Coordination and Cooperation between DPWH and Relevant Agencies

Presently AMMS of DPWH is preparing and coordinating capacity training programs for employees within the Department. In case, LGUs request DPWH for such programs, DPWH shall provide them under the provision of Local Government Code-1991. Providing the regular programs, a mutual agreement between DPWH and DILG are required. Under the rules provided for this purpose, FCSEC should take a main role of assistance.

DPWH principally controls river flow and river area (flow section and easement) of the channel sections in the developed area. DENR may control land use of other areas in the river basin including floodplain

It is, therefore very important for DPWH to cooperation with these agencies concerned as well as to participate IWRM with its own provision on river basin approach to flood control. The planning sections are encouraged to carry out those aspects. In the course of IWRM,

an organization of flood management may be created for the effective coordination and cooperation among the agencies concerned.

(c) Proper Management System of Data/Information

Planning sections shall lead the DPWH and PAGASA to enhance and rehabilitate the hydrological observation system. Recording and data collecting activity should involve the DEOs, ROs and the central office; the processing should be taken by FCSEC, and access authority should be given to FCSEC so the total system should be kept in FCSEC.

(d) Flood Control Project Identification

Project identification consists of some steps described as follows:

- Either inventory survey or past flood data shall be used for preparation of criteria on project identification;
- Prioritization of rivers or areas for flood control projects shall be made firstly with collection on data/information on flood damages/losses and their potentials in the future;
- Analysis on the listed flood control projects with economic, financial and social aspects;
- Evaluation and prioritization of projects based on the analysis and criteria.

Central level of planning sections or FCSEC is required to prepare the criteria for project identification and further prioritization for the project implementation.

(e) Planning Resources/Capability

In order to prepare a comprehensive flood control implementation plan, the planning resources and capability shall be strengthened. The FCSEC (Project ENCA), which was started in January 2000 shall be continued and expanded having a wider target for technology transfer. It is necessary to increase the number of engineers having training under and working in FCSEC.

Enforcement of institutional capacity is badly required for the Planning Service to promote the RBA-FC planning. Some sections for flood control shall be added to or reorganized in the Planning Service. Further, data/information of the relevant agencies shall be always provided and updated for easy access. Particularly, capability of the hydrological analysis, which is a basis of project identification and formulation of flood control, shall be well-developed in the PS and FCSEC.

(f) River Basin Approach and Flood Management

Strengthening this function for RBA-FC is to organize the existing bodies, DENR, PAGASA, PHIVOLCS, for machinery for consultation chaired by FCSEC. At the planning stage, DPWH is required to pay more attention to involvement to IWRM and RBM. The planning sections, therefore, are required to prepare the plan of comprehensive flood control and drainage and integrated infrastructure program within the river basin utilizing guidelines and criteria provided by FCSEC.

A new concept of flood control, that is "*Flood Management*" shall be integrated into RBA-FC and IWRM as one of the important keys in the Philippines. A national committee for Flood Management shall also be scheduled for RBA-FC scheme.

(g) Public Consultation and Participatory Planning

The planning sections are required to practice the public consultation and participatory planning with guidelines prepared by FCSEC. Structure and method of sharing tasks among the central office, ROs and DEOs should be established.

(h) Fund for Implementation and O&M

Projects are identified among the projects proposal requested from DEO through RO or some are requested other organizations like Regional Development Councils. In this stage the process is to identify potential projects with expected return of investments.

In the deliberation of projects at the Regional Development Council, it should also identified and arranged fund for the actual implementation of the project, as well as for a proper O&M. The national budget, local budget, request from CDF and foreign loans may be discussed.

The proposed projects are mostly made for portion by portion of damaged areas or rivers. In order to rationalize the expected return, preliminary studies are conducted assisted by the Planning Service.

(2) Flood Control and Sabo Engineering Center (FCSEC)

Considering the requirement for flood control and sabo works above mentioned, FCSEC should be responsible to render its power and authority for the following issues, other than the tasks and works mentioned planning sections:

- Continue to prepare/revise technical guidelines, standards and manuals,
- Continue to promulgate the technical guidance for engineers of DPWH in regional and district levels,
- Pursuit the way of promulgation of technical guidance for engineers in LGU level,
- Brush-up the technical guidelines, standards and manuals for planning, especially for hydrological analysis, and foster the hydrological analysts,
- Prepare the guidelines, standards and/or manuals for participatory planning and socio-economic aspects,
- Prepare the guidelines, standards and/or manuals for comprehensive flood control and mitigation methodology with river basin approach on flood management with the concept of IWRM, including structure and non-structure methods.
- Be core for coordination and cooperation with the other agencies concerned with flood and sediment-disasters.

7.2 Formulation of Improvement Plan

In the preparation of flood control plan for major rivers, most of which were conducted with the technical cooperation of JICA and financial assistance of JBIC, those aspects such as IWRM, basin-wide approach, integrated planning including structural/non-structural measures and sediment control. As well the related agencies were also involved in the planning stage by organizing a steering committee for the project. Further, the methods of participatory planning and social impact assessment have been developed in the flood control project implementation in the recent years.

On the other hand, the aforementioned aspects and/or methods have been not considered, and the coordination with related agencies and their works has not pursued for flood control project implementation for principal rivers. As the projects have been designed and implemented by Regional Office or District Engineering Office, the capacities of offices and fund allocated were not adequate.

In order to formulate the improvement plan of flood control project implementation system for principal rivers, a *Comprehensive Flood Control Project Implementation Plan* for principal rivers shall be emphasized as summarized in Chapter 6. The stage or term-wise approach is prepared to attain the above objectives. Categorizing the plan into two terms, the period of each term is assumed as follows:

Medium-Term: 2005 to 2010 (6 years)

Long-Term: 2011 to 2030 (20 years)

7.2.1 Action Plan for Medium-Term (2005-2010)

Inclusive of the preparation of comprehensive flood control project implementation plan, the projects and activities to be carried out for medium-term in the course of improvement of implementation system are enumerated as follows:

- Preparation of comprehensive flood control project implementation plan for principal rivers;
- Establishment of data/information management system for flood control and sabo works;
- Preparation and implementation of information and education campaign for flood control and sabo works; and
- Implementation of the flood control 1st medium-term plan.

(1) Preparation of Comprehensive Flood Control Project Implementation Plan

A comprehensive flood control implementation plan for principal rivers will be prepared within the early period in the Medium-Term Schedule (2005 to 2010).

(a) Inventory Survey

As an initial step, an inventory survey shall be conducted for 326 principal rivers (A catchment area is 40 km^2 to 1,400 km^2) including identification of other principal rivers and review on the dimensions such as catchment area, river length, etc. The inventory survey will be made for the following items:

- Location and basin area (administrative region to belong);
- Topography, geology and vegetation;
- River length and gradient;
- Records of rainfall and water level stations, if any;
- Annual mean basin rainfall;

- Administrative units (province, city, municipality), their areas and populations;
- Land use and population within the river basin;
- Records of past flood and sediment damages, if any;
- Area and population within the flood-plain area;
- Outline of water resources development projects, if any; and
- Other regional development plans and projects, if any.

(b) Preparation of Comprehensive Flood Control Project Implementation Plan

With the key indices indicating importance and urgency in project implementation such as area and population of flood-plain for importance and magnitude/frequency of flood damages for urgency, priority for implementation will be placed to all subject rivers.

Selecting 20 rivers with higher priorities, a flood control master plan will be prepared for each selected river, while the master plan is mainly formulated with structural measures, as planning dimensions to be defined below:

- Project scale;
- Main structures and facilities;
- Project cost;
- Investment plan/economic evaluation;
- Management plans for natural/social environmental impacts; and
- Implementing bodies and schedules.

Assuming the project scale to be once in 30 to 50 years for recurrence probability, the optimum project scale will be selected through the economic evaluation. Aspect of IWRM and basin-wide approach shall be employed in the planning as well as consultation/coordination with relevant agencies and LGUs shall be carried out in the preparation. On the basis of the flood control master plans for 20 selected rivers, the implementing schedules including major structures, project costs, etc. will be tabulated as follows:

Priority	River	Area (km^2)/ Population			Region	Major Structures/ Facilities	Project Cost (mil. peso)	Implementation (Year)
		Catch ment	Flood	Popu-lation				
1.	Ambura yan	1,386			I	Dike, Revetment		2006 - 10
2.	Talisay	144			III	Dike, Dredging		2006 - 10
3.	Pansipit	656			IV-A	River Wall, Dredging		2006 - 10
4.	Imus	105			IV-A	Revetment, Dredging		2006 - 10
～								～
20.	Lucban	269			IV-A	Revetment		2011 - 15
21.	Yawa	70			V	Dikes, Revetment		2011 - 15
～								～
326.								

(2) Establishment of Data/Information Management System

A network for data/information will be established in the Medium-Term. Other than the data and information, of which network has been constructed through NWIN, the river and flood data shall be firstly collected and processed into a database (*Flood Control Database = FCD*). Secondly, the database will be developed into an information network (*Flood Control Information Network = FCINET*) including NWIN.

For establishing the flood control information network by Planning Service as a lead office, the following works will be undertaken in the Medium-Term in collaboration with the related agencies:

(a) Inventory Survey on Existing River Data and Flood Data

Including past projects and studies of flood control, an inventory survey on river and flood data (refer to Section 2.3, Chapter 2) will be conducted with central and regional offices of DPWH.

(b) Preparation of Data Format and Encoding

Referring the existing format for data encoding, a unified format will be prepared by integrating types of data and information. The unified format will be distributed to the regional offices for encoding. For this work, each regional office shall establish a *Working Group* for inventory and encoding the data and information on river and flood within its jurisdiction. Each regional office shall prepare a library in its office for storing and updating the raw data as well as encoded format for reference and future development.

(c) Digitizing Data and Preparation of Database

After encoding the data into specified format, digitizing and preparing the database will be carried out by the central office (Planning Service).

(d) Establishment of FCINET

Through an investigation of available telecommunication system such as Internet and exclusive communication line, a network (FCINET) for collection and dissemination of data/information of river and flood will be established.

(e) Management and Development of FCINET

FCSEC will preferably manage and develop the FCINET, including integration with other information network such as NWIN. Further, FCINET will be expanded for not only data/information but also monitoring of rivers and floods as well as their project implementation.

(3) Preparation and Implementation of Information and Education Campaign

For proper floodplain management, specifically smooth and effective flood control project implementation, a total information and education campaign shall be commenced in the early stage in the Medium-Term. Inclusive of concepts for IWRM and River Basin Approach, general policies and directions for flood mitigation shall be disseminated.

(a) Preparation of Program

Together with the preparation of Comprehensive Flood Control Project Implementation Plan, a program of information and education campaign will be prepared. The program

shall emphasize the importance of public consultation and participatory planning.

The program preparation may refer to and develop the guidelines/methods of the recent practices of information and education campaigns, conducted in several projects such as Pasig-Marikina River Channel Improvement Project, Iloilo Flood Control Project, etc. Planning Service and Public Information Division of DPWH will prepare the program in collaboration with FCSEC.

(b) Implementation of Campaign

Based on the program for information and education campaign, two types of campaign will be implemented. One is for general about all flood control works undertaken by the DPWH, which will be mainly conducted through the related organization and media. The other is for some specific flood control plans for principal rivers listed in the Comprehensive Flood Control Project Implementation Plan; therefore it will be conducted by the relevant regional offices by means of public consultation and participatory planning.

(4) Implementation of Flood Control 1st Medium-Term Plan

At the later part of Medium-Term, the flood control projects designated in the 1st Medium-Term will be started with the detailed engineering. The implementing office will be the regional office of which jurisdiction may cover the area of principal rivers for the implementation.

(a) Target Rivers

In the Comprehensive Flood Control Project Implementation Plan, four to five principal rivers will be selected with higher priorities for the implementation. The flood control projects are works for rather maintenance, rehabilitation and improvement than new construction, on account of the recent financial constraint.

(b) Implementation Organization

The regional office will be an implementing office with technical assistance of FCSEC, assistance for contracting and administration from PMO-MFCP and monitoring by Planning Service.

(c) Coordination with Related Agencies

Coordination with other related agencies at regional level would be also carried out by the subject Regional Office.

7.2.2 Projects and Activities for Long-Term (2011–2030)

The Flood Control Project Implementation System will be finalized from the lessons and experiences through the Action Plan for Medium-Term.

(1) Major Undertakings

Integrating the flood control works for both principal and major rivers, a hierarchic organization and system for flood control and sediment disaster prevention (sabo) works will be prepared through the following undertakings mainly by DPWH:

- Review of the flood control medium-term plans;
- Review of the sabo medium-term plans; and
- Implementation of information and education campaign.

The works will be carried out on account of major issues identified in the existing flood control project implementation system such as IWRM, river basin approach, coordination with other agencies, participatory planning, etc.

(2) Flood Management for Long-Term Program

In the comprehensive flood control, now called as *Flood Management*, many governmental agencies are involved with their own mandates on the flood control and sediment-related disasters; DPWH for flood control and drainage while DENR for watershed management, NIA for soil conservation, PAGASA for weather and flood forecasting, LLDA for Laguna Lake development and conservation, NEDA for Regional Development, NHRC for hydraulics, PHIVOLCS for volcanic sediment disasters and NWRB for integrated water resources development.

Under the National Flood Management Committee, River Flood Plain Management Committee is created in the flood plain, which the Secretary of DPWH designated consisting of the following members (Organizational Chart of the NFMC is shown in **Figure 7.2)**:

(a) Definition of Flood Management

Flood Management is the action to mitigate the damages caused by flood- and sediment-related disasters, by means of structures such as floodway, dam and etc. and/or by non-structural method such as risk-mapping, forecasting & warning system and land use regulation provided in river basin-wide area, and other methods and activities in any forms to mitigate such damages.

(b) Objectives

Objectives of creating National Flood Management Committee are:

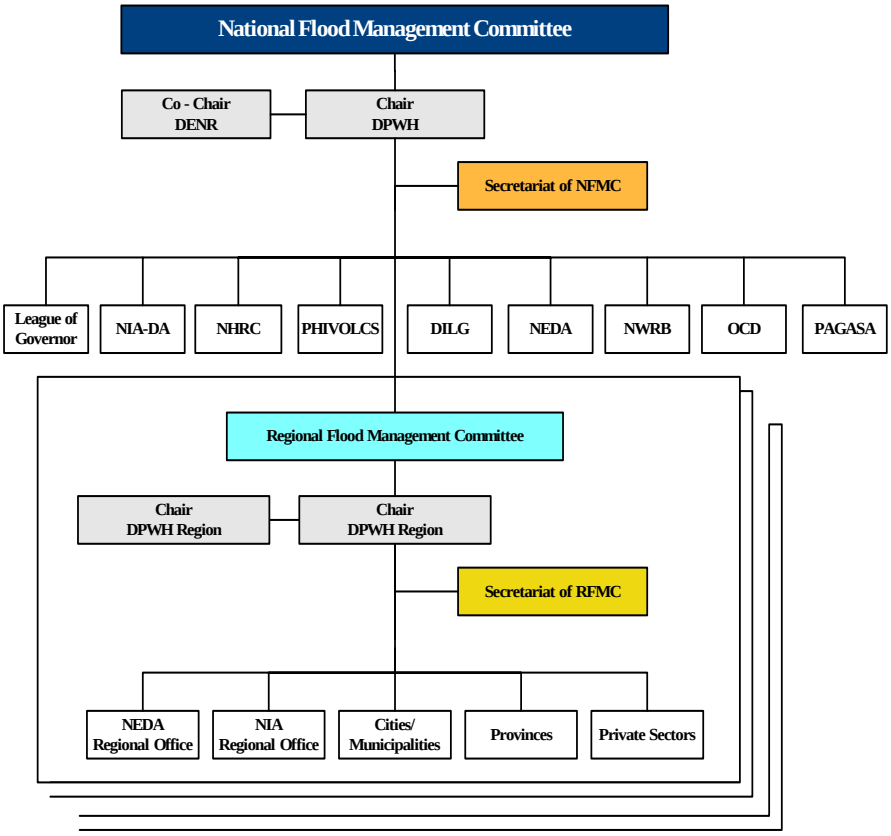
- Lead all agencies and people for flood disaster mitigation;
- Integrate all efforts and investments to be effective for flood disaster mitigation; and
- Coordinate all activities related to flood and water resources.

(c) Roles and Functions

- Formulate and promulgate the national flood management guideline to promote the best interest of the country and the coordinated protection of flood- and sediment-related disaster prone areas.
- Organize the joint inspection team for flooding areas to identify and study the causes and countermeasures.
- Monitor the progress of the projects for flood mitigation.
- Provide necessary arrangement and coordination among the central government agencies for technical and administrative support to the local government units for the flood management.

(d) Organization

The organization of the ***National Flood Management Committee*** is composed of the related government agencies as shown in the table below, while it has a regional branches: ***Regional Flood Management Committee***, which should take action closely to the respective regions as well as LGUs therein under the guidelines and instructions of the ***National Flood Management Committee***.



ORGANIZATIONAL SETUP OF NATIONAL FLOOD MANAGEMENT

National Flood Management Committee

Chair	:	Department of Public Works and Highways
Co-chair	:	Department of Environment and Natural Resources
Member	:	Department of Public Works and Highways
	:	Department of Environment and Natural Resources
	:	Department of Interior and Local Government
	:	National Economic Development Authority
	:	Department of Agriculture/National Irrigation Administration
	:	PAGASA
	:	National Water Resources Board
	:	National Hydraulic Research Center
	:	Philippine Institute of Volcanology and Seismology
	:	Office of Civil Defense
	:	League of Governors

Regional Flood Management Committee

Chair		Department of Public Works and Highways
Co-Chair		Department of Environment and Natural Resources
Member		Department of Public Works and Highways
		Department of Environment and Natural Resources
		National Economic Development Authority
		Department of Agriculture/National Irrigation Administration
		Provinces
		Cities/Municipalities
		Private Sectors

(e) Roles of Secretariats and Committee Member

The roles of Secretariats of both National and Regional Flood Management Committees are proposed as follows:

Secretariat of National Flood Management Committee

- Arrange the meeting of this National Committee regularly and periodically;
- Prepare the necessary materials for this National Committee;
- Draft the flood management guideline; and
- Provide necessary coordination for technical and administrative cooperation among the member agencies on the implementation of flood control, sabo and drainage projects.

Secretariat of Regional Flood Management Committee

- Arrange the meeting of this Committee regularly and periodically;
- Prepare the necessary materials for this committee;
- Draft the regional flood management guideline in line with the national flood management guideline;
- Provide necessary arrangement for technical and administrative support to the local government units on the implementation of flood control, sabo and drainage projects within its region.

For committee members of either National or Regional Flood Management Committees, their roles are enumerated as follows:

Department of Public Works and Highways

- Provide secretariat for this Committee;
- Provide all necessary data/information on flood control and sabo works;
- Prepare Medium-Term Flood Control and Sabo Plan under the flood management guideline and submit to the Committee; and
- Prepare annual flood control and sabo plan for both national and regional levels.

Department of Environment and Natural Resources

- Provide all necessary data/information on the forest management and watershed management; and
- Formulate and implement the forest management and watershed management according to the flood management guideline.

Department of Interior and Local Government

- Provide necessary arrangement for implementation of projects in jurisdiction of the local government units, and technical and administrative supports of the central government for the local government units; and
- Provide necessary arrangement for devolution of implementing projects

National Economic Development Authority

- Provide necessary arrangement on the national policy, development and foreign assistance; and
- Examine and evaluate the flood management guideline from the view of national

development plan.

Department of Agriculture/National Irrigation Administration

- Provide all data/information on irrigation and drainage projects and soil conservation projects; and
- Formulate and implement the irrigation and drainage plan in accordance with the flood management guideline.

Philippine Atmospheric, Geophysical and Astronomical Services Administration

- Provide necessary data and information on meteorology and hydrology; and
- Prepare the plans of weather/flood forecasting systems nationwide.

National Water Resources Board

- Review and update the inventory of rivers and water resources;
- Provide the national policy and direction of water resources developments; and
- Prepare an expansion plan of the National Water Information Network (NWIN) and coordinate/arrange functions of agencies concerned.

National Hydraulic Research Center

- Provide necessary information and technical support on hydrology and hydraulics; and
- Introduce the modern technology for flood control and sabo engineering.

Philippine Institute of Volcanology and Seismology

- Provide necessary information and technical support on volcanic sediment flow; and
- Provide data on topographical and geological features of flood and sediment disaster prone areas.

Office of Civil Defense

- Provide necessary information on damages caused by floods and sediment related disasters, and
- Prepare the plans and measures of fighting, evacuation, rescue and restoration for natural disasters.

League of Governors

- Provide necessary arrangement for implementation of projects in jurisdiction of the local government units; and
- Coordinate technical and administrative supports of the central government for the local government units.

Provinces/Cities/Municipalities

- Provide data/information on damages and conditions of flood and sediment disasters in their jurisdictional area;
- Identify the flood control projects according to the regional flood management guideline; and
- Represent the benefit of their jurisdiction and public services and facilities

Private Sectors

- Provide data/information of affects and damages of flood and sediment disasters on private entities; and
- Perform their activities related to flood management in consistent with the regional flood management guideline.

7.2.3 Organization for Implementation System

(1) Organizational Structures

Organizational resources will be maximized to effectively formulate and implement the Comprehensive Flood Control Project Implementation Plan. Based on the existing organizational structure of DPWH, (1) Strengthening the capacity of Planning Sector and (2) Extending functions of FCSEC, are proposed to pursue the Action Plan in the Medium-Term as follows:

(a) Strengthening the Capacity of Planning Sectors

(i) Create the *Flood Control Section* to the Development Planning Division, the Planning Service. This section is in charge of the followings:

- Manage the information on flood control and drainage over the country;
- Formulate/examine the flood control and drainage programs/projects;
- Monitor and evaluate the flood control and drainage project implementation;
- Coordinate with the other agencies concerned with flood control and drainage;
- Supervise the Regional Offices for works on the flood control and drainage; and
- Consult and cooperate with FCSEC on technical matters.

(ii) Create the *Flood Control Section* to Planning and Design Division in Regional Office. This section is in charge of the followings works in their jurisdiction:

- Manage the information on flood control and drainage;
- Formulate/examine the flood control and drainage programs/projects;
- Implement the flood control and drainage projects;
- Coordinate with other agencies concerned on the flood control and drainage at the regional level; and
- Evaluate the project implementation and report to the Central Office.

(b) Extending Functions of FCSEC

(i) Formulate Good Practices on Comprehensive Flood Management

Formulate the good practices compiling the information on comprehensive flood management practices collected in the Philippines and from the other countries.

(ii) Prepare Manual for M/P and F/S on Comprehensive Flood Management

Prepare the manual for M/P and F/S including the convenient manners for evaluation using diametrical analysis, which are compiled from the results of the previous studies on the flood control and drainage projects carried out in the Philippines

(iii) Strengthen the Technical Capacity of RO's Engineers through OJT

Strengthen the technical capacity of ROs through the OJT including the actual implementation in addition to the present activities to promulgate the technical guidelines and standards through the seminars.

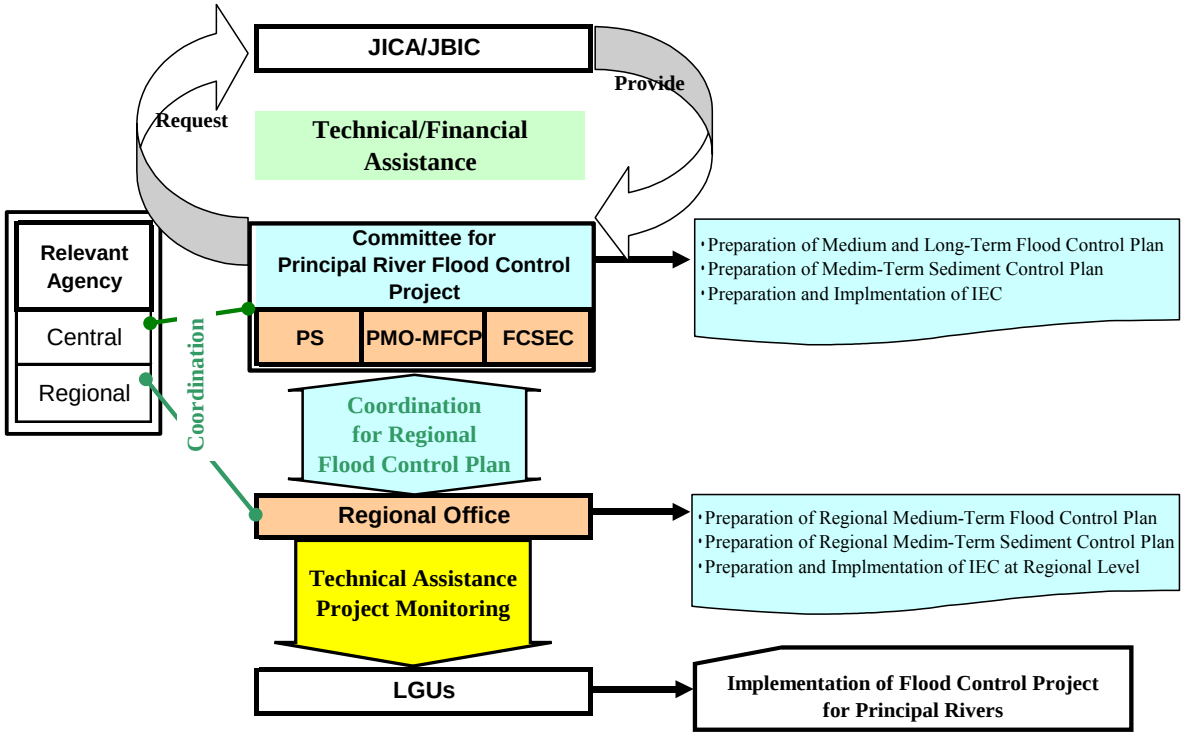
(iv) Strengthen the Function of FCSEC as Information Management Center on Flood Control and Sabo Engineering

(2) Structure of Executing Body

For the undertaking the projects and activities in the two terms: medium- and long-terms, the executing body for the implementation is proposed as follows:

(a) Executing Body for Medium-Term Projects and Activities

The organizational configuration is proposed as follows:



With this organizational structure, the main works to be undertaken are as follows:

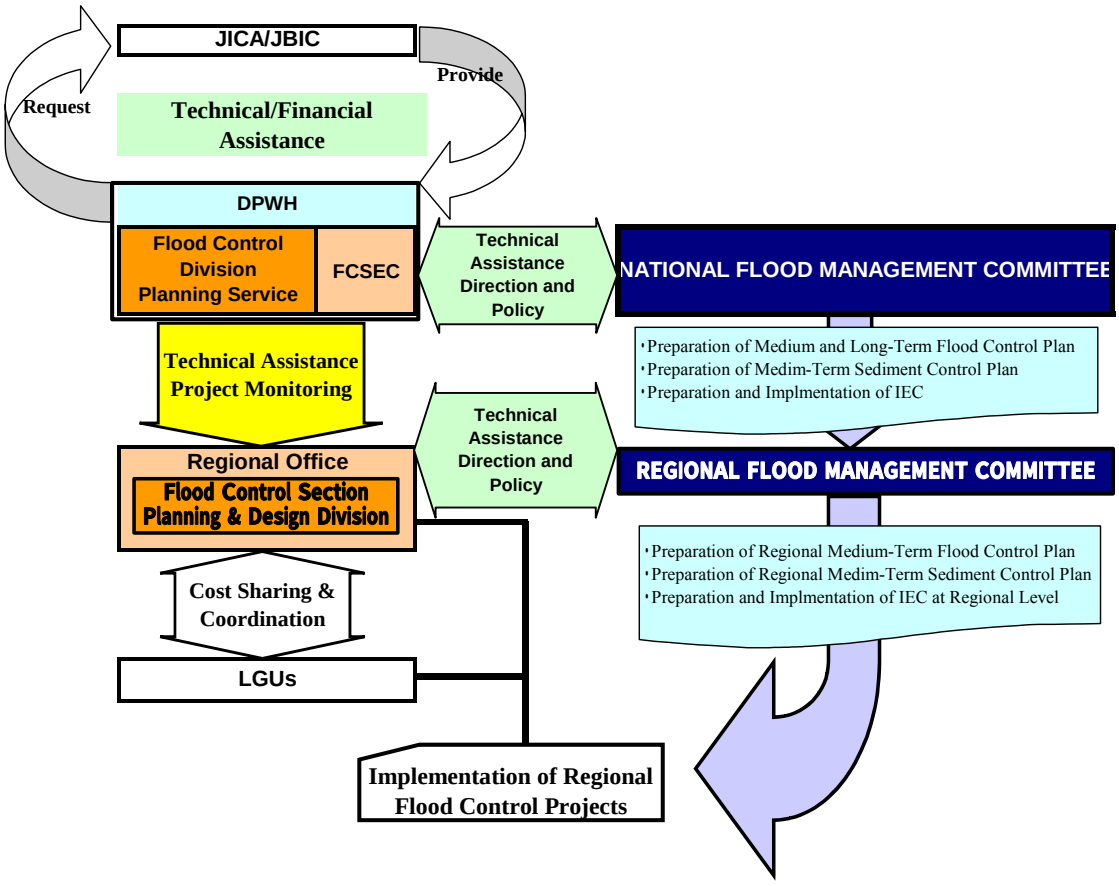
- By creating "*Principal River Flood Control Project Committee*", which consisting of engineers of FCSEC, PS and PMO-MFCP, an expected JICA study for nation-wide flood control plan will be carried out by the Committee.
- Simultaneously, the engineers of planning & design division of ROs, which belongs to the region where the subject river is located, shall be members of the Committee.
- The regional office shall implement the medium-term flood control plan, as leading executing body. The Committee shall function for providing the technical assistance and monitoring the project implementation.
- The regional office shall coordinate with the relevant agencies as well as LGUs concerned for management for natural and social environmental impacts and O&M after construction.

- The Committee will prepare the medium-term flood control plan after 1st medium-term plan, further study for optimum organization for principal river flood control implementation.
- The Committee shall prepare the medium-term sediment control plan.

The above work items and necessary assistances by FCSEC are enumerated in the diagram as shown in **Figure 7.3**.

(b) Executing Body for Long-Term Projects and Activities

The organizational configuration is proposed as follows:



With this organizational structure, the main works to be undertaken are as follows:

- Principal River Flood Control Committee will be converted into a permanent office for planning, ex. "Flood Control Division in Planning Services, DPWH" which shall undertake the preparation of flood control plan for both principal and major rivers in the Philippines.
- A "River Division" will be created in every Regional Office for design and construction of flood control projects.
- All projects implemented by the District Engineering Offices will be integrated into the project for the implementation of the Regional Office.

TABLES

Table 3.1 (1/2) Session Report of IWRM in WWF3

1. Key Issues

The key issue confronting most countries today is that of more effective governance, improved capacity and adequate financing to address the increasing challenge of satisfying human and environmental requirements for water.

We face a governance crisis, rather than a water crisis. Water governance is about putting Integrated Water Resources Management, IWRM, with river and lake basin management and public participation as critically important elements of it, into practice.

IWRM addresses economic efficiency, environmental sustainability and equity. And with good reason: global figures of water scarcity, billions without adequate water supply and sanitation, devastating floods and droughts, environmental degradation, water related health problems and poverty tell a story of failure to act.

The three basic ”pillars” of IWRM are the enabling environment of appropriate policies and laws, the institutional roles and framework, and the management instruments for these institutions to apply on a daily basis. IWRM addresses both the management of water as a resource, and the framework for provision of water services to all categories of users, and it addresses both water quantity and quality. In doing so the basin (river, lake or groundwater) must be recognized as the basic unit for planning and management, and a firm societal commitment and proper public participation must be pursued.

2. Actions

New national policies, strategies and laws for water resources development and management are being developed in a large number of countries worldwide, most often following the principles of IWRM. Such plans have often led to restructuring of the institutional framework as a result, including river and lake basin organizations as the basic institutional entities for implementing IWRM.

Many regions, countries and local communities have come to realize that water is a multi-stakeholder issue, and that partnerships of all interested and affected parties are a viable mechanism to translate this into practice.

Encouraging actions in IWRM and basin management are also taking place between states at the regional level, both in terms of regional conventions and protocols for shared waters.

The vital role of ecosystems in sustaining water as a resource and providing livelihoods to human beings and other species is increasingly being recognized in national and local planning and management of water.

Table 3.1 (2/2) Session Report of IWRM in WWF3

3. Commitments/Recommendations
Recommendation 1: Prepare national IWRM strategies Pursue Article 25 of the WSSD Plan of Implementation: "develop IWRM and water efficiency plans by 2005, with support to developing countries, through actions at all levels". This objective should be pursued in close coordination with the UN Task Force for the achievement of the Millennium Development Goals. In doing so it is critically important to integrate policies and strategies on water with other relevant sectors such as agriculture, energy, health, transport, education etc. In this context the integration of water into poverty reduction strategies (and PRSP's) must be pursued.
Recommendation 2: Build multi-stakeholder partnerships Multi-stakeholder partnerships at regional, country and local levels should be promoted, including the water related Type II Partnerships launched at WSSD in Johannesburg. Such partnerships include governments, private sector, academia, NGO's and civil society organizations.
Recommendation 3: Create and support river and lake basin management structures As also stressed in the WSSD Plan of Implementation there is a need to "develop and implement national/regional strategies, plans and programs with regard to integrated river basin, watershed and groundwater management", including "programs for mitigating the effects of extreme water related events". The creation and support to river and lake basin organizational structures involves all stakeholders, and include public participation through the mobilization and empowerment of the users and other relevant interest groups. The support required for basin management spans from policies and laws through regulations, standards, financial arrangements and information management to practical capacity building at all levels.
Recommendation 4: Disseminate and implement the World Lake Vision A World Lake Vision (WLV) has been prepared as a major basis for developing and implementing individual lake visions and action plans. It should be supported to promote immediate actions to address the major environmental and socio-economic challenges facing lakes and their drainage basins.

Table 3.2 Framework Theme No. 3: Revisiting Integrated Water Resource Management

General Description	IWRM is a still a contested framework to devise water resource strategies. Many efforts have been directed towards building strategies, institutions and processes for integrated water resource management. The main objective of this theme is to constructively review these intents. Theoretical progress on different aspects and tenets of IWRM will be reviewed with a particular emphasis on specific policy oriented contributions. Diverse river basin approaches and experiences will be discussed as well as ground- water management practices in an attempt to further elaborate on the political, social, economic, institutional, technological and cultural factors that have an influence over the performance of such integrated approaches. Also because river basin organizations rely on processes of public participation, public deliberation, conflict resolution, consensus building and collective action, the inputs of political and social science are thought to have important analytical leverage to help understand the performance of such institutions and processes, and thus are also welcomed (i.e. governance and politics) Lastly, another very important aspect to be addressed as part of IWRM is water disaster prevention and management issues.
Associated Issues	Advances in theoretical developments and implementation of IWRM approaches. Lessons learnt from IWRM plan preparation. Forms of institutional innovation for IWRM. River basin management; legal reforms and decentralization, institutional building and local capacity-building for river basin management. The role of information system. Partnerships with communities. Transboundary water resource management, global water commons. The role of water legal frameworks and the process of legal reform. Institutional innovation for ground water management. Mechanisms for conflict resolution and for water sharing. Managing water hazards, preventive measures, risk and vulnerability assessment, health impact assessment, etc. Inter-institutional coordination for emergency planning and community participation.
Expected Outputs	Will be defined during the 2004 World Water Week

Table 3.3 (1/2) Framework for Disaster Risk Reduction

Thematic Areas/ Components	Characteristics
Thematic Areas 1: POLITICAL COMMITMENT AND INSTITUTIONAL ASPECTS (GOVERNANCE)	
Political commitment	
Policy and planning	• Shift in approach from response to risk reduction • Promotion of disaster reduction including in reconstruction process • Integration of risk reduction in development planning and sectoral policies (poverty eradication, social protection, sustainable development, climate change adaptation, desertification, energy, natural resource management, etc)
Legislation	• Laws, acts and regulations • Accountability
Resources	• Resource mobilization and allocation: financial (innovative and alternative funding, taxes, incentives), human, technical, material
Institutional aspects	
Organizational structures	• Interministerial, multidisciplinary & multisectoral approaches • Implementing and coordinating mechanisms • Decentralization, civil society and community participation, local institutions
Normative framework	• Codes, standards, norms • Enactment mechanisms
Thematic Areas 2: RISK IDENTIFICATION	
Risk assessment	• Hazard analysis: characteristics, impacts, historical and spatial distribution, multi-hazard assessments, hazard monitoring including of emerging hazards • Vulnerability and capacity assessment: social, economic, physical and environmental, political, cultural factors • Risk monitoring capabilities, risk maps, risk scenarios
Impact assessments	• Loss/impact assessment, • Socio-economic and environmental impact assessment • Loss analysis
Forecasting and early warning systems	• Forecast and prediction • Warning processing and dissemination • Response

Table 3.3 (2/2) Framework for Disaster Risk Reduction

Thematic Areas/ Components	Characteristics
Thematic Areas 3: KNOWLEDGE MANAGEMENT	
Information management and communication	• Official information and dissemination programs and channels • Public and private information systems (including disaster, hazard and risk databases & websites) and networks for disaster risk management (scientific, technical and applied information, traditional knowledge), timely end user products
Education and training	• Inclusion of disaster reduction from basic to higher education (curricula, material development and institutions) • Vocational training • Dissemination and use of traditional/indigenous knowledge. • Community training programs.
Public awareness	• Official public awareness policy and programs with associated material, guidelines and instructions • Media involvement in communicating risk
Research	• Comprehensive research agenda for risk reduction • Related methodological development including for planning and progress assessment • Regional and international cooperation in research, science and technology development.
Thematic areas 4: RISK MANAGEMENT APPLICATIONS	
Environmental and natural resource management	• Interface between environmental management and risk reduction practices, in particular in wetland and watershed protection and restoration, integrated water resource management; reforestation, agricultural practices, ecosystem conservation
Social and economic development practices	• Social protection and safety nets (social solidarity strategies, e.g. PRSPs) • Financial instruments (involvement of financial sector in disaster reduction: insurance/reinsurance, risk spreading instruments for public infrastructure and private assets, micro-credit and finance, revolving community funds, social funds) • Sustainable livelihoods strategies
Technical measures	• Land use planning, urban and regional planning • Implementation and control mechanisms for specific risk (construction, infrastructure, desertification and flood control techniques, hazard control structures) • Compliance with international standards, codes and norms
Thematic areas 5: PREPAREDNESS AND EMERGENCY MANAGEMENT	
	• Effective communication and coordination system between response entities • Contingency planning • Preparedness planning • Logistics, infrastructure

Table 3.4 Budgeting Timetable

Step	ACTIVITY	TIME/PERIOD
1.	Issuance of Budget Call by the DBM	January
2.	Conduct of budget forum and issuance of budget ceiling	January
3.	RDC/DBM Regional Offices consultations	January
4.	Submission of agency budget proposals to the DBM	March
5.	Evaluation of agency budget proposals by DBM	April – May
6.	Conduct of DBM Inter-Office Coordination Groups-Agency consultation/dialogue	April – June
7.	DBM budget review of the proposed budget	April – May
8.	Initial presentation to the Cabinet	June
9.	Presentation of the proposed budget levels of Departments/Agencies/Special Purpose Funds to the LEADEC	June
10.	Presentation to the President/Cabinet of the proposed expenditure program of departments/agencies	June
11.	Issuance of the proposed expenditure program of departments/agencies for confirmation by agency heads	June
12.	Printing of the Budget Documents	July
13.	Submission of the proposed national budget documents to Congress	July
14.	Submission by the President of the Budget to Congress	July
15.	Budget legislation/authorization – Approval of the GAA including veto message by the President	4 months
	Budget execution/implementation	

Table 4.1 Past River Basin Development Authority Bills

No.	Date Filed	Full Title	Principal Author	Primary Referral	Bill Status
HB01188	2001-07-19	An Act mandating each city and municipality to create a river development authority for the preservation, protection, and development of all rivers, river systems and natural waterways within its respective jurisdiction, defining its powers and functions and appropriating funds therefore.	Jaraula, Constantino G	Local Government	Pending with the Committee on Local Government since 2001-07-30
HB01295	2001-07-24	An Act creating the Iloilo River and Muelle Loney Development Authority, defining its powers and functions, providing appropriations therefor and for other purposes	Gonzales, Raul	Government Enterprises and Privatization	Pending with the Committee on Government Enterprises and Privatization since 2001-07-30
HB03790	2001-10-29	An Act creating the Davao River Authority and for other purposes.	Garcia, Vincent J.	Government Enterprises and Privatization	Pending with the Committee on Government Enterprises and Privatization since 2001-11-19
	2001-11-05	An Act creating the Cagayan River Development Authority, prescribing its powers, functions and duties, providing funds therefore, and for other purposes	Uy, Edwin C.	Government Enterprises and Privatization	Pending with the Committee on Government Enterprises and Privatization since 2001-11-19
HB03801	2002-05-08	An Act creating the Zamboanga City River Development Authority for the preservation, protection and development of all rivers, river systems and natural waterways within the city's jurisdiction, defining its powers and functions, and appropriating funds therefore.	Lobregat, Celso L.	Government Enterprises and Privatization	Pending with the Committee on Government Enterprises and Privatization since 2002-05-13
HB04767	2002-06-06	An Act creating the Agusan River Basin Authority, prescribing its powers, functions and duties, appropriating its therefore and for other purposes.	Plaza, Rodolfo "Ompong" G.	Government Enterprises and Privatization	Pending with the Committee on Government Enterprises and Privatization since 2002-07-23
HB06411	HB04916	An Act creating the Agno River Basin Development Authority, defining its powers, functions and responsibilities, appropriating funds therefor and for other purposes	De Venecia, Jose Jr. C.	Government Enterprises and Privatization	Pending with the Committee on Government Enterprises and Privatization since 2003-09-10

Table 4.2 Powers, Duties, and Functions of Councils of LGUs

Barangay	Municipality	Province
Provide for the construction and maintenance of barangay facilities and other public works projects chargeable to the general fund of the barangay or such other funds actually available for the purpose.	- Provide for the establishment, maintenance, protection, and conservation of communal forests and watersheds, tree parks, greenbelts, mangroves, and other similar forest development projects. - Authorize the establishment, maintenance and operation of ferries, wharves, and other structures, and marine and seashore or offshore activities intended to accelerate productivity. - Subject to existing laws, provide for the establishment, operation, maintenance, and repair of an efficient waterworks system to supply water for the inhabitants; regulate the construction, maintenance, repair and use of hydrants, pumps, cisterns and reservoirs; protect the purity and quantity of the water supply of the municipality and, for this purpose, extend the coverage of appropriate ordinances over all territory within the drainage area of said water supply and within one hundred (100) meters of the reservoir, conduit, canal, aqueduct, pumping station, or watershed used in connection with the water service; and regulate the consumption, use or wastage of water.	Subject to applicable laws, facilitate or provide for the establishment and maintenance of a waterworks system or district waterworks for supplying water to inhabitants of component cities and municipalities.

Table 4.3 Basic Services and Facilities to be Provided by LGUs

Barangay	Municipality	Province
Infrastructure		
Infrastructure facilities such as multi-purpose hall, multi-purpose pavement, plaza, sports center, and other similar facilities.	Infrastructure facilities intended primarily to service the needs of the residents of the municipality and which are funded out of municipal funds including but not limited to municipal roads and bridges; school buildings and other facilities for public elementary and secondary schools; clinics, health centers and other health facilities necessary to carry out health services; communal irrigation, small water impounding projects other similar projects, fish-ports; artesian wells; spring development, rainwater collectors and water supply systems; **seawalls, dikes, drainage and sewerage, and flood control**; traffic signals and road signs; and similar facilities:	Infrastructure facilities intended to service the need of the residents of the province and which are funded out of provincial funds including, but not limited to, provincial roads and bridges; inter-municipal waterworks, **drainage and sewerage, flood control,** and irrigation systems; reclamation projects; and similar facilities:
Public facility		
Information and reading center, and satellite or public market, where viable.	- Municipal buildings, cultural centers, public parks including freedom parks, playgrounds - Sports facilities and equipment, and other similar facilities. - Public markets slaughterhouses and other municipal enterprises and public cemetery - Sites for police and fire stations and substations and municipal jail.	Provincial buildings, provincial jails, freedom parks and other public assembly areas, and other similar facilities.
Others		
	Tourism facilities and other tourist attractions including the acquisition of equipment, regulation and supervision of business concessions, and security services for such facilities.	Programs and projects for low-cost housing and other mass dwellings, except those funded by the Social Security Systems (SSS), Government Service Insurance System (GSIS), and the Home Development Mutual Fund (HDMF); Provided, that national funds for these programs and projects shall be equitably allocated among the regions in proportion to the ratio of the homeless to the population.

Table 5.1 2004-2009 DPWH MEDIUM-TERM PUBLIC INVESTMENT PROGRAM

LIST OF PROJECTS	Funding Aid	Implementation Schedule	Total Cost
1. Pasig-Marikina River Channel Improvement Project Phase II Manila, Makati, Mandaluyong, Pasig and Marikina	JBIC-STEP	2004-2010	3,547,000
2. Bicol River Basin and Watershed Management Program	World Bank	2006-2010	860,194
3. Restoration/ Rehabilitation of Nationwide Selected River Basins and Waterways, Phase 1	Finish Concessional Credit	2007-2009	415,410
4. Disaster Prevention and Reconstruction for Camiguin Island	JICA	2007	20,860
5. Mt. Pinatubo Hazard Urgent Mitigation Project, Phase III	JBIC	2006-2012	4,132,000
6. Panay River Flood Control Project (1st Stage), Aklan, Capiz and Iloilo	JBIC-STEP	2008-2012	4,224,990
7. Mayon Volcano Hazard Urgent Mitigation Project	JBIC-STEP	2008-2012	2,442,560
8. Agno and Allied Rivers Urgent Rehabilitation Project, Phase III	JBIC	2008-2012	3,476,900
9. Cagayan River Flood Control Project, Phase I-Urgent Bank Protection Work (Lower Cagayan River)	JBIC	2008-2012	2,390,110
10. Valenzuela-Obando-Meycauayan (VOM) Area Drainage System Improvement and Related Works Project	German Financing?	2008-2012	3,076,110
11. Mt. Pinatubo Hazard Urgent Mitigation Project	JBIC	2000-2005	4,278,022
12. Phase II-A & II-B (Wawa, Bayambang to Alcala, Pangasinan including Poponto Swamp, Hector Mendoza Bridge & Tarlac River) JBIC 22nd YCP (PH-P-193) JBIC 24th YCP (PH-P223) Pangasinan and Tarlac	JBIC	1999-2007	4,696,942
13. San Roque Multi-Purpose Project Flood Control Component (Reimbursement of Funds Advance by NPC) JEXIM	NPC		726,180
14. Lower Agusan Development Project Stage I, Phase II, Butuan City JBIC 21st YCP (PH-P180) Agusan del Norte 1st District	JBIC	1997-2005	2,659,397
15. Iloilo Flood Control Project Phase II Iloilo City JBIC 25th YCP (PH-230) (DE Completed)	JBIC	2003-2009	4,262,000
Total			**41,258,675**

Source: DPWH Planning Services

Table 5.2 Status of Flood Control Programs of Major River Basins (1980-Present)

GENERAL INFORMATION							COMPLETED / ON-GOING PROGRAMS								
Code No.	Name of River Basin	Region	Province	Catch A. (sq.km.)	River Description		STUDY					IMPLEMENTATION			
					Section	Features	Agency	Year	Type	Title / Scope	Status	Agency	Year	Project Description	Status
1	Laoag	I	Ilocos Norte	1,353		Sedimentation Problem	JICA	1996-97	M/P& F/S	Sabo/Flood Control	Completed	JBIC	2001-06	DD	On-Going
2	Abra	I CAR	Abra	5,125		Sedimentation Problem									
3	Cagayan	II	Cagayan Isabel Quirino Nueva Vizcaya	25,649	Whole	Largest River	JICA	1985-87	M / P	Water Res. Dev.	Completed				
					Lower	Flooding Due to Narrow Sections	JICA	2000-02	F / S	Flood Control	Completed				
					Upper										
4	Abulug	II CAR	Cagayan Apayao	3,372											
5	Agno	CAR I III	Benguet Pangasinan Tarlac	5,952	Whole	Flooding / Sedim.	JICA	1998-91	F / S	Flood Control	Completed				
					Lower	Flooding / Sedim.			D / D	Flood Control	Completed	OECF	1995	PH-1	Completed
					Middle	Poponto-Swamp			D / D	Flood Control	Completed	OECF	1999-2007	PH-2A	On-Going
												JBIC	2001-07	PH-2B	On-Going
					Upper										
					Lower-Sinocalan										
					Tarlac River	Lahar	JBIC	2002	D / D						
6	Pampanga	III	N. Vizcaya Pampanga Bulacan	9,759	Delta	Delta-Development w/ Opposition	JICA	1979-82	M / P	Flood Control	Completed	16-YL	1990-2003	Ph-1	On-Going
							13-YL	1986-89	D / D	Flood Control	Completed				
					Upper										
7	Pasig-Marikina Laguna Lake	NCR IV-A	Metro Manila Rizal Laguna	4,678	Metro Manila	Pumping Stations						1-YL	1973-83	10 Pumping Sta.	Completed
												12-YL	1984-87	2 Pumping Stations	Completed
												14-YL	1988-98	3 Pumping Stations	Completed
						Mangahan FW						4-YL	1975-88	Floodway	Completed
						EFCOS						11-YL	1983-93	FC Operation	Completed
												GOJ/GA	2000-01	Rehabilitation	Completed
						West of Mangahan Floodway	JICA	1987-90	F / S	Flood Control	Completed	21-YL	1996	North Laguna Flood Control	On-Going
							16-YL	1990-96	D / D	Flood Control	Completed				
						KAMANAVA	JICA	1987-90	F / S	Flood Control	Completed				
							DPWH	1998	Re-FS	Flood Control	Completed				
							JBIC	2001	D / D	Flood Control	Completed	JBIC	2002-04	Flood Control	On-Going
						Drainage Main / Laterals						GOJ/GA	1989	Retrieval	Completed
												GOJ/GA	1992	Retrieval 2	Completed
						Metro Manila Core Area	JICA	2003	F / S	Flood Control	On-Going				
						Esteros	JICA	2000	Pre-FS						
					Pasig-Marikina River	Channel Improvement	JICA	1987-90	F / S	Flood Control	Completed				
							SAPROF	1997-98	F / S	Flood Control	Completed				
							23-YL	1999-04	D / D	Channel Improv.	Completed				
					Pasig River	Dredging						Belgium	2000	Dredging	On-Going
					San Juan R.	Dredging						GOP	2000	Dredging	On-Going
8	Amnay-Patrick	IV-B	Occidental Mindoro	993		Sedimentation & Flooding	7-YL	1978-82	M / P	NFCPRDP	Completed				
							DPWH	1984	Pre-FS	Multi-purpose	Completed				
9	Bicol	V	Camarines Sur Albay	3,771		Flooding in Urban Area	7-YL	1978-82	M / P	NFCPRDP	Completed				
							BRBDP	1983	F / S	Flood Control Component	Completed	DPWH	1973-91	Cut off / Diversion Channels	Completed
							BRBDP (ADB)	1992	D / D	Irrigation & Flood Control	Completed				
10	Panay	VI	Capiz, Iloilo Panay Island	1,843		Flooding Flood Control	JICA	1985	M / P	NFCPRDP	Completed				
							JETRO	2002	F / S	Flooding	Completed				
11	Jalaur	VI	Iloilo, Antique Capiz	1,503			7-YL	1978-82	M / P	NFCPRDP	Completed				
12	Ilog-Hilabangan	VI	Negros Occidental Negros Oriental	1,945		Flooding at Lower Reaches	7-YL	1978-82	M / P	NFCPRDP	Completed				
							JICA	1989-91	M / P	Flood Control					
13	Agusan	CARAGA	Agusan del Norte Agusan del Sur Surigao del Sur Surigao del Norte	10,921	Lower	Flooding in Urban Area	7-YL	1978-82	M / P	NFCPRDP	Completed				
							10-YL	1982-85	D / D	Flood Control	Completed	14-YL	88-99	Ph-1, West Bank	Completed
												21-YL	1996	Ph-2, East Bank	On-Going
					Whole	Bunawan Marsh	7-YL	1978-82	M / P	NFCPRDP	Completed				
14	Tagoloan	X	Misamis Oriental Bukidnon	1,704		Sedimentation & Flooding	7-YL	1978-82	M / P	NFCPRDP	Completed				Completed
15	Cagayan de Oro	X	Misamis Oriental Bukidnon	1,521		Flooding in Urban Area	LGU	1999	M / P	Flood Control & Env'l Imprvt	for funding				
16	Tagum - Libuganon	XI	Davao	3,064		Flooding in Agrc'l Area	NIA - DPWH		F / S	Flood Control & Irrigation	Completed	NIA		Diking-Left Bank	Completed
												DPWH		Diking-Right Bank	Completed
17	Davao	XI	Davao	1,623		Flooding in Urban Area	Davao City	1998	M / P, F / S	Drainage	Completed				
18	Buayan-Malingan	XI	South Cotabato Davao del Sur	1,434											
19	Agus	XII	Lanao del Norte	1,645											

Table 5.3 (1/10) List of Flood Control, Drainage and Other Related Projects in Amburayan River Basin

River System: ***Amburayan River***
City/Munincipality/Province: ***Bangar, La Union Province***

	Name of Project	Location	Implementing Agency	Other Involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Amburayan -Caba Creek	Bangar, La Union	DPWH Region 1			DPWH	2001-2002		
2.0	Amburayan River Control Project	Bangar, La Union	DPWH Region 1						Requested verbally to the Central Office
3.0	Amburayan River Control Ipet, Sudipen, La Union	Sudipen, La Union	1st DEO			DPWH	1999/6/27	1999/12/30	completed
4.0	Amburayan River Control Mindoro, Bangar, La union	Bangar, La Union	1st DEO			DPWH	2001/1/17	2001/2/12	completed
5.0	Amburayan River Control Caggao, Bangar, L a Union	Bangar, La Union	1st DEO			DPWH	2001/6/10	2001/6/29	completed
6.0	Amburayan River Control Maria Cristina, Bangar, La Union	Bangar, La Union	1st DEO			DPWH	2002/3/28	2001/4/28	completed
7.0	Amburayan River Control Up-Uplas, Bangar, La Union	Bangar, La Union	1st DEO			DPWH	2002/3/28	2002/5/22	completed
8.0	Amburayan River Control Caggao, Bangar, La Union	Bangar, La Union	1st DEO			DPWH	2002/3/25	2002/6/22	completed
9.0	Amburayan River Control Maria Crisitna, Bangar, La Union	Bangar, La Union	1st DEO			DPWH	2002/4/6	2002/12/31	completed
10.0	Resolution No. 002-2004:								
	Fund for the Construction of Amburayan River Dike Flood Control System at Barangay Mindoro	Bangar, La Union			12 million	CDF	19-Jan-04		submitted / Requested at the office of the Congressman 1st District Manuel Ortega
11.0	Resolution No. 008-2004:								
	Funding for the Construction of Boulder Apron along the Existing Concrete Revetment of Brgy. Maria Cristina East and Brgy. General Terero Areas of the Amburayan River Flood Control System	Bangar, La Union			5 million	CDF	January 19 2004		submitted / Requested at the office of the Congressman 1st District Manuel Ortega
13.0	Resolution No. 005-2004:								
	Fund for the Construction of Spur Dikes to Divert the Flow of Water thereby Protecting the Eastern Portion of Brgy. Mindoro,	Bangar, La Union			600,000.00		January 19 2004		submitted to the office of the 1st DEO
14.0	Patching on Damaged Portions of Dikes	Gen. Prin West, Bangar, La Union	Brgy. General Prim West			Barangay Fund			implemented
	Drainage								
1.0	Infrastructure Support to Clean and Green Program	La Union	Municipality of Luna		375,000.00	Municipal Fund	Jan-Dec. 2003		Proposed
2.0	Integrated Flood Control and Drainage System	La Union	DPWH Region 1						Proposed/Requested verbally from Central Office
3.0	Sition Urban Canal	Gen. Prim West, Bangar, La Union				Barangay Fund			implemented
4.0	Man-made Canal	Gen. Prim East, Bangar, La Union				Barangay Fund			implemented
5.0	Urban Drainage Concrete Canal	Maria Cristina West, Bangar				Barangay Fund			implemented
	Watershed Management								
1.0	Geohazards Coastal Survey and Landslides	La Union	DENR-MGB			DENR-MGB			proposed
2.0	Amburayan River Basin Watershed (Suyo Proper-Watershed Rehabilitation Project)	Suyo, Alilen, Sugpon, Tagudin, Cervantes & Sigay Ilocos	DENR-FMS			DENR-FMS	December 31,2003		for implementation
3.0	Tree Planting along River Banks	Gen. Prim East, Bangar, La Union				Barangay Fund			implemented
	Irrigation								
1.0	Maintenance of Irrigation Facilities	Luna, La Union	NIA		200,000.00	NIA	Jan-Dec. 2003		Proposed
2.0	Sudipen STW (20 units)	Sudipen, La Union (80 hectares)	NIA		300,000.00	NIA	CY 2004		
3.0	Bangar STW (20 units)	Bangar, La Union (60 hectares)	NIA		300,000.00	NIA	CY 2004		
4.0	Maloyo SWIP	Balaoan, La Union (2,000 hectares)	NIA		310 million	NIA	CY 2004		
5.0	Repair / Rehabilitation of Irrigation Main Canal from Barangay San Cristobal to Luzong Sur, Bangar, La Union	Bangar, La Union	Municipality of Bangar		3 million	DAR			Proposed/Requested to Central Office of DAR
6.0	Repair / Rehabilitation of the Irrigation Canal from Sitio Apaleng, Rissing, to Sitio Kimmarayan, Luzong Sur, Bangar, La Union	Bangar, La Union	Municipality of Bangar		3 million	DAR			Proposed/Requested to Central Office of DAR
	Municipal and Water Supply								

Table 5.3 (2/10)-a List of Flood Control, Drainage and Other Related Projects in Talisay River Basin

River System: Talisay River
City/Munincipality/Province: Balanga City, Bataan

	Name of Project	Location	Implementing Agency	Other involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Dredging of Talisay River, Balanga	Balanga	Balanga Region III		9,637,260				
2.0	Desilting of Sibacan River (Mouth Section)	Sibacan River	Bataan SDEO, Region III		9,637,260				
3.0	Desilting of Sibacan River (Upper Section)	Sibacan River	Bataan SDEO, Region III		9,637,260				
4.0	Construction / Rehabilitation of Dike Barangay Pto. Rivas, Itaas, Balanga City	Balanga City	Bataan SDEO, Region III		1,000,000	LH CY 2003 under MOA with City of Balanga			Completed
5.0	Construction / Rehabilitation of Drainage, Barangay Daan Pare, Orion	Orion	Bataan SDEO, Region III		150,000	LH CY 2002 under MOA with City of Balanga			Completed
6.0	Construction / Rehabilitation of Drainage Various Barangays, Orion	Orion	Bataan SDEO, Region III		300,000	LH CY 2002 under MOA with City of Balanga			Completed
7.0	Pilar Flood Control	Pilar	Bataan SDEO, Region III		1,000,000	LH CY 2001 under MOA with City of Balanga			Completed
8.0	Bataan Rivers, District wide		Bataan SDEO, Region III		1,000,000	DPWH CY 1999			Completed
9.0	Construction of Talisay River Control, Bagumbayan, Balanga	Bagumbayan, Balanga	Bataan SDEO, Region III		1,300,000	APP CY 1998			Completed
10.0	Construction of Talisay River Control, Pto. Rivas Lote, Balanga	Balanga City	Bataan SDEO, Region III		2,180,000	APP CY 1998			Completed
11.0	Dike Construction / Rehabilitation Brgy. Pto. Rivas Itaas	Pto. Rivas Itaas	Municipal LGU		1,000,000	Under MOA CY 2004			Proposed
12.0	Dike Construction / Rehabilitation Brgy. Tuyo	Barangay Tuyo	Municipal LGU		1,000,000	Under MOA CY 2004			Proposed
13.0	Rehabilitation of Existing Dike and other Flood Control System	Balanga City	Municipal LGU		2,992,658	Under MOA CY 2004			Proposed
14.0	Improvement of Flood Control System leading to MRF Munting Batangas	Munting Batangas	Municipal LGU		800,000	Under MOA CY 2004			Proposed
	Drainage								
1.0	Drainage System, Cupang to Malabia, Balanga, Bataan	Bataan	Bataan SDEO, Region III		300,000	DPWH CY 1999			Completed
2.0	Drainage Construction / Rehabilitation, Barangay Ibayo	Barangay Ibayo	Municipal LGU		500,000	Under MOA CY 2004			Proposed
3.0	Drainage Construction / Rehabilitation, Barangay Poblacion	Barangay Poblacion	Municipal LGU		800,000	Under MOA CY 2004			Proposed
4.0	Drainage Construction / Rehabilitation, Brgy. Pto. Rivas Lote	Brgy. Pto. Rivas Lote	Municipal LGU		750,000	Under MOA CY 2004			Proposed
5.0	Drainage Construction / Rehabilitation, Brgy. Pto. Rivas Itaas	Brgy. Pto. Rivas Itaas	Municipal LGU		1,250,000	Under MOA CY 2004			Proposed
6.0	Declogging, Desilting of Flood Control System within the vicinity of Balanga City	Balanga City	Municipal LGU		2,000,000	Under MOA CY 2004			Proposed
7.0	Conctuction / Road Widening and drainage system, Ibayo to Tenejero (night side)		Municipal LGU		950,000	Under MOA CY 2004			Proposed
8.0	Construction / Road Widening and drainage system, Ibayo to Tenejero (Left Side)		Municipal LGU		977,500	Under MOA CY 2004			Proposed
9.0	Construction of Drainage System at BES to Talisay River, Barangay Talisay	Barangay Talisay	Municipal LGU		500,000	Under MOA CY 2004			Proposed
10.0	Construction of Box Culvert, Brgy. Doña Maria	Brgy. Doña Maria	Municipal LGU		800,000	Under MOA CY 2004			Proposed
11.0	Rehabilitation of Urban Drainage System Improvement, Brgy. Cataning	Brgy. Cataning	Barangay			20% IRA			
12.0	Rehabilitation / Construction of Drainage System		Barangay			20% IRA			
13.0	River Improvement Works / Drainage System, Pto. Rivas Itaas		Barangay		500,000	National and Local Government			
14.0	Improvement of Drainage System at River Works		Barangay			National and Local Government			
	Watershed Management								
	Irrigation								
1.0	Repair of dam and existing canal an area of 440 has. (Manimas (CIS), Balanga)	Balanga City	NIA		2,000,000				Completed
2.0	Repair of dam and canal (Panikian (Magsaysay CIS), Pilar)	Pilar	NIA		2,500,000				Completed
3.0	Repair of dam and canal (Tabon ng Bayan (Magsaysay CIS), Pilar)	Pilar	NIA		2,435,000				Completed
4.0	Bataan province is now 80% developed in terms of Communal Irrigation. The remaining 20% is targeted to be developed in 5 years starting CY 1996. The Bataan Irrigation Program was proposed and will cover the construction of 39 project / system				98,515,000		1996	2002	
	Municipal and Water Supply								
1.0	Construction / Rehabilitation of Water System at Various Barangays,	Balanga City	Municipal LGU		895,000	Under MOA (CY 2004)			Proposed
2.0	Water System Construction / Rehabilitation, Brgy. Cabog-Cabog	Brgy. Cabog-cabog	Municipal LGU		800,000				Proposed
3.0	Water System Construction / Rehabilitation, Brgy.Camacho	Brgy. Camacho	Municipal LGU		500,000				Proposed
4.0	Water System Construction / Rehabilitation, Brgy. Central	Brgy. Cental	Municipal LGU		800,000				Proposed
5.0	Water System Construction / Rehabilitation, Brgy. Lupang Proper	Brgy. Lupang Proper	Municipal LGU		1,500,000				Proposed
6.0	Water System Construction / Rehabilitation, Brgy. Dangcol	Brgy. Dangcol	Municipal LGU		500,000				Proposed
7.0	Water System Construction / Rehabilitation, Brgy. Ibayo	Brgy. Ibayo	Municipal LGU		500,000				Proposed
8.0	Water System Construction / Rehabilitation, Brgy. Munting Batangas	Brgy. Munting Batangas	Municipal LGU		500,000				Proposed
9.0	Water System Construction / Rehabilitation, Brgy. Tenejero	Brgy. Tenejero	Municipal LGU		1,500,000				Proposed
10.0	Water System Construction / Rehabilitation, Brgy. Tortugas	Brgy. Tortugas	Municipal LGU		1,400,000				Proposed
11.0	Construction of Water System and Water Tank, Brgy. Tanato	Brgy. Tanato	Municipal LGU		500,000				Proposed
12.0	Construction of 3000 gal. Elevated Water Tank and Distribution of Pipeline at MRF, Brgy. Munting Batangas	Brgy. Munting Batangas	Municipal LGU		550,000				Proposed
13.0	Construction / Rehabilitation of Water System within the City of Balanga,	Balanga City	Municipal LGU		1,000,000				Proposed

Table 5.3 (3/10) List of Flood Control, Drainage and Other Related Projects in Sta. Rita River Basin

River System: Sta. Rita River
City/Munincipality/Province: Olongapo City, Zambales

	Name of Project	Location	Implementing Agency	Other involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Desilting of Kalaklan River	Kalaklan River	District Office, Olongapo City DPWH ZSDEO		9,301,087				
2.0	Construction of Flood Gate Weir and Access Road (Operation & Maintenance)		District Office, Olongapo City DPWH ZSDEO		Annual 3,168,305.08				Completed
3.0	Desilting of Sta. Rita River	Sta. Rita River	District Office, Olongapo City DPWH ZSDEO		9,325,044				
4.0	Maintenance of Sabo Dam, Upper Section of Sta. Rita River		District Office, Olongapo		Annual 1,869,985.00				Completed
5.0	Construction of 1 Km Revetment Wall		Local Government Unit						Completed
6.0	Flood Barricade (8 Km)		Local Government Unit						Completed
	Drainage								
1.0	Construction of Drainage System		Local Government Unit				1999	2004	
2.0	Construction of Drainage with Road Improvement		Local Government Unit				1999	2004	
3.0	Drainage Improvement, Brgy. Banicain		Barangay	Local Government Unit	50,000 annualy fund from National & Local Government	20% IRA National & Local Government			
4.0	Construction of Drainage System (300m) Rizal Avenue - Corpuz, Brgy. Banicain		Local Government Unit	Barangay	456,830	Local Fund			Completed
5.0	Construction of Drainage Sysem (300m) w-1st st-w-2nd st., Barangay Banicain		Local Government Unit	Barangay	633,780	Local Fund			Completed
6.0	(340m) Desilting of drainage channel at perimeter road, between SBMA and Olongapo City		Local Government Unit	Barangay	1,980,000	DPWH Fund			Completed (1996)
7.0	Construction of one side drainage system at Foster St. (222m) w-1st to Luna St., Brgy. Banicain		Local Government Unit	Barangay	529,025	Local Fund			Completed (1997)
8.0	Asphalting and Rip-rap revetment wall at Luna St. (50m), Brgy. Banicain		Local Government Unit	Barangay	687,123	Local Fund			Completed (1998)
9.0	Construction of one-side drainage system at W-1st st. (Phase I), Corpuz St. to Luna St., Brgy. Banicain	Brgy. Banicain	Local Government Unit	Barangay	479,031	Local Fund			Completed (1998)
10.0	Construction of one-side drainage system at Gil St., Gordon St. to Basa St., Brgy. Banicain	Brgy. Banicain	Local Government Unit	Barangay	283,976	Local Fund			Completed (1998)
11.0	Construction of oneside drainage system at Luna St. (114m) W-St. to Foster St., Brgy. Banicain	Brgy. Banicain	Local Government Unit	Barangay	249,725	Local Fund			Completed (1999)
12.0	Construction of Drainage System at Foster St. (L-1981m) W-1st St. - W2nd St., Brgy. Banicain	Brgy. Banicain	Local Government Unit	Barangay	436,773	Local Fund			Completed
13.0	Construction of one side drainage system at W-1st St. (130m) Rizal Avenue to Basa St., Brgy. Banicain	Brgy. Banicain	Local Government Unit	Barangay	249,980	Local Fund			Completed
14.0	Construction of drainage system at Basa St. and Silahis St.		Local Government Unit	Barangay					Proposed
15.0	Drainage Improvement, Brgy. New Ilalim		Barangay	Local Government Unit	100,000 Annually	20% IRA & Local Fund			
16.0	Desilting and declogging the main drainage system, Brgy. Sta. Rita	Brgy. Sta. Rita	Barangay	Local Government Unit	250,000 Annually	20% IRA & Local Fund			
	Watershed Management								
	Irrigation								
	Municipal and Water Supply								

Table 5.3 (4/10) List of Flood Control, Drainage and Other Related Projects in Bucao River Basin

River System: Bucao River
City/Munincipality/Province: Botolan, Zambales

	Name of Project	Location	Implementing Agency	Other involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Maculcol River Control System	Maculcol River	District Office (DPWH)		For Flood Control (2003 - 44M, 2002 - 5M, 2001 - 6M, 2000 - 5M, 1999 - 45 M, 1998 - 150M)		1992	Present	
2.0	Bucao River Control System	Bucao River	District Office (DPWH)				1992	1998	
3.0	Maloma River Control System	Maloma River	District Office (DPWH)				1996	2000	
4.0	Road Dike Improvement Botolan	Brgy. Paudpod	Municipal						on going
5.0	Desilting of Carael Creek, Brgy. Carael	Carael Creek	Barangay		20% IRA				on going
6.0	Construction of Bucao River Dike (6.5km)	Bucao River	Local Government Unit		93,000,000	Government/ BOT			Proposed
7.0	Dredging of Batonlapoc Creek	Batonlapoc Creek	Local Government Unit		300,000				Proposed
8.0	Dredging of Tampo-Paco Creek	Tampo-Paco Creek	Local Government Unit		750,000				Proposed
9.0	Dredging of Talabangka Bancal Creek	Bancal Creek	Local Government Unit		500,000				Proposed
10.0	Dredging of Pamalabangan Creek	Pamalabangan Creek	Local Government Unit		500,000				Proposed
	Drainage								
1.0	Drainage System Improvement	Brgy. San Juan	Barangay	Municipal		20% IRA & National / Local Governemnt			
2.0	Drainage System Improvement	Brgy. San Miguel	Barangay	Municipal		20% IRA & National / Local Governemnt			
3.0	Improvement Road Drainage System	Brgy. Paudpod	Barangay		400,000 Annually	Local Government			
	Watershed Management								
	Irrigation								
1.0	400 Hectares Permanent Agricultural Rehabilitation of Lahar Plan		Local Government Unit		100,000,000				
	Municipal and Water Supply								
1.0	Construction of water supply	Brgy. Parel	DPWH		810,800				Proposed
2.0	Construction of water supply	Brgy. San Juan	DPWH		791,400				Proposed
3.0	Construction of water supply	Brgy. Bihawa	DPWH		635,400				Proposed

Table 5.3 (5/10) List of Flood Control, Drainage and Other Related Projects in Angat River Basin

River System: Angat River
City/Munincipality/Province: Calumpit, Bulacan

	Name of Project	Location	Implementing Agency	Other involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Concrete Slope Protection (2.8km) Pampanga River		PRCS				1994	Present	
2.0	Concrete Slope Protection (1.8km) Quitagil River		PRCS				1994	Present	
3.0	Concrete Slope Protection (1.759 km), Sapang Maragul		PRCS				1995	Present	
4.0	Slope Protection (1.4km), Angat River		PRCS		500,000		1996	Present	
5.0	Labangan Upgrading and Dewatering (2km) Labangon C.O.C		PRCS						Completed
6.0	Operation and Maintenance of Concrete Slope Protection		PRCS		5,185,000 Annually				
7.0	Operation and Maintenance of Slope Protection		PRCS		800,000 Annually				
8.0	Operation and Maintenance of Restoration of scoured and		PRCS		21,900,000 Annually				
9.0	Provision of check gate, upgrading of dike and slope protection		PRCS		7,920,000 Annually				
	Drainage								
1.0	Drainage Improvement, Brgy. Caniogan	Brgy. Caniogan	Barangay	Local Government Unit		20% IRA & Local Fund			
2.0	Drainage Improvement, Brgy. Sto. Niño	Brgy. Sto. Niño	Barangay	Local Government Unit		20% IRA & Local Fund			
3.0	Drainage Improvement, Brgy. Dampol II-A	Brgy. Dampol II-A	Barangay			20% IRA & Local Fund			
4.0	Drainage Improvement, Brgy. Dampol II-B	Brgy. Dampol II-B	Barangay	Local Government Unit		20% IRA & Local Fund			
5.0	Drainage Improvement, Brgy. Pungo	Brgy. Pungo	Barangay	Local Government Unit		20% IRA & Local Fund			
	Watershed Management								
	Irrigation								
	Municipal and Water Supply								

Table 5.3 (6/10) List of Flood Control, Drainage and Other Related Projects in Pansipit River Basin

River System: Pansipit River
City/Munincipality/Province: Lemery Batangas

	Project	Location	Implementing Agency	Other Involved Agency	Funding / Estimated Cost	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Construction of embankment protection	Brgy. Matingain II			95,000.00	Gen. Fund	2003		Completed
2.0	Construction of breakwater	Brgy. Sambal Ilaya			136,079.40		2003		Completed
3.0	Embankment protection / riprapping	Brgy. Mahayahay			184,095.98		2003		Completed
4.0	Construction of embankment protection	Brgy. Gulod			258,500.00	20% Dev. Fund	2002		Completed
5.0	Construction of embankment protection	Brgy. Nonong Casto			96,025.25	20% Dev. Fund	2002		Completed
6.0	Construction of parapet wall	Brgy. District II			281,820.00	Brgy. Fund	2001		Completed
	Drainage								
1.0	Portioned const. of a CHB lined canal w/ cover	Brgy. Maguihan	LGU		67,000.00	20% Dev. Fund	2003		Completed
2.0	Portioned const. of a CHB lined canal w/ cover	Brgy. Rizal	LGU		96,350.75	20% Dev. Fund	2003		Completed
3.0	Portioned const. of a CHB lined canal w/ cover	Brgy. Lucky	LGU		96,250.00	20% Dev. Fund	2003		Completed
4.0	Portioned const. of a CHB lined canal w/ cover	Brgy. Wawa Ibaba	LGU		96,250.00	20% Dev. Fund	2003		Completed
5.0	Portioned const. of a drainage canal (open lined canal)	Brgy. Palanas	LGU		96,131.76	20% Dev. Fund	2003		Completed
6.0	Portioned construction of a CHB lined canal	Brgy. Wawa Ilaya	LGU		96,350.75	20% Dev. Fund	2003		Completed
7.0	Portioned construction of a CHB lined canal	Brgy. Anak-Dagat	LGU		96,350.75	20% Dev. Fund	2003		Completed
8.0	Cleaning & clearing of canal	Brgy. District III	LGU		14,400.00		2003		Completed
9.0	Improvement of drainage canal	Brgy. District II	LGU		240,955.07		2003		Completed
10.0	Declogging of drainage canal	Brgy. Bucal	LGU		6,300.00		2003		Completed
11.0	Cleaning & clearing of canal	Brgy. Lucky	LGU		27,000.00		2003		Completed
12.0	Const. of CHB open lined canal along Filipinismo St.	Brgy. Sangalang	LGU		374,000.00	Suppl. Plan No. 3	2002		Completed
13.0	Cleaning & clearing of canal	Brgy. Maguihan	LGU		22,500.00	Barangay Fund	2001		Completed
14.0	Declogging of canal - OPLAN Linis	Poblacion	LGU		25,650.00	Municipal Fund	2001		Completed
	Watershed Management								
	Irrigation								
1.0	Pull-out & replacement of submersible pump & motor	Brgy. Payapa Ilaya	LGU		206,000.00		2003		Completed
2.0	Installation of irrigation system	Brgy. Matingain I	LGU		216,499.98	Trust Fund	2001		Completed
3.0	Installation of irrigation system	Brgy. Balanga	LGU		71,610.52	Trust Fund	2001		Completed
4.0	Installation of irrigation system	Brgy. Nonong Casto	LGU		532,987.00	Trust Fund	2001		Completed
5.0	Installation of jetmatic pump	Brgy. Sinisian West	LGU		4,941.00	Barangay Fund	2001		Completed
	Water Supply								
1.0	Rehabilitation of water system facilities	Brgy. San Isidro Itaas	LGU		65,291.00	20% Dev. Fund	2003		Completed
2.0	Construction of waterworks facilities	Brgy. Arumahan	LGU		179,996.69	20% Dev. Fund	2003		Completed
3.0	Improvement of water facilities	Brgy. Arumahan	LGU		76,600.86	20% Dev. Fund	2003		Completed
4.0	Installation of pipes	Brgy. Cahilan II	LGU		257,710.50	20% Dev. Fund	2003		Completed
5.0	Improvement of waterworks facilities	Brgy. Payapa Ibaba	LGU		170,026.81	20% Dev. Fund	2003		Completed
6.0	Construction of waterworks facilities	Brgy. Cahilan I	LGU		1,100,000.00	20% Dev. Fund	2002		Completed
7.0	Construction of waterworks facilities	Brgy. Talaga	LGU		1,200,000.00	20% Dev. Fund	2002		Completed
8.0	Construction of waterworks facilities	Brgy. Payapa Ibaba	LGU		964,500.00	20% Dev. Fund	2002		Completed
9.0	Const. of waterworks facilities / installation of 3KVA transformer	Brgy. Payapa Ibaba	LGU		217,600.00	20% Dev. Fund	2002		Completed
10.0	Construction of waterworks facilities	Brgy. Payapa Ilaya	LGU		962,977.75	20% Dev. Fund	2002		Completed
11.0	Installation of water distribution main line	Brgy. San Isidro Ibaba	LGU		94,330.75	20% Dev. Fund	2002		Completed
12.0	Installation of water distribution main line	Brgy. San Isidro Itaas	LGU		163,678.00	20% Dev. Fund	2002		Completed
13.0	Construction of waterworks facilities	Brgy. San Isidro Itaas	LGU		479,309.98	20% Dev. Fund	2002		Completed

Table 5.3 (7/10) List of Flood Control, Drainage and Other Related Projects in Imus River Basin

River System: Imus River
City/Munincipality/Province: Bacoor, Cavite

	Project	Location	Implementing Agency	Other involved Agency	Funding / Estimated Cost	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Const. Of watergate and Flood Control Structure	San Nicolas	Cavite PEO	DPWH/ Bacoor LGU	1,935,771.22	Provincial Fund	05/30/2002	06/28/2002	
	Drainage								
1.0	Construction of Canal Lining	Tabing Dagat	Cavite PEO	Recipient Brgy Council	290,664.69	Provincial Fund	06/29/2001	07/26/2001	These information were obtained from the
2.0	Construction of Canal Lining	Talaba IV	Cavite PEO	Recipient Brgy Council	96,567.00	Provincial Fund	08/14/2001	08/29/2001	list of projects implemented by the Cavite
3.0	Riprapping and Rehab of storm drainage canal	Queen's Row	Cavite PEO	Recipient Brgy Council	96,724.83	Provincial Fund	07/02/2001	07/20/2001	Provincial Engineer's Office for the
4.0	Construcution of Drainage Canal	salinas II	Cavite PEO	Recipient Brgy Council	96,514.00	Provincial Fund	03/06/2001	09/04/2001	year 2001 to 2004. Said document
5.0	Rehab/Construciton of Canal Lining	Salinas I	Cavite PEO	Recipient Brgy Council	145,385.21	Provincial Fund	09/14/2002	09/20/2002	was provided by the Provincial
6.0	Construction of Drainage Canal	Maliksi	Cavite PEO	Recipient Brgy Council	199,218.81	Provincial Fund	09/03/2002	09/16/2002	Engineer of Cavite, Engr. Mario Silan
7.0	Construction of Canal Lining with Covers	Zapote	Cavite PEO	Recipient Brgy Council	241,858.15	Provincial Fund	05/30/2002	06/19/2002	at his office at Trece Martirez City.
8.0	Construction of Covered Canal Lining	Molino II	Cavite PEO	Recipient Brgy Council	193,345.74	Provincial Fund	04/29/2003	05/09/2003	
9.0	Construction of Canal Lining	Habay I	Cavite PEO	Recipient Brgy Council	83,635.05	Provincial Fund	09/16/2003	09/27/2003	
10.0	Construction of Drainage Canal	Aniban II	LGU Bacoor	Recipient Brgy Council	200,000.00	Mun. Dev. Fund		1995	These information were obtained from the
11.0	Construction of Drainage Canal	Aniban III	LGU Bacoor	Recipient Brgy Council	100,000.00	Mun. Dev. Fund		1995	list of projects implemented by the
12.0	Construction of Drainage Canal	Aniban V	LGU Bacoor	Recipient Brgy Council	70,000.00	Mun. Dev. Fund		1995	Municicpality of Bacoor thru
13.0	Construction of Drainage Canal	Banalo	LGU Bacoor	Recipient Brgy Council	100,000.00	Mun. Dev. Fund		1995	the cooperation of the
14.0	Construction of Drainage Lines	Bayanan	LGU Bacoor	Recipient Brgy Council	300,000.00	Mun. Dev. Fund		1995	Office of the Municipal Engineer
15.0	Improvement of Drainage Canal	Ligas II	LGU Bacoor	Recipient Brgy Council	100,000.00	Mun. Dev. Fund		1995	headed by Engineer Alvarez.
16.0	Improvement of Drainage Canal	Ligas III	LGU Bacoor	Recipient Brgy Council	90,000.00	Mun. Dev. Fund		1995	
17.0	Construction of Drainage Canal	Maliksi I	LGU Bacoor	Recipient Brgy Council	100,000.00	Mun. Dev. Fund		1995	
18.0	Construction of Open Canal Drainage	Mambog II	LGU Bacoor	Recipient Brgy Council	100,000.00	Mun. Dev. Fund		1995	
19.0	Construciton of Canal Covering	Talaba I	LGU Bacoor	Recipient Brgy Council	60,000.00	Mun. Dev. Fund		1995	
20.0	Construciton of Canal Covering	Talaba IV	LGU Bacoor	Recipient Brgy Council	25,000.00	Mun. Dev. Fund		1995	
21.0	Construciton of Canal Lining	Talaba V	LGU Bacoor	Recipient Brgy Council	35,000.00	Mun. Dev. Fund		1995	
22.0	Installation of Drainage Line	Aniban I	Brgy Council	LGU Bacoor, MEO	9,980.00	Brgy Dev. Fund		1995	
23.0	Declogging of all Canals	Aniban IV	Brgy Council	LGU Bacoor, MEO	9,680.00	Brgy Dev. Fund		1995	
24.0	Clearing of Canals	Maliksi I	Brgy Council	LGU Bacoor, MEO	9,975.00	Brgy Dev. Fund		1995	
25.0	Clearing of Canals	Maliksi II	Brgy Council	LGU Bacoor, MEO	9,975.00	Brgy Dev. Fund		1995	
26.0	Construction of Open Drainage Canal	Mambog III	Brgy Council	LGU Bacoor, MEO	9,998.00	Brgy Dev. Fund		1995	
27.0	Construction of Open Canal	Molino I	Brgy Council	LGU Bacoor, MEO	9,997.50	Brgy Dev. Fund		1995	
28.0	Clearing of Canals	Panapaan II	Brgy Council	LGU Bacoor, MEO	9,607.00	Brgy Dev. Fund		1995	
29.0	Clearing of Canals	Panapaan III	Brgy Council	LGU Bacoor, MEO	9,975.00	Brgy Dev. Fund		1995	
30.0	Construction of Canal Cover	Salinas I	Brgy Council	LGU Bacoor, MEO	9,985.00	Brgy Dev. Fund		1995	
31.0	Construction of Open Canal	San Nicolas I	Brgy Council	LGU Bacoor, MEO	9,952.50	Brgy Dev. Fund		1995	
32.0	Construction of Open Canal	Talaba II	Brgy Council	LGU Bacoor, MEO	9,995.00	Brgy Dev. Fund		1995	
33.0	Canal Cleaning	Alima	LGU Bacoor	Recipient Brgy Council	49,473.00	Mun. Dev. Fund		2002	These information were obtained from the
34.0	Canal Cleaning	Aniban I	LGU Bacoor	Recipient Brgy Council	161,980.00	Mun. Dev. Fund		2002	annual report provided by the
35.0	Canal Cleaning	Aniban II	LGU Bacoor	Recipient Brgy Council	128,660.50	Mun. Dev. Fund		2002	Municipal Planning and Design
36.0	Canal Cleaning	Aniban III	LGU Bacoor	Recipient Brgy Council	153,689.00	Mun. Dev. Fund		2002	Office headed by Mr. Jesus
37.0	Canal Cleaning	Aniban IV	LGU Bacoor	Recipient Brgy Council	65,334.00	Mun. Dev. Fund		2002	Francisco
38.0	Canal Cleaning	Aniban V	LGU Bacoor	Recipient Brgy Council	52,736.50	Mun. Dev. Fund		2002	
39.0	Canal Cleaning	Banalo	LGU Bacoor	Recipient Brgy Council	105,316.00	Mun. Dev. Fund		2002	
40.0	Canal Cleaning	Bayanan	LGU Bacoor	Recipient Brgy Council	94,354.50	Mun. Dev. Fund		2002	
41.0	Canal Upgrading	Camposanto	LGU Bacoor	Recipient Brgy Council	59,642.00	Mun. Dev. Fund		2002	
42.0	Construction, rehabilitation and clearing of Canal	Daang Bukid	LGU Bacoor	Recipient Brgy Council	1,039,805.15	Mun. Dev. Fund		2002	
43.0	Construction, clearing and rehabilitation of Canals	Dulong Bayan	LGU Bacoor	Recipient Brgy Council	223,326.50	Mun. Dev. Fund		2002	
44.0	Cosntruction and Rehabilitation of Canals	Habay I	LGU Bacoor	Recipient Brgy Council	89,906.00	Mun. Dev. Fund		2002	
45.0	Construction of Open Canal	Ligas I	LGU Bacoor	Recipient Brgy Council	119,156.00	Mun. Dev. Fund		2002	
46.0	Cleaning of Canal	Ligas II	LGU Bacoor	Recipient Brgy Council	101,585.00	Mun. Dev. Fund		2002	
47.0	Cleaning of Canal	Ligas III	LGU Bacoor	Recipient Brgy Council	107,854.00	Mun. Dev. Fund		2002	
48.0	Cleaning of Canal	Mabolo I	LGU Bacoor	Recipient Brgy Council	39,879.00	Mun. Dev. Fund		2002	
49.0	Cleaning of Canal	Mambog I	LGU Bacoor	Recipient Brgy Council	55,518.00	Mun. Dev. Fund		2002	
50.0	Improvement of Canal	Mambog II	LGU Bacoor	Recipient Brgy Council	59,801.00	Mun. Dev. Fund		2002	
51.0	Canal Cleaning	Mambog III	LGU Bacoor	Recipient Brgy Council	57,939.00	Mun. Dev. Fund		2002	
52.0	Canal Cleaning	Mambog IV	LGU Bacoor	Recipient Brgy Council	45,555.00	Mun. Dev. Fund		2002	
53.0	Canal Cleaning	Mambog V	LGU Bacoor	Recipient Brgy Council	35,599.50	Mun. Dev. Fund		2002	
54.0	Canal Cleaning	Molino V	LGU Bacoor	Recipient Brgy Council	54,555.00	Mun. Dev. Fund		2002	
55.0	Canal Cleaning	Molino VI	LGU Bacoor	Recipient Brgy Council	54,555.00	Mun. Dev. Fund		2002	
56.0	Canal Cleaning	Niog II	LGU Bacoor	Recipient Brgy Council	19,496.00	Mun. Dev. Fund		2002	
57.0	Canal Construction	Panapaan III	LGU Bacoor	Recipient Brgy Council	146,157.20	Mun. Dev. Fund		2002	
58.0	Construction of Canal	Real II	LGU Bacoor	Recipient Brgy Council	233,708.03	Mun. Dev. Fund		2002	
59.0	Canal Cleaning	San Nicolas I	LGU Bacoor	Recipient Brgy Council	54,970.00	Mun. Dev. Fund		2002	
60.0	Construction of Open Canal	San Nicolas II	LGU Bacoor	Recipient Brgy Council	59,981.00	Mun. Dev. Fund		2002	
61.0	Canal Rehabilitation	Talaba I	LGU Bacoor	Recipient Brgy Council	52,444.00	Mun. Dev. Fund		2002	
62.0	Canal Cleaning	Talaba II	LGU Bacoor	Recipient Brgy Council	55,644.00	Mun. Dev. Fund		2002	
63.0	Construction/cleaning/rehab of Canal	Talaba III	LGU Bacoor	Recipient Brgy Council	177,253.00	Mun. Dev. Fund		2002	
64.0	Construction of Canal	Zapote II	LGU Bacoor	Recipient Brgy Council	59,912.00	Mun. Dev. Fund		2002	
65.0	Canal Construction and Improvement and Cleaning	Zapote III	LGU Bacoor	Recipient Brgy Council	197,643.00	Mun. Dev. Fund		2002	
	Watershed Management								
	Irrigation								
	Municipal and Water Supply								

Table 5.3 (8/10) List of Flood Control, Drainage and Other Related Projects in Camatian River Basin

River System: Camatian River
City/Munincipality/Province: Lucban, Quezon Province

	Name of Project	Location	Implementing Agency	Other Involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
Flood Control									
							(Date/Period/Status)		
1.0	Construction of Camatian River Embankment Protection	Sitio Maderal, Brgy. Palola	Municipality of Lucban		200,000.00	Calamity Fund	2000		completed
2.0	Construction of Camatian River Embankment Protection	Sitio Maderal, Brgy. Palola	Municipality of Lucban		40,000.00	20% Dev. Fund	2001		completed
Drainage									
1.0	Concreting with gutter and canal	Mabini St., Brgy. Palola	Municipality of Lucban		74,000.00	20% Dev. Fund	1997		Completed
2.0	Desilting and Rehabilitation of Canal	Brgy. 7 and 9	Municipality of Lucban		200,000.00	20% Dev. Fund	2004		Completed
Watershed Management									
Irrigation									
1.0	Rehabilitation of irrigation System	Brgy's. Palola, Samil, kakawit, tinamnam,Igang, Abang	Municipality of Lucban		704,771.96	20% Dev. Fund	1995 - 1996		Completed
2.0	Rehabilitation of irrigation System	Brgy's. Palola, Samil, Abang, Ayuti	Municipality of Lucban		1 million	ABS-CBN	1995 - 1996		Completed
3.0	Communal Irrigation System	Brgy's. Igang, Samil, Ayuti, Palola, Tinamnan, Kulapi, Malupak, Kakawit, Abang, Kalyaat	DA		7.5 million	DA	2001		Completed
Municipal and Water Supply									
1.0	Rehabilitation/Expansion of Lucban Waterworks System	Brgy. Palola and Poblacion	Municipality of Lucban		350,000.00	20% Dev. Fund	1997		Completed
2.0	Rehabilitation/Additional Mainline of Apolinario dela Cruz Waterworks System	Brgy. Palola	Municipality of Lucban		1 million	PMS	1997		Completed

Table 5.3 (9/10)-a List of Flood Control, Drainage and Other Related Projects in Quinale (B) River Basin

River System: Quinale (B) River
City/Munincipality/Province: Malinao, Albay

	Name of Project	Location	Implementing Agency	Other involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1	Dredging, Taque River (Upstream Section - Lateral B)	Barangay Tagoytoy							Proposed
2	Dredging, Quinale River - Balza Section								Proposed
3	Dredging, San Francisco River - Pawa Bagumbayan Section								Proposed
4	Dredging, Quinale River - Comun Soa Section								Proposed
6	Dredging, San Francisco River - Labnig Tuliw Section								Proposed
7	Dredging, San Francisco River - Awang Section								Proposed
8	River Dike, Comun - Soa Section								Proposed
9	River Dike, Labnig - Diaro Section								Proposed
10	River Dike, Labnig-Malolos Section								Proposed
11	River Dike, Tagoytoy Section (Taque River)								Proposed
12	River Dike, Ogob River								Proposed
13	River Dike, Poblacion Section (To Payahan)								Proposed
14	RIVER CONTROL REHAB: Rechannelization/Rehab. of San Francisco River Control	Bagumbayan, Balza Payahan	DPWH		7000000	20% EDF			Implemented
15	RIVER CONTROL REHAB: Ogob-Diaro Section	Ogob-Diaro			4000000	20% EDF			Implemented
16	RIVER CONTROL REHAB: Labnig-Malolos Section	Labnig-Malolos			4000000	20% EDF			Implemented
17	RIVER CONTROL REHAB: Pawa-Tuliw Rear Dike	Pawa-Tuliw			1500000	20% EDF			Implemented
18	RIVER CONTROL REHAB: Comun-Soa Section	Comun-Soa			2000000	20% EDF			Implemented
19	RIVER CONTROL REHAB: Quinale River (Balza Section)	Balza			7000000	20% EDF			Implemented
20	RIVER CONTROL REHAB: Estancia-Awang Section	Estancia-Awang			4500000	20% EDF			Implemented
21	RIVER CONTROL REHAB: Labnig-Awang Section	Labnig-Awang			4500000	20% EDF			Implemented
22	RIVER CONTROL REHAB: Lagbanog River Control	Sta. Elena/Tagoytoy			10000000	20% EDF			Implemented
23	RIVER CONTROL REHAB: Tanawan Section	Tanawan			5000000	20% EDF			Implemented
24	Construction of Slope Protection at Sugcad-Matalipni Road	Malinao, Albay							
25	Dredging of Pawa - Burabod & Mabinit River Channel (Phase II)	Legazpi City							
	Drainage								
1	BRIDGE/BOX CULVERTS REHAB: Ogob Bridge	Ogob	DPWH		20000000	20% EDF			Implemented
2	BRIDGE/BOX CULVERTS REHAB: Balza Box Culverts	Balza	DPWH/LGU		500000	20% EDF			Implemented
3	BRIDGE/BOX CULVERTS REHAB: Bulang-Quinarabasahan Box Culverts	Bulang-Quinarabasahan	DPWH		4500000	20% EDF			Implemented
4	BRIDGE/BOX CULVERTS REHAB: Bulang-Quinarabasahan Spillway	Bulang-Quinarabasahan	-do-		2100000	20% EDF			Implemented
6	BRIDGE/BOX CULVERTS REHAB: Awang Bridge	Awang	-do-		5000000	20% EDF			Implemented
7	LINE CANAL CONSTRUCTION: Open Line Canal	Poblacion-Payahan	Prov'l/LGU		1000000	20% EDF			Implemented
	Irrigation								
1	Rehabilitation of BURABOD-JONOP Communal Irrigation System (Phase 2)	Sta. Elena		NIA	758483.38	20% EDF	Oct. 2002	Nov. 2002	Completed
2	Rehabilitation of BURABOD-JONOP Communical Irrigation System (Phase 3)	Sta. Elena		NIA	1650000	20% EDF		01-Aug-03	Completed
3	Rehabilitation of DIARO Communal	Diaro		NIA	679828.83	20% EDF	Oct. 2002	Nov. 2002	Completed
4	Rehabilitation of Tagoytoy Communical Irrigation System	Tagoytoy		NIA	2435829.84	20% EDF	Oct. 01	01-Jan-02	Completed
6	Rehabilitation of BURABOD-JONO Communal Irrigation System (Phase 1)	Sta. Elena		NIA	2838091.14	20% EDF	01-Sep-00	01-Aug-01	Completed
7	Rehab of "SAGOANKANBANWA" irrigation system	Awang to Pawa		Department of Agriculture	413533	20% EDF	Nov. 2004	Dec. 2001	Completed
	Water Supply Systems								
77	Installation of Water System "Cluster A" at Baybay	Malinao, Albay			300000	20% EDF		16-Jun-03	Completed
78	Installation of Water System Cluster "A" (Extension)	Baybay, Malinao, Albay			200000	20% EDF		16-Sep-03	Completed
	Roads and Bridges								
1	(Road Opening) Bulang-Quinarabasahan	Malinao, Albay							Proposed
2	(Road Opening) Quinarabasahan-Bagatangki	Malinao, Albay							Proposed
3	(Road Opening) Pawa Circumferential Road	Malinao, Albay							Proposed
4	(Road Opening) Balading - Poblacion Alternate Road	Malinao, Albay							Proposed
6	(Road Opening) Balza-Bakyad to Jonop	Malinao, Albay							Proposed
7	(Road Opening) Malolos - Diaro	Malinao, Albay							Proposed
8	Bridge Construction, Awang Section	Awang							Proposed
9	Bridge Construction, Labnig - Malolos	Malinao, Albay							Proposed
10	Bridge Construction, Balza (approach going to Balza Proper, Libod, etc.)	Malinao, Albay							Proposed
11	Road Concreting, Tagoytoy to Tanawan	Malinao, Albay							Proposed
12	Road Concreting, Estancia - Ogob - Comun	Malinao, Albay							Proposed
13	Road Concreting, Ogob-Diaro	Malinao, Albay							Proposed
14	Road Concreting, Payahan -Baybay	Payahan							Proposed
15	Road Concreting, Balading Iraya Road	Malinao, Albay							Proposed
16	Road Concreting, Jonop Road	Jonop							Proposed
17	Road Concreting, Cabunturan Road	Cabunturan							Proposed
18	Road Concreting, Comun - Soa Road	Malinao, Albay			1000000	20% EDF			Implemented
19	Road Concreting, Soa - Bulang Road	Malinao, Albay			2000000	20% EDF			Implemented
20	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Ogob Road	Estancia	DPWH		2000000	20% EDF			Implemented
21	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Ogob-Comun Road	Ogob-Comun	-do-		3000000	20% EDF			Implemented
22	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Tanawan - Tagoytoy Road	Tanawan-Tagoytoy	-do-		3000000	20% EDF			Implemented
23	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Balza Bakyad Road	Balza	-do-		5000000	20% EDF			Implemented
24	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Baybay Road	Baybay	-do-		3000000	20% EDF			Implemented
25	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Cabunturan-Jonop Road	Cabunturan	-do-		2000000	20% EDF			Implemented
26	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Bulang Road	Bulang	-do-		6000000	20% EDF			Implemented
27	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Labnig - Awang Road	Awang	-do-		3000000	20% EDF			Implemented
28	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Balading/Sitio Awang Road	Balading	-do-		5000000	20% EDF			Implemented
29	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Matalipni-Malolos Road	Matalipni-Malolos	-do-		4000000	20% EDF			Implemented
30	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Ogob-Diaro Road	Ogob-Diaro	-do-		3000000	20% EDF			Implemented
31	INFRS. & UTILITIES SECTOR FARM TO MARKET ROAD CONCRETING: Comun-Soa-Bulang Road	Comun-Soa-Bulang	-do-		30000000	20% EDF			Implemented
32	ROAD OPENING, Bulang-Quinarabasahan-Bagatangki Rd.	Bulang-Quinarabasahan	DPWH/LGU		32000000	20% EDF			Implemented
33	ROAD OPENING, Diaro-Sitio Palale Road	Diaro	DPWH		5000000	20% EDF			Implemented
34	ROAD OPENING, Poblacion-Balading Alternate Road	Poblacion-Balading	-do-		5000000	20% EDF			Implemented
35	ROAD OPENING, Sitio Bakyad-Jonop Road	Balza-Jonop	-do-		5000000	20% EDF			Implemented
36	ROAD OPENING, Balading-Awang Road	Balading-Awang	-do-		8000000	20% EDF			Implemented
37	ROAD OPENING, Malolos-Diaro Road	Malolos-Diaro	-do-		5000000	20% EDF			Implemented
38	Construction of COMUN-SOA Road with 180 linear REINFORCED CONC. DECK GIRDER BRIDGE	Comun		DAR, WB-ARCDP and LGU	19475076.34	20% EDF	01-Jan-00	01-Apr-01	Completed
39	Construction of SOA-BULANGROAD	Soa to Bulang		DAR	5540513.16	20% EDF	01-May-01	01-Nov-02	Completed
40	Construction of 200 linear meter Balading-Ilawod Road	Balading		Department of and LGU	586467	20% EDF	05-Dec-01	28-Dec-01	Completed

Table 5.3 (10/10) List of Flood Control, Drainage and Other Related Projects in Yawa River Basin

River System: Yawa River
City/Munincipality/Province: Legazpi, Albay

	Name of Project	Location	Implementing Agency	Other involved Agency	Funding/Est'd Cost (Php)	Source of Fund	Date Undertaken	Date Completed	Remarks
	Flood Control								
1.0	Construction of Pumping Station	Pawa		Devt. Fund of LGU	150000	20% EDF	01-Mar-03	01-Aug-03	Completed
2.0	Pumping Station Energization Project	Pawa		Dev. Fund of LGU	210000	20% EDF	Aug. 2004	01-Dec-03	Completed
3.0	Dredging of Pawa - Burabod & Mabinit River Channel (Phase II)	Legazpi City			300000	20% EDF		08-Apr-03	Completed
4.0	Construction of Retaining walls/ seawall	Legazpi City			36934000		1998	2002	Completed
5.0	Dredging of Basin	Legazpi City			40000000			1998	Completed
6.0	Riverbank Riprap	Legazpi City			1050000		1997.	1998	Completed
	Drainage								
1.0	Construction of Open-Lined Canal at Rawis	Legazpi City			300,000.00	20% EDF		07-May-03	Completed
2.0	Construction of Drainage System at Albay Capitol Annex Building	Legazpi City			300,000.00	20% EDF		14-Oct-03	Completed
3.0	Formulation of Sewerage Waste	Legazpi City							
4.0	Drainage System, Open Canals, River and Waterworks	Legazpi City			67,340,000.00		1998	2000	Completed
5.0	Construction of Drainage System	Legazpi City			1,200,000.00		1997	1998	Completed
6.0	Line/ Drainage Canal	Legazpi City	CEO		350,000.00		2004	2006	Proposed
7.0	Construction of Drainage System	Legazpi City	LGU/ Nat'l		31,310,000.00		2004	2006	Proposed
8.0	Riprapping along riverbanks	Legazpi City		LGU/ Nat'l/ Brgy	8,780,000.00	LGU/ Nat'l/ Brgy	2004	2006	Proposed
	Watershed Management								
1.0	Reforestation Project	Legazpi City	LGU		1,500,000.00		2004	2006	Proposed
2.0	Tree Planting	Legazpi City	LGU		100,000.00		2004	2006	Proposed
	Irrigation								
1.0	New Development of Irrigation Facilities	Legazpi City			35,000,000.00		1998	2002	Completed
2.0	Rehabilitation/ Maintenance of Irrigation Facilities	Legazpi City			16,070,000.00		1998	2002	Completed
3.0	Construction of CIP Irrigation Facilities	Legazpi City	DAR/ PGA		9,000,000.00	Nat'l Fund		1998	Completed
4.0	Rehabilitation/ maintenance of existing/ old irrigation facilities	Legazpi City	DAR/ PGA/ City Gov't		2,632,000.00	Nat'l Fund	1996	2002	Completed
5.0	Construction of Irrigation Facilities	Legazpi City	CAO		9,000,000.00	NIA/ DA	2004	2006	Proposed
	Municipal and Water Supply								
1.0	Construction of Homapon & Banquerohan Gravity Bed Water System	Legazpi City				LWD	1998	2002	Completed
2.0	Construction/ Maintenance of Water Supply Sytem	Legazpi City	LGU/ CEO/ LCWD		7,500,000.00	LGU/ Nat'l	2004	2006	Proposed
	Roads and Bridges								
1.0	Road Concreting of Brgy. 8 Washington Drive	Legazpi City			300,000.00	20% EDF		15-Apr-03	Completed
2.0	Repair of Brgy. Road	Buyoan, Legazpi City			300,000.00	20% EDF		19-Sep-03	Completed
3.0	Concreting of City Roads	Legazpi City			69,120,000.00		1998	2000	Completed
4.0	Patching/resealing and asphalting of brgy. Roads	Legazpi City			92,455,000.00		1998	2000	Completed
5.0	Construction of permanent bridges in specific road section of the city	Legazpi City			59,500,000.00			1998	Completed
6.0	Opening of Villahermosa-Banquerohan Road	Daraga & Legazpi City	PGA		6,000,000.00				
7.0	Homapon-Mariawa-Talahib-Bascaran Road	Legazpi City	LGU/DPWH		50,000,000.00	Nat'l Fund	1999	2002	Completed
8.0	Villahermosa-Banquerohan-Bariis Road	Legazpi City	LGU/DPWH		100,000,000.00	Nat'l Fund	1999	2002	Completed

Table 6.1 SUMMARY MATRIX OF PROBLEMS AND ISSUES IN FLOOD CONTROL PROJECT IMPLEMENTATION FOR PRINCIPAL RIVERS

Requirements in National Development Plans and Policies		Problems Identified by Survey on Flood Control Project Implementation		PCM Workshop	
MEDIUM-TERM PHILIPPINE DEVELOPMENT PLAN	Pursue proper O & M of flood control and drainage facilities including an effective garbage collection and disposal in coordination with other concerned government agencies and LGUs	ENGINEERING	Lack of flood data/information and survey works for rivers and flood-prone area	NO COMPREHENSIVE IMPLEMENTATION PLAN	Technical standards and guidelines for flood control plans are not well established nor disseminated among DPWH offices.
	Relocate and prevent informal settlers living along the banks of rivers/esteros/creeks		Deficiencies in technical standards and regulations		
	Implement sabo projects for the prevention/ mitigation of sediment-related disasters, debris and lahar flow/landslide		Lack of consultation and coordination with other related agencies		Inadequate manpower to prepare flood control master plan in DPWH regional and district engineering offices.
	Study and formulate guidelines leading to sustainable development/land use in sediment-related disaster-prone areas				Basic data gathering/surveys/investigations are limited, and processed and stored data are inadequate for planning
	Implement comprehensive measures consisting of construction, warning/evacuation, livelihood programs in coordination with concerned agencies and LGUs		No comprehensive study of flood control project implementation for principal rivers		Attention/emphasis is only given to structural measures in addressing flood control
MEDIUM-TERM DPWH INFRASTRUCTURE DEVELOPMENT PLAN	Comprehensive planning and identification of inundation areas in major and principal rivers				Planning is not participatory
	Provide flood control facilities and sabo works, and pursue non-structure measures in flood/sediment disaster-prone areas	IMPLEMENTATION	Choice of projects and priority in implementation are dictated more by political expediency rather than by actual project appropriateness.	ROLES AND FUNCTIONS ARE NOT CLEAR	Relevant laws and regulations hardly meet actual conditions
	Strengthen the FCSEC for research and studies, information center and sabo engineering program				Inadequate Information & Education Campaign (IEC), and consultation with beneficiaries, negatively affected group, and other stakeholders
	River management in coordination with LGUs		Wrong construction method being adopted		
NATIONAL FRAMEWORK FOR PHYSICAL PLANNING	Prioritize and implement infrastructure projects that support the policy of national dispersal through regional concentration		Lack of continuity of the system (piece-meal implementation);		No exchange nor transfer of data/information between DPWH and other relevant agencies
	Ensure compatibility of infrastructure with local land use and development plans, giving priority to projects with the most strategic impacts		Lack of cooperation and coordination with relevant agencies and LGUs concerned during construction period	IMPORTANCE OF FLOOD CONTROL	Importance of flood control projects for principal rivers is not well recognized/ understood by the government as well as the people
	Compatibility with NIPAS (National Integrated Protected Area System) and other production areas	OPERATION AND MAINTENANCE	No funds and no manpower at the LGU level to undertake O&M		Funds for flood control projects for principal rivers are not adequate
	Incorporate disaster mitigation principles in infrastructure development		Responsibility of the LGU in operation and maintenance is not clear	COORDINATION BETWEEN IMPLEMENTING AGENCIES	Relevant data/information being gathered by their respective agencies shall be provided among them
INTEGRATED WATER RESOURCES MANAGEMENT POLICY	Evaluate properly the efficiency of flood control strategies		No clear agreement exist between LGU and DPWH regarding operation and maintenance		Funds for flood control projects that are within their agencies' scope of responsibilities shall be provided
	Improve data collection systems and access to information by users				Relevant agencies shall participate in the planning, design, implementation and monitoring of flood control projects
	Establish policy instruments and the legal and regulatory framework		No operation and maintenance budget and team that would monitor all flood control structures in the district engineering office		Relevant agencies shall participate in the Information and Education Campaign
	Establish mechanisms for consultation and public participation, and conduct intensely information/ education campaign			OPERATION & MAINTENANCE	DPWH shall provide technical assistance to the responsible agencies
	Enhance capacity building of not only governmental agencies but also non-governmental organizations	LAW ARRANGEMENT	DPWH mandate in EO 124 are not well implemented.		Information and education campaign regarding the importance of flood control works shall be intensely conducted
	Adopt philosophy of flood management and create management agencies (including river basin organizations)		Implementation rules and regulations of Water Code shall be prepared in compliance with actual conditions.		Training for O&M of flood control works shall be given to the direct beneficiaries
	Establish mechanisms to achieve financial sustainability		Implementation rules and regulations of Local Government Code shall be revised to clarify the jurisdiction of river areas.		DPWH shall monitor and feedback of the flood control project implementation

SUMMARY OF ISSUES AND PROBLEMS

1. Jurisdiction of River Area
- No definition on the jurisdiction for rivers and their areas under the law.
- No coordination among governmental agencies to undertake river works.
- Relevant laws and regulations hardly meet actual conditions.

2. Coordination and Cooperation between DPWH and Relevant Agencies
- No data/information exchange between DPWH and relevant agencies
- No coordination and cooperation during construction
- No clear arrangement for O & M between DPWH and LGUs

3. Proper Management System of Data/Information
- Basic data gathering/surveys/investigations are limited including processing and storing
- No proper data collection systems, and access to information by users
- No proper monitoring and feedback mechanism for project implementation

4. Flood Control Project Identification
- Importance of flood control is not well recognized.
- Choice of projects and priority in implementation shall be dictated by actual project appropriateness.
- Study to formulate sabo projects is urged for sustainable development/land use in sediment-related disaster-prone areas.

5. Planning Resources/Capability
- Technical standards and guidelines are not well disseminated among DPWH offices.
- Hydraulic/hidrologic analytical capacities are not well developed.
- Inadequate manpower to prepare master plan of river basin flood control.

6. River Basin Approach and Flood Management
- No comprehensive implementation of flood control including non-structural measures as well as livelihood program.
- No management body covering river basin

7. Public Consultation and Participatory
- Inadequate information & education campaign, and consultation with stakeholders
- Participation of beneficiaries and stakeholders is not well practiced in the planning, design, implementation and O&M

8. Fund for Implementation and O&M
- Funds for flood control projects for principal rivers are not adequate
- No funds and no manpower at the DPWH DEOs as well as LGU level to undertake O&M
- No mechanisms to achieve financial sustainability is established

Table 7.1 Draft Project Design Matrix

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal More effective and appropriately designed flood control and sabo structures/facilities will be constructed by the DPWH in accordance with technical standards and guidelines (TSG), technical manuals and guidelines formulated and produced by the Project.			
Project Purpose Improved flood control project implementation system.	Proper recommendations will be made for flood control project implementation of principal rivers.	Submission of Final Report. Implementation and evaluation of pilot projects.	
Outputs **I. Collected and analyzed data/information of flood control project** (1) Current conditions of flood control projects by both national and local governments will be analyzed. (2) Data/information of flood control projects for major and principal rivers will be collected and processed.	1-1 Current conditions of flood control works in the country will be compiled through data collection and interview with residents. 1-2 Relevant information on flood control works will be collected and processed by the Project until June 2004.	1-1 Conduct of participatory workshop 1-2 Preparation & submission of Interim Report.	
II. Formulated/prepared Flood Control Project Implementation System (1) Comprehensive plan of principal rivers flood control works will be proposed. (2) Roles and functions in flood control project of relevant organizations will be clarified. (3) Necessity of flood control works for principal rivers will be recognized. (4) Optimal utilization of funds for flood control projects.	2-1 Flood control comprehensive plan of principal rivers will be proposed until Sept. 2004. 2-2 Function-role matrix of relevant organizations to flood control will be prepared until Sept. 2004. 2-3 80% of attendants to the Technical Transfer Seminar could basically absorb the technical principles of flood control works of principal rivers. 2-4 Establishment of an agency/body that will regulate the implementation of flood control projects in principal rivers.	2-1 Comprehensive flood control plan will be concurred by the government. 2-2 Function-role of relevant organizations will be agreed by themselves. 2-3 Questionnaire survey in Seminar 2-4 Institutional and financial study on implementation and O&M of flood control projets.	No major changes in relevant laws and regulation
Activities Presented below by Project Output.	**Input** [Japan side] JICA Study Team (3 experts) and local engineers and staff Japanese staff in FCSEC	[Philippine side] - Counterparts to JICA Study Team - Counterparts in FCSEC	The Project is continued. Security conditions are not changed. **Pre-conditions** FCSEC continues its activities

FIGURES

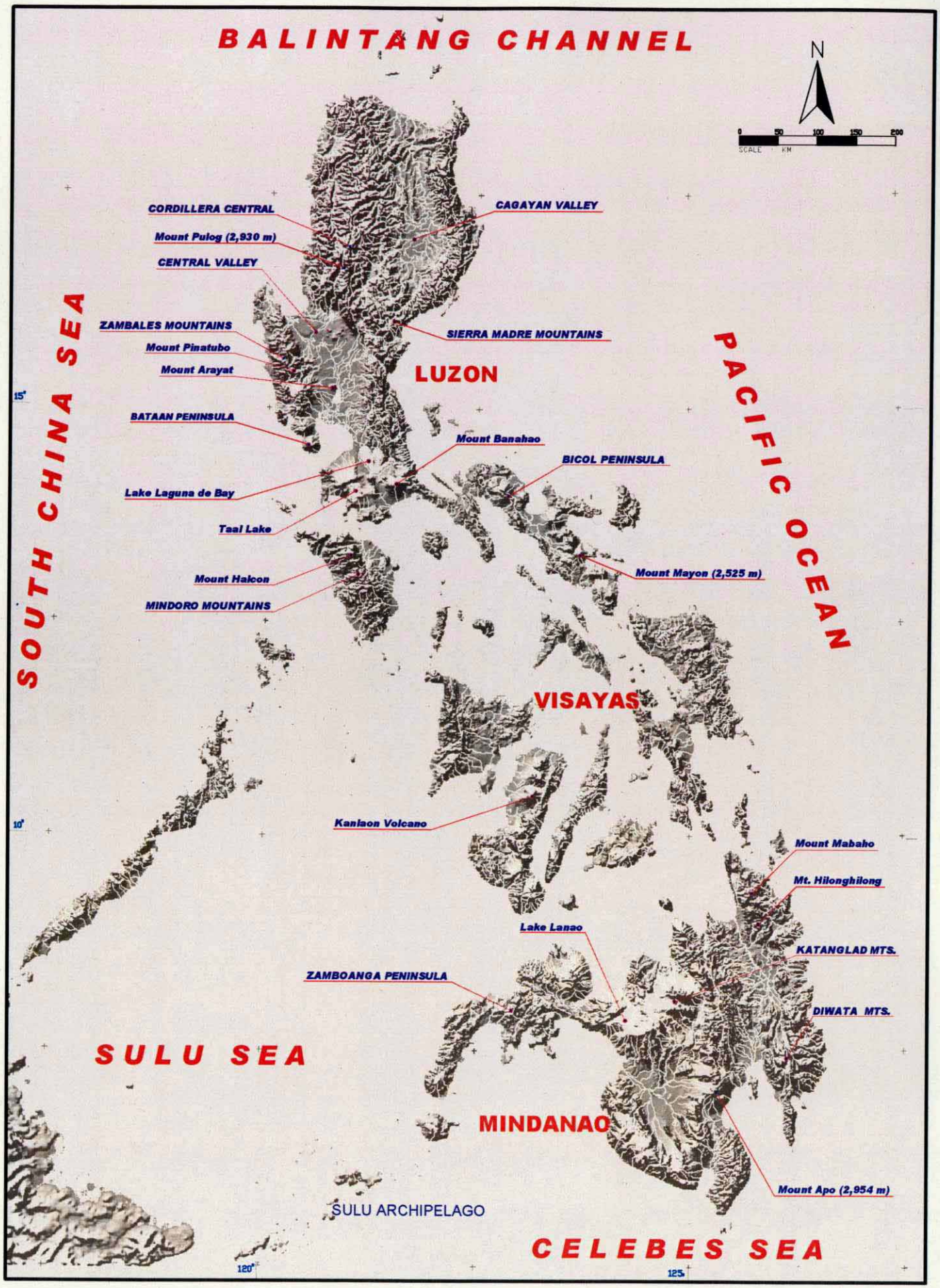


FIGURE 2.1 TOPOGRAPHY OF THE PHILIPPINES

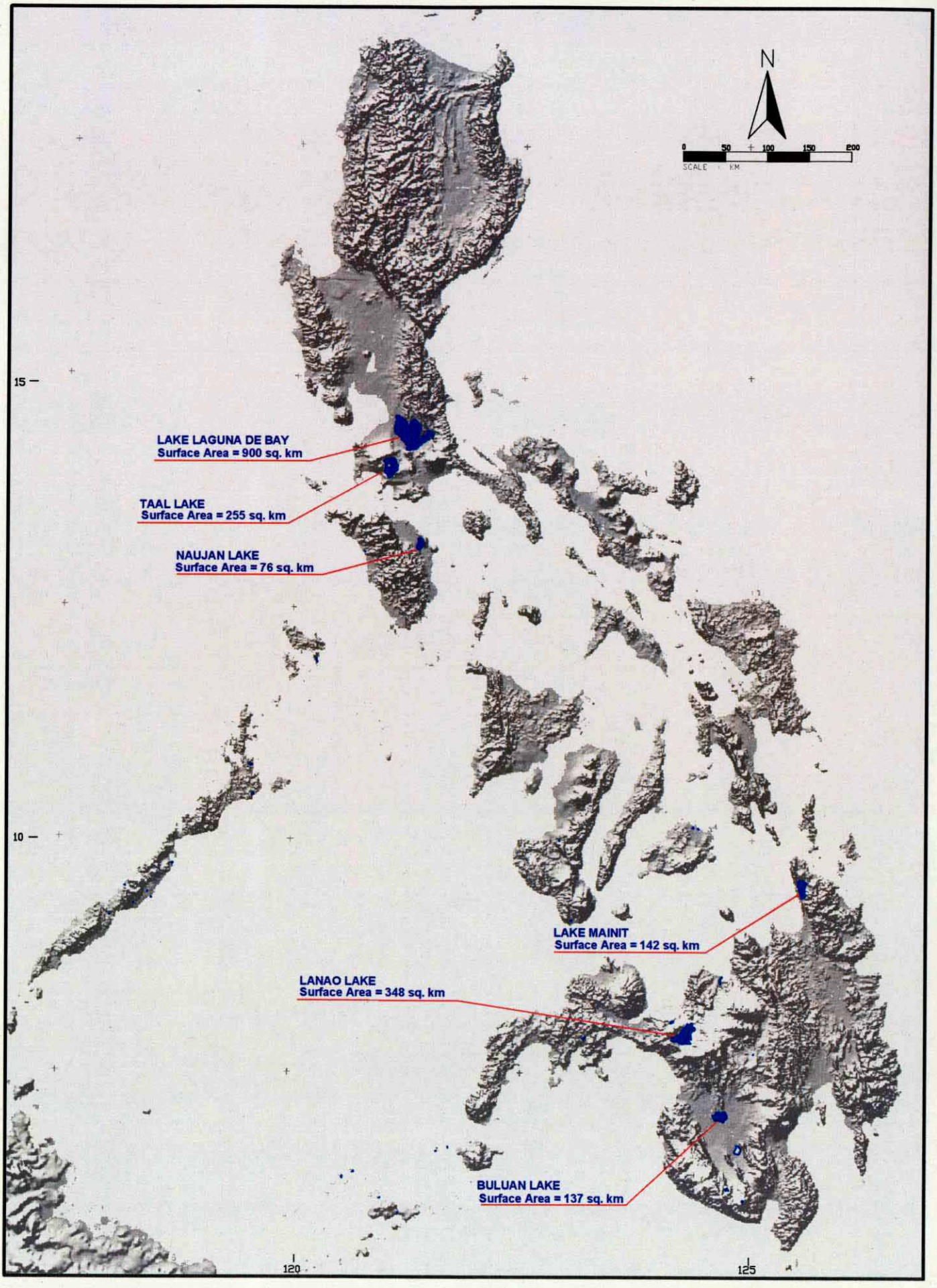


FIGURE 2.2 LOCATION OF THE LARGEST LAKES IN THE PHILIPPINES

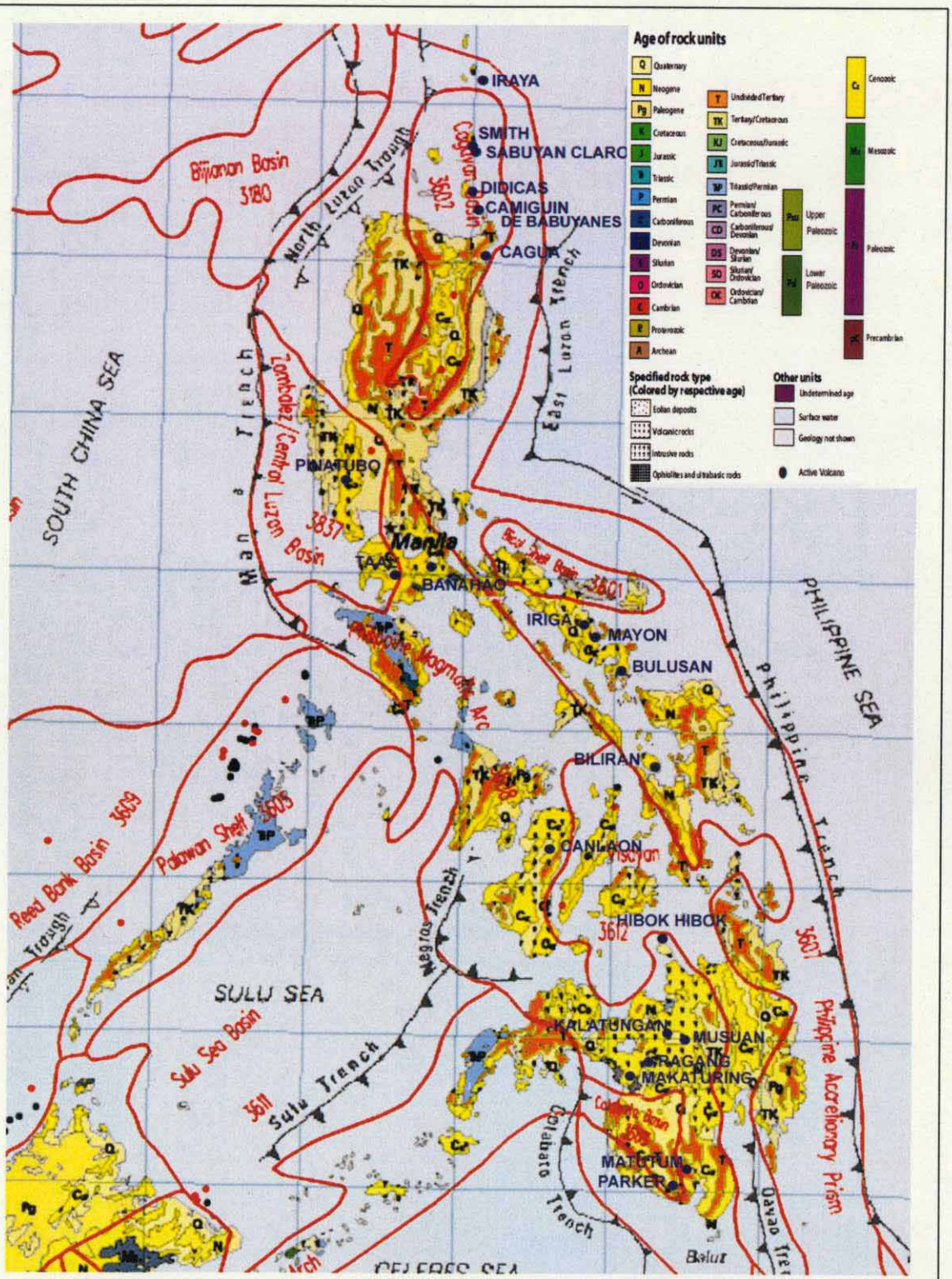


Figure 2.3 Geological Map of the Philippines
(Phivolocs)

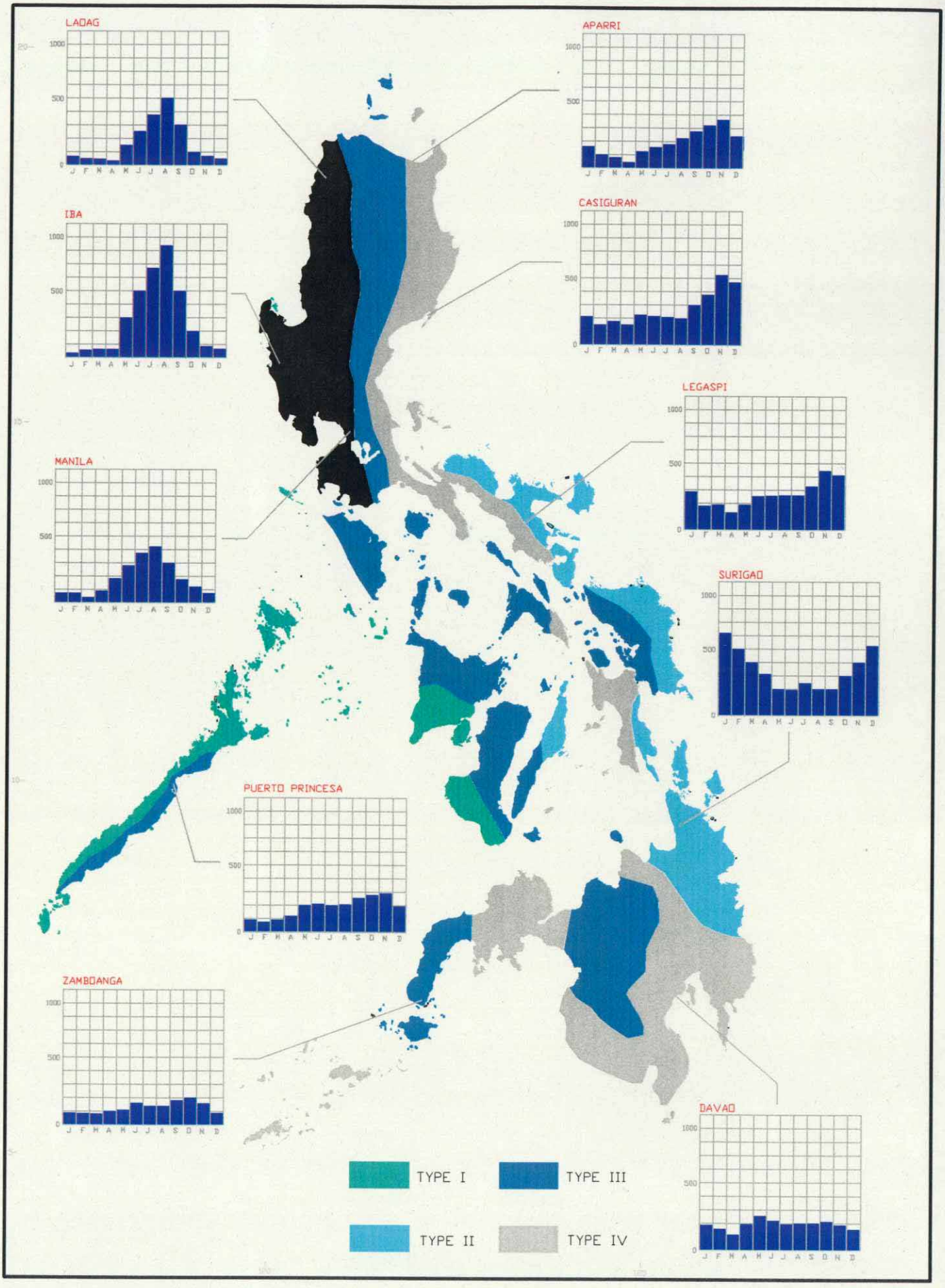


FIGURE 2.4 CLIMATOLOGICAL MAP OF THE PHILIPPINES

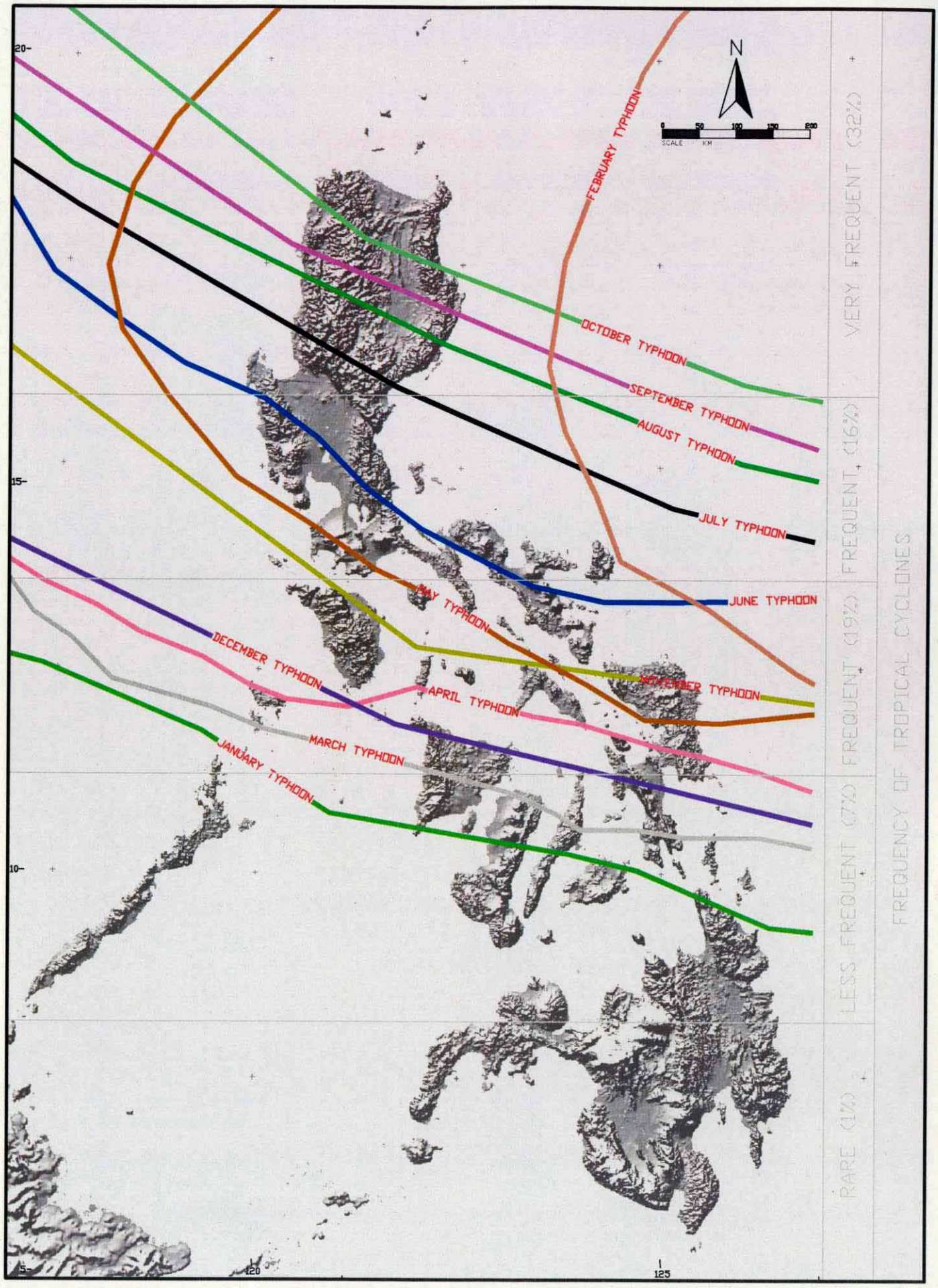


FIGURE 2.5 TYPHOON TRACKS

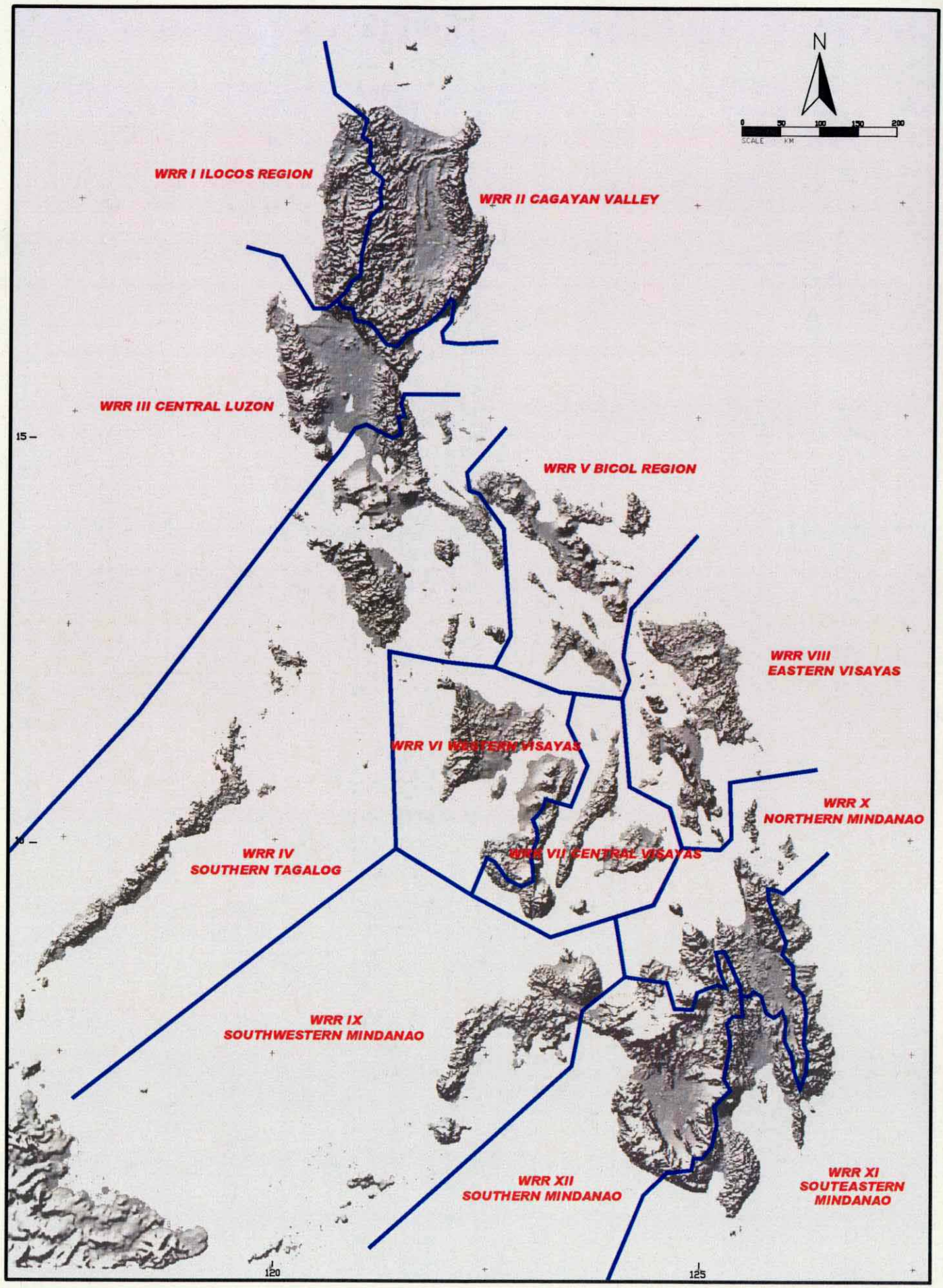


FIGURE 2.6 BOUNDARIES OF THE WATER RESOURCES REGIONS

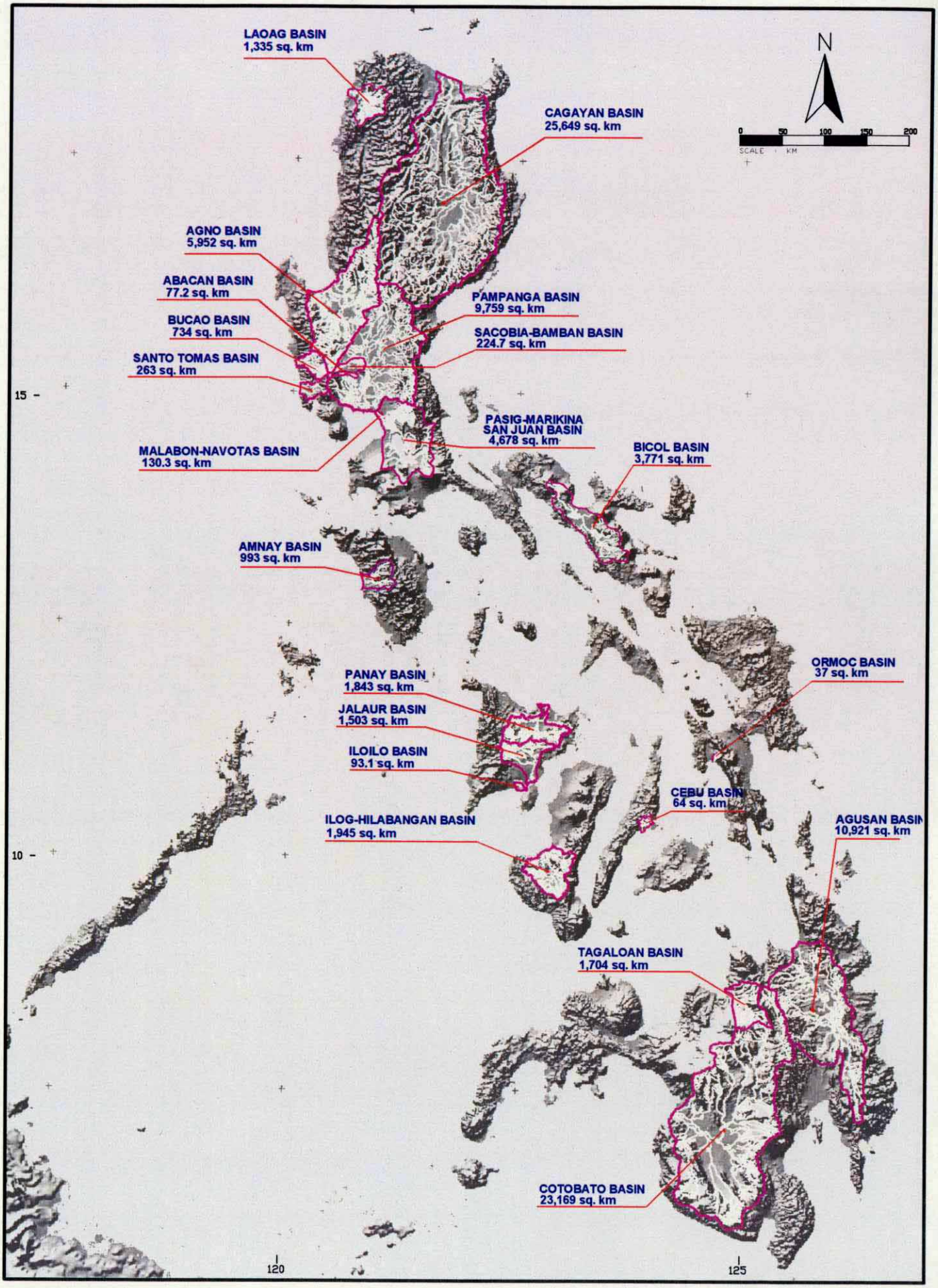


FIGURE 2.7 LOCATION OF 18 MAJOR RIVER BASINS

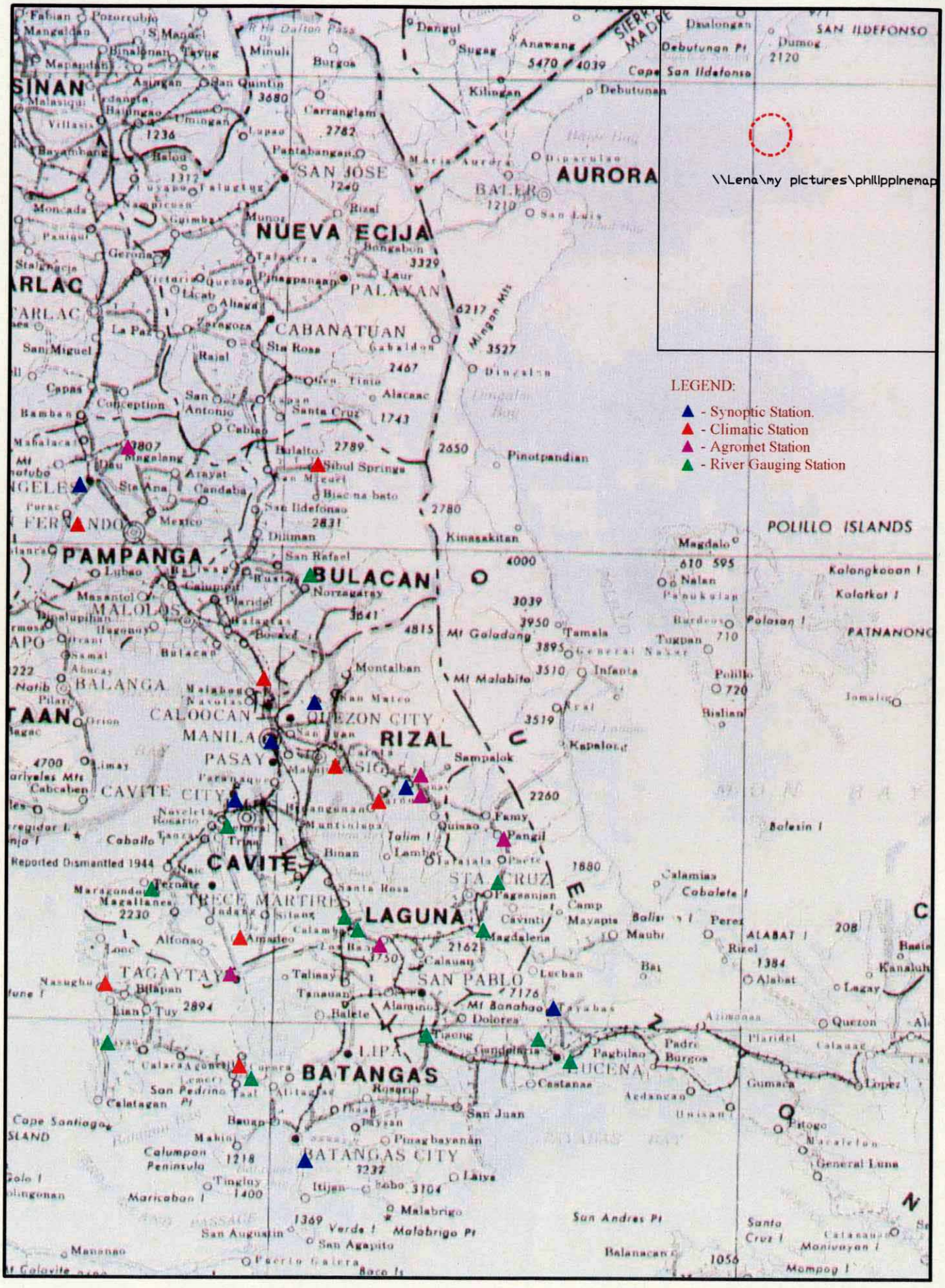
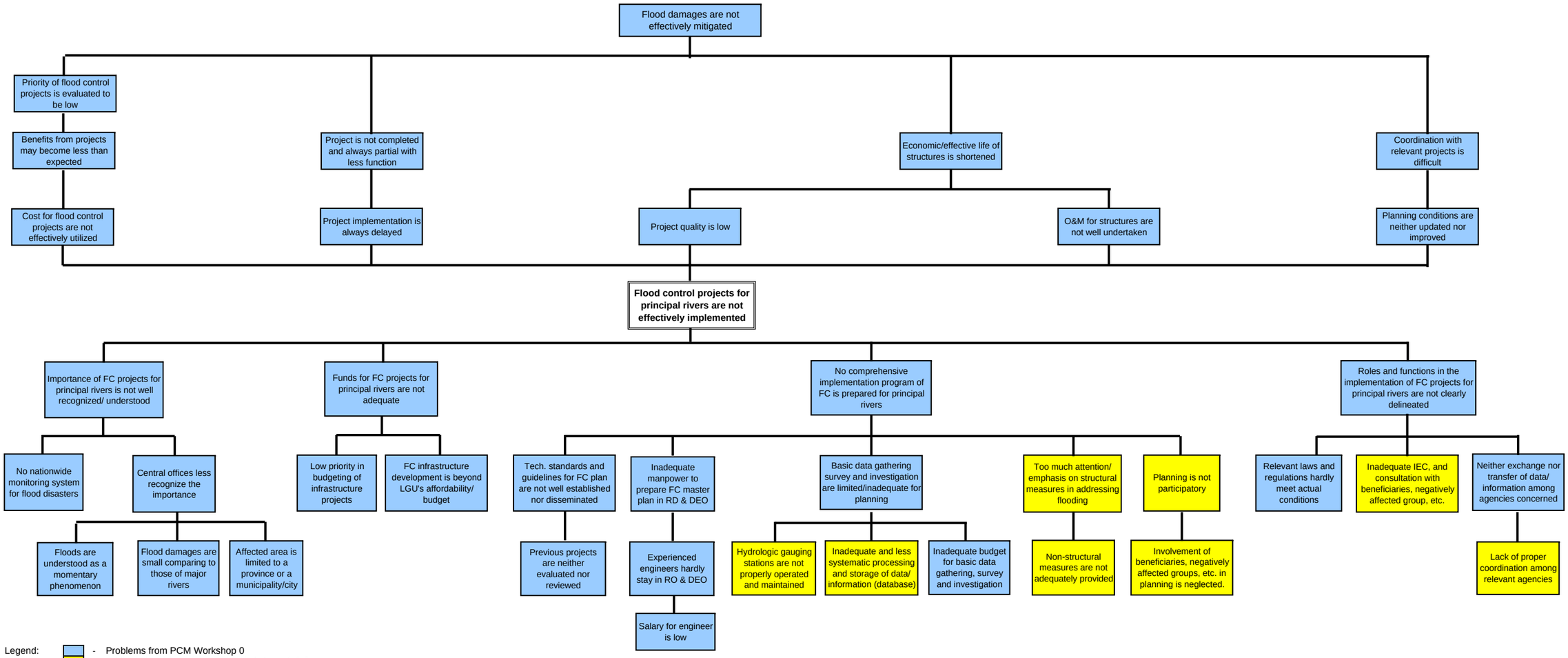


FIGURE 2.8 LOCATION OF SURVEYED GAUGING STATIONS

Figure 6.1 PROBLEM TREE - CONSOLIDATED WORKSHOP OUTPUT

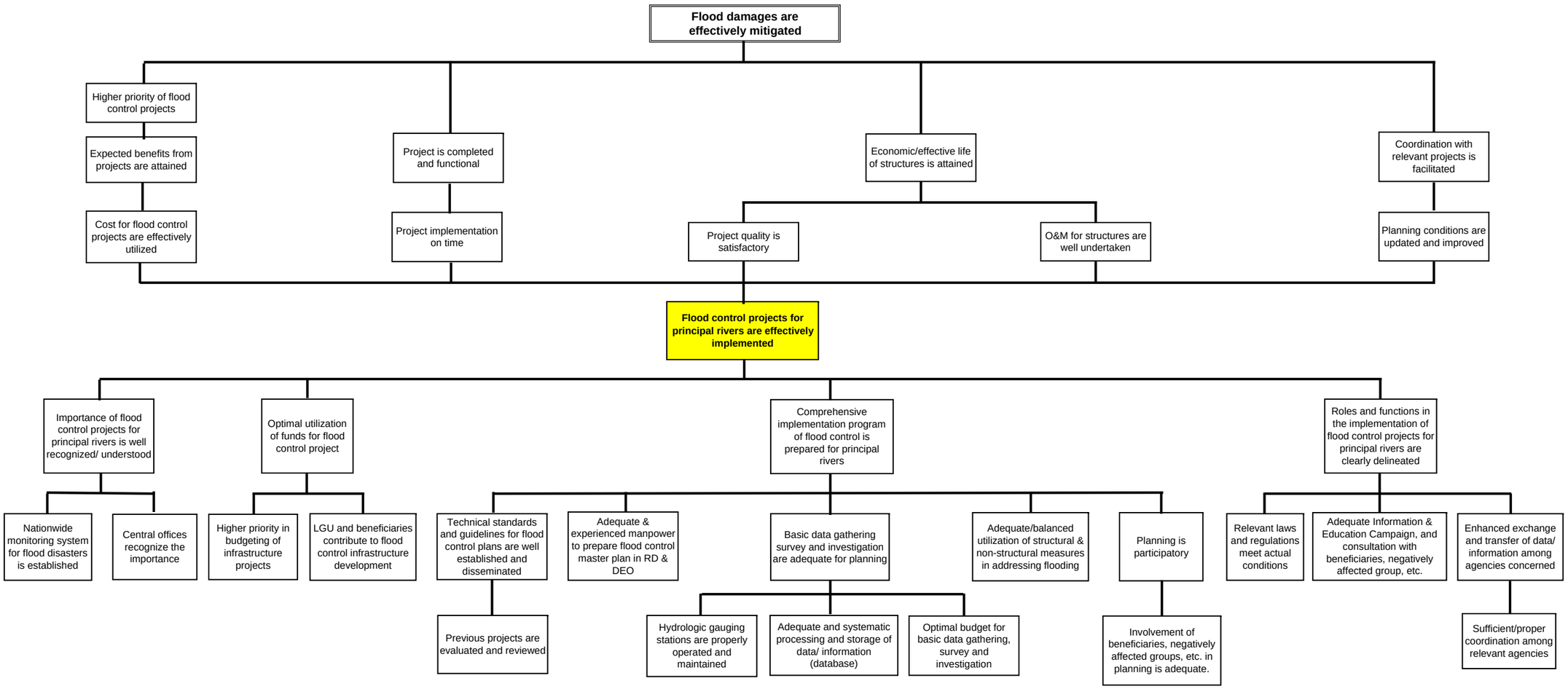
FLOOD CONTROL PROJECT IMPLEMENTATION FOR PRINCIPAL RIVERS



Legend:
- Problems from PCM Workshop 0
- Additional problems from PCM Workshops 1 & 2

FC : Flood Control

FIGURE 7.1 PCM OBJECTIVE TREE
FLOOD CONTROL PROJECT IMPLEMENTATION FOR PRINCIPAL RIVERS



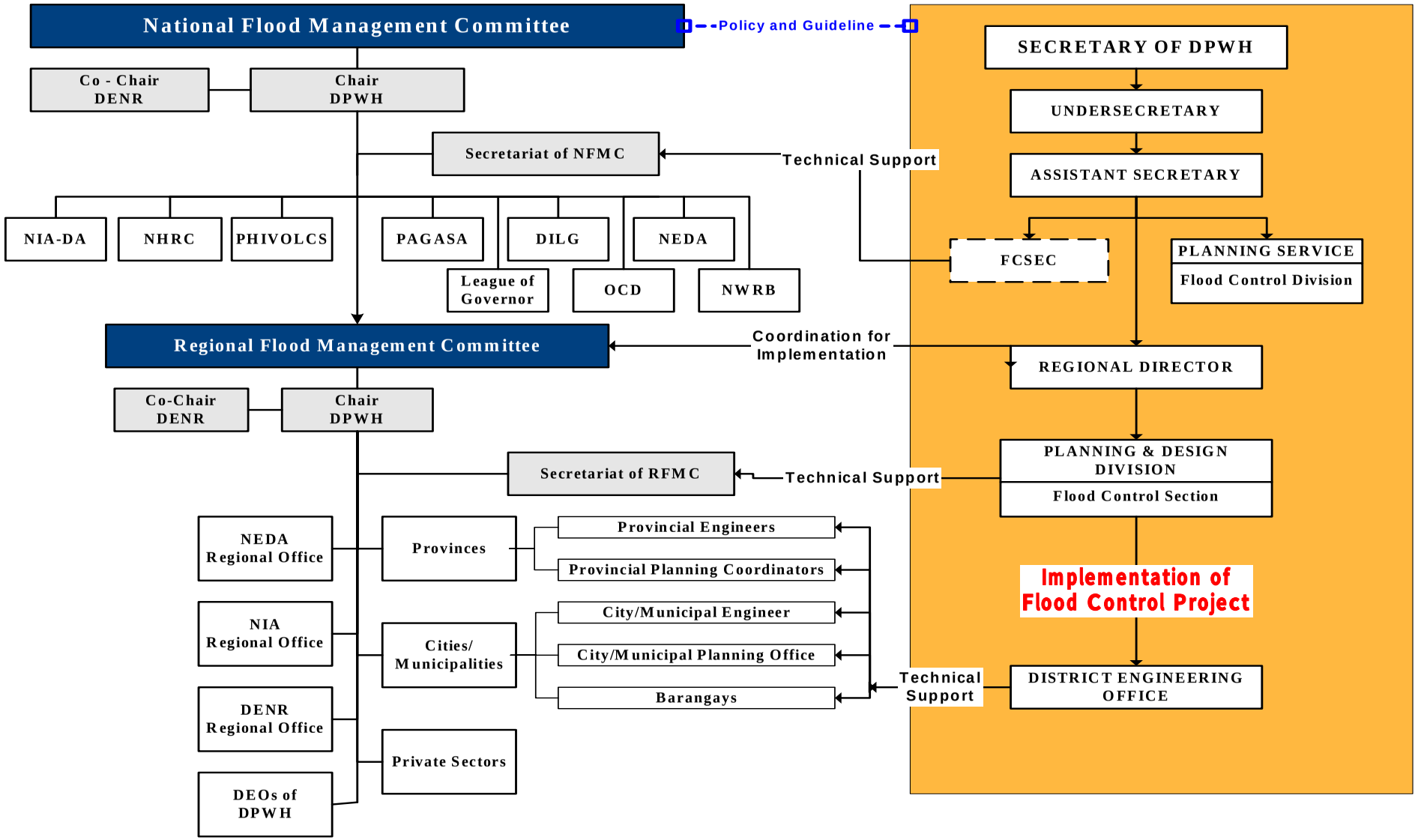


Figure 7.2 Organizational Structure of Flood Management System of DPWH with National Flood Management Committee

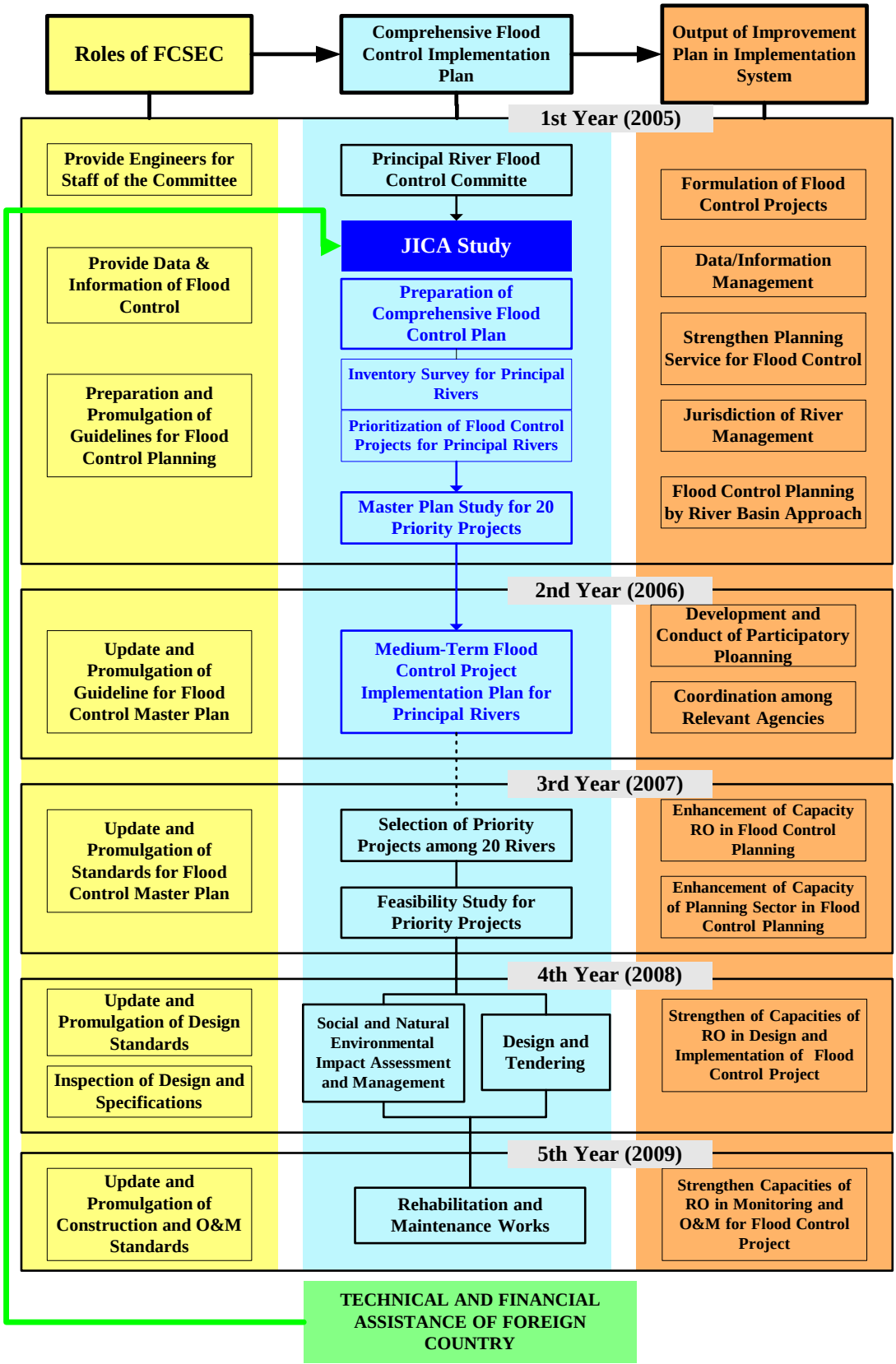


Figure 7.3 Schedule Diagram of Action Plan and Roles of FCSEC