SIXTEENTH CONGRESS OF THE REPUBLIC)
OF THE PHILIPPINES)
Second Regular Session)

'14 AUG 27 P3:11

SENATE

RECEIVED BY

COMMITTEE REPORT NO. 73

Submitted by the Committee on Public Works on AUG 27 2014.

Re: P. S. Res. No. 6

Recommending the adoption of the recommendations and their immediate implementation.

Sponsors: Sen. Ferdinand R. Marcos Jr. and Sen. Ralph G. Recto

MR. PRESIDENT:

The Committee on Public Works to which was referred P.S. Res. No. 6, introduced by Senator Ralph G. Recto entitled:

> **"RESOLUTION DIRECTING THE SENATE COMMITTEE ON PUBLIC WORKS TO CONDUCT AN INQUIRY, IN AID OF LEGISLATION, ON THE VIABILITY OF THE APPROVED OVER-ALL MASTER PLAN ON FLOOD MANAGEMENT IN THE NATIONAL CAPITAL REGION, WITH THE END IN VIEW OF ENSURING A COMPREHENSIVE AND COST-EFFICIENT SOLUTION TO THE FLOODING PROBLEM AND WOULD IMMEDIATELY BRING RELIEF TO THE PUBLIC"**

has considered the same and has the honor to submit its report on its inquiry back to the Senate, recommending the adoption of the recommendations as contained in this Report and their immediate implementation.

Respectfully Submitted by:

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Chair

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see separate opinion
concur w/ some amendments

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SENATE COMMITTEE ON PUBLIC WORKS

Committee Report on
Metro Manila Flood Management

26 September 2013

"The case of Tropical Storm Ondoy has also demonstrated that Metro Manila is not exempt from the possibility of severe flooding; given that it is the engine of the country's growth, disasters that are centered in Metro Manila are a cause for alarm as these will certainly adversely affect the entire country's economy." **(from the Greater Metro Manila Area Risk Analysis Plan [GMMA-RAP] "Greater Metro Manila: Ready, Safe and Resilient Against Flood" primer)**

Introduction

The Senate Committee on Public Works is privileged to submit for the consideration and approval of this august Chamber the report on the Resolution filed by Senator Ralph Recto (Senate Resolution No. 6) that had called upon the Committee to inquire, in aid of legislation, the current flood problem of Metro Manila and the initiatives planned and being implemented by the Government to manage and solve the same:

- PS Res. 6 - Resolution directing the Senate Committee on Public Works to conduct an inquiry, in aid of legislation, on the viability of the approved over-all Master Plan on flood management in the National Capital Region, with the end in view of ensuring a comprehensive and cost-efficient solution to the flooding problem and would immediately bring relief to the public (Sen. Recto)

For this purpose, the Committee conducted a hearing on 26 September 2013, and required the Department of Public Works and Highways (DPWH), Metropolitan Manila Development Authority (MMDA), Department of Environment and Natural Resources, to report their respective studies and findings, plans, programs and accomplishments.

In addition, this Report embodies an in-depth research and analysis made by the Committee, for a greater appreciation of the issue at hand.

As the lead agency with the legal mandate of undertaking: (a) the planning of infrastructure, such as national roads and bridges, flood control, water resources projects and other public works, and (b) the design, construction, and maintenance of national roads and bridges, and major flood control systems **(From the DPWH website: http://www.dpwh.gov.ph/about_us/index.htm [accessed on 29 May 2014])**, the Department of Public Works and Highways (DPWH) submitted to the Committee the salient features of its Master Plan for flood management in Metro Manila and its surrounding areas.

During the hearing, Secretary Rogelio Singson of the DPWH explained, through his comprehensive powerpoint presentation, the Department's flood management master plan for Metro Manila and surrounding areas.

DPWH Master Plan

According to the DPWH, after the massive floods brought by typhoons Ondoy and Pepeng in 2009, the Department had set out to undertake a flood risk assessment study, under a World Bank grant, of the flood occurrences in Metro Manila and its surrounding

areas. The study resulted in the formulation of a Master Plan for the sustainable control and management of flooding in Metro Manila and its surrounding areas until the year 2035. The Master Plan was finally approved by the National Economic and Development Authority (NEDA) Board in September 2012, after consultations with various stakeholders and concerned local government units.

The Master Plan covers the entire Metro Manila and its critical surrounding areas, particularly the provinces of Rizal, Laguna, and parts of Bulacan. Altogether, the coverage totals an area of 4,354 square kilometers (435,400 hectares), encompassing seventeen (17) cities/municipalities of Metro Manila, sixty-three (63) cities/municipalities in the CALABARZON area, and eight (8) cities/municipalities in Bulacan, and affecting an estimated 17.1 million of the populace. It also includes the Pasig-Marikina, Malabon-Tullahan, Meycauayan, South Parañaque-Las Piñas river basins, the Laguna Lake basin, as well as the Malabon-Navotas and Parañaque-Las Piñas drainage basins.

Three (3) Major Flooding Occurrences in Metro Manila

At the outset, the Master Plan determined three major flooding occurrences in Metro Manila and the surrounding areas, all of which were attributed to two main factors: climate change and rapid urbanization in the coverage areas.

The first is flooding caused by overflow due to the huge volume of water coming down to the Pasig-Marikina River from the Sierra Madre mountain ranges and the surrounding mountain ranges of the Laguna Lake, as a result of the loss of watershed atop these mountain ranges.

The second is the flooding due to drainage capacity constraints in the core area of Metro Manila.

And the third is flooding in the low-lying communities around Manila Bay and Laguna Lake.

An example of the first type of flood occurrence happened during the Ondoy and Pepeng floods, where an average of 3,000 cubic meters-per-second torrents rammed their way down tributaries with capacities in the hundreds of cubic meters per second only. The second type is made possible by our constricted waterways and esteros, because of siltation and obstructions due to garbage and other solid wastes, as well as settlement communities and other man-made obstructions. All the solid wastes also further exacerbate the flooding problem as they get sucked in by the pumping stations, thereby damaging these crucial equipment. The third type of flooding is primarily due to the topography of the affected communities, which get flooded because of tidal action and regardless of rainfall.

Solutions and DPWH Projects

In planning and crafting the proposed solutions, the DPWH considered the following "guiding principles":

1) Integrated water resources management principles and river basin approach

2) Safety and resiliency

3) Importance of information and warning systems

4) Systematic and community-based flood risk management

5) Utilization of runoff waters as water resources

6) Reforestation and watershed management

The solutions mapped out by the DPWH in its Master Plan involve certain structural and non-structural interventions or measures, which are aimed to be spread over short-term and long-term plans.

The projects entailing structural intervention in the core area of Metro Manila mainly involve:

- Pasig-Marikina river improvement and dam construction, which is now in Phase 3-4;
- The rehabilitation and improvement of fifteen (15) major pumping stations; rehabilitation and upgrading of drainage channels;
- Dredging and de-clogging works/removal of obstructions along the eight (8) priority waterways; eviction and resettlements.
- The DPWH is also constructing additional drainage mains along Bonifacio Avenue and in Mandaluyong City, and huge box culverts to augment the carrying capacity of the tributaries, like the three-kilometer long "Blumentritt interceptor" in the Sampaloc and Tondo redirect waters to Manila Bay.

The proposed structural interventions in the Laguna Lake area involve:

- Dredging works;
- improvements of river inflows around the lake;
- Land raising and putting up a road dike around the lake and installation of pumping stations;
- Construction of a spillway that will cut through Parañaque and another that will go through the Pacific Ocean.

The structural interventions to alleviate the flooding in the low-lying communities, particularly in the CAMANAVA area (Caloocan, Malabon, Navotas, and Valenzuela) and in Obando, Bulacan, the DPWH is presently constructing flood dikes and pumping systems that will close and block water from Manila Bay in case of high tide, and pump out water to Manila Bay in case of low tide.

All in all, the structural intervention measures that are laid out by the DPWH in accordance with its mandate are estimated at PhP351.718B. Of these, Special Allotment Release Orders (SAROs) amounting to PhP5B have already been issued for short-term projects deemed "high impact" and identified for immediate implementation. In addition, the amount of PhP1.6B has been released to the Metro Manila Development Authority (MMDA) for the rehabilitation and improvement of the twelve (12) pumping stations that are within its control and custody. For complete list, please refer to the DPWH Briefer attached hereto as **Annex "A"**.

The non-structural measures proposed under the Master Plan include:

1) Strengthening of the Flood Information and Warning System

- Effective flood control operation and warning system improvement
- New telemetric rainfall and water level gauging stations

2) Capacity-building and strengthening of community-based flood risk management
   - Update and implement information and education campaign programs
   - Rainfall and water level monitoring by Barangay Disaster Risk Reduction and *Management Councils*
3) Improvement of Management Information System for Disaster Risk Management
4) Reforestation and watershed management
5) Effective and judicious land use planning by the local government units
6) Strict enforcement of waterways easement laws (Civil Code, Water Code and its implementing rules and regulations [IRR])

Flood forecasting and warning information systems

The strengthening of Metro Manila's flood information and warning system is being handled by the Department of Science and Technology (DOST), primarily through the hydrometeorology services of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). The PAGASA regularly issues flood-forecasting and warning and other hydrologic bulletins as part of their official mandate. Please see **Annex "B"** for reference.

Moreover, there is what is called Project NOAH (Nationwide Operational Assessment of Hazards), which integrates the expertise and technologies of the DOST through the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Philippine Institute of Volcanology and Seismology (PHIVOLCS), and the DOST-Advanced Science and Technology Institute (ASTI), in partnership with the UP National Institute of Geological Sciences and the University of the Philippines (UP) College of Engineering. Launched in 2012, Project NOAH has the following components: installation of hydrological devices along the eighteen (18) river basins of the Philippines; Disaster Risk Exposure Assessment for Mitigation-Light Detection and Ranging (DREAM-LiDAR) project; Coastal Hazards and Storm Surge Assessment and Mitigation (CHASSAM); Flood Information Network (FloodNET); Local Development of Doppler Radar Systems (LaDDeRS); Landslide Sensors Development project; and the Weather Hazard Information Project (WHIP). **(Taken from the website: http://www.gov.ph/about-project-noah/ [accessed on 6 June 2014])**

In a related development, it is noteworthy to note in this Report that the Senate Committee on Science and Technology conducted a hearing on the proposed measures which aims to upgrade the PAGASA.

However, the hearings of the Senate Committee on Science and Technology have confirmed that, the DOST, more particularly PAGASA, PHIVOLCS and ASTI, is presently faced with personnel constraints and instability due to "brain drain", as several scientists and technical staff were confirmed to have left their critical government posts in exchange for better-paying jobs overseas. **(Hearing of the Senate Committee on Science and Technology, 3 June 2014)**

Integrated water resources management and river basin management

During the Public Works Committee hearing, the DPWH has suggested integrated and river-based management approaches to solving the flood problem, not only of Metro Manila, but also of the entire country.

According to the DPWH, an integrated and river-based approach properly views the flood control problem from holistic and much broader perspectives, in view of the "interconnectedness" of the flooding occurrences, as discussed above, with the entire water system. In solving the flooding problem, it is also prudent to also engage in "potamology", or a study of rivers, and understand how the flood problem relates to *the entire network of waterways in the area, including the local main river systems.*

Indeed, the World Wildlife Fund (WWF) confirms that, "(r)iver basins are dynamic over space and time, and any single management intervention has implications for the system as a whole." **(World Wildlife Fund [WWF]. Taken from the website: http://wwf.panda.org/about_our_earth/about_freshwater/rivers/irbm/ [accessed on 29 May 2014])**

In fact, the European Centre for River Restoration (ECRR), founded in 1995, advocates and acknowledges "river restoration," which refers to "a large variety of ecological, physical, spatial and management measures and practices. These are aimed at restoring the natural state and functioning of the river system in support of biodiversity, recreation, flood management and landscape development." Simply put, it relates to the improvement of the natural capacity of a river to retain water, as a solution to flood risk management **(European Centre for River Restoration. "How does river restoration contribute to flood risk". From the website: http://www.restorerivers.eu/RiverRestoration/Floodriskmanagement/ tabid/2615/Default.aspx [accessed on 29 May 2014]).**

It suggests that a "new approach" to flood management must be pursued, in view of the financial costs and worsening destructive effects of climate change. This "modern" approach to flood risk management, does not focus on building dikes and engineering interventions (known as the "classic" approach), but rather focuses on "re-connecting brooks, streams and rivers to floodplains, former meanders and other natural storage areas, and enhancing the quality and capacity of wetlands" in order to increase the natural storage capacity of rivers. **(Ibid.)**

The direct relation of our flood problem to river management is not far-fetched and has been recognized by existing law. A "critical watershed", as defined by the Revised Forestry Code **(Presidential Decree No. 705, as amended by P.D. No. 1559 [1978])**, is "a drainage area of a river system supporting existing and proposed hydro-electric power, irrigation works or domestic water facilities needing immediate protection or rehabilitation." However, for purposes of this Report, the original definition given by Presidential Decree No. 705 in 1975 is in fact more instructive and to the point, as it clearly referred to its direct relation to flood management:

> (n) Critical watershed is a drainage area of a river system supporting existing and proposed hydro-electric power and irrigation works needing immediate rehabilitation as it is being subjected to a fast denudation causing accelerated erosion and destructive floods. It is closed from logging until it is fully rehabilitated. **(Section 3, Presidential Decree No. 705 [1975]) (underscoring supplied)**

As suggested by the DPWH, this "modern" or "river-based" approach to flood management will also have to tie in with principles of integrated water resources management. This perhaps is in view of the country's commitment to the Agenda 21 of

the United Nation Conference on Environment and Development (UNCED) or the "Earth Summit" in 1992, which includes the "protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources" (#18). Consistently enough, one of the activities under the number 18 agendum is "flood and drought management, including risk analysis and environmental and social impact assessment".

Integrated water resource management (IWRM) is defined by the Global Water Partnership[1] as, "a process which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare without compromising the sustainability of ecosystems and the environment." **(From the Global Water Partnership website [www.gwp.org/About-GWP/] [accessed on 6 June 2014])** This means that as the country addresses its flood problems, the means and measures employed and the infrastructure put up must ensure as much as possible that the "water resource" would not be wasted and be put to good use for the benefit of the people. As an example, in constructing a retarding dam for floodwaters, there should also be a coordinate way to harness such water resource for electricity production and potable human consumption, and other beneficial uses.

But the important question raised during the hearing was: is there an existing integrated river management program that would help ease the flood problem in Metro Manila?

It would seem that there is as yet none being employed, as the current approach being employed by the government with regard to the flood problem of Metro Manila has rather been invariably described as "piecemeal" and "fragmented". As rivers are elongated and complex as they are, the required government functions and tasks are equally diverse and varied, and cut across the mandates of several agencies. Worse, the needed functions traverse the territories and boundaries of several local government units. The major functions and tasks called for by the flood management efforts, such as engineering, clearing and eviction, resettlement, and reforestation, are not only handled by separate agencies—but are also situated in different areas and localities. Thus, management of the problem becomes ever more tedious and difficult because it coincides with the leadership and authority of local government units—numerous, in fact—within their respective territorial jurisdictions.
In the case of Metro Manila alone, a total of 12 out of the 17 LGUs are already traversed by the eight (8) priority rivers and waterways identified by the DPWH.

	PRIORITY WATERWAY	LGUs TRAVERSED
1	San Juan River	Mandaluyong
		Quezon City
		San Juan
2	Manggahan Floodway	Pasig
3	Estero Tripa de Gallina	Makati
		Pasay
4	Maricaban Creek	Makati
		Pasay
		Taguig
5	Tullahan River	Caloocan
		Malabon
		Quezon City
		Valenzuela

[1] Global Water Partnership is an international organization formed in 1996 by the World Bank, the United Nations Development Programme, and the Swedish International Development Cooperation agency to promote integrated water resource management.

6	Pasig River	Makati
		Mandaluyong
		Manila
		Pasig
7	Estero de Maypajo	Caloocan
		Manila
		Navotas
8	Estero de Sunog Apog	Manila

(Source: GMA Online)

And of the 12 LGUs traversed by the 8 priority waterways, a minimum of 211 affected Barangays have been identified, with a combined population of 2,241,635 (as of the 2010 Census). **(Vallarta, Brenda Barrios. "Flooding Along Metro Manila Waterways Can Be Alleviated By Relocating Informal Settlers". 21 June 2013. GMA News Online website [http://www.gmanetwork.com/ news/story/313881/news/specialreports/flooding-along-major-waterways-can-be-alleviated-by-relocating-informal-settlers] [accessed on 29 May 2014])**

	LGU TRAVERSED BY PRIORITY WATERWAY	BARANGAYS AFFECTED
1	Caloocan	9
2	Valenzuela	4
3	Malabon	2
4	Navotas	2
5	Manila	107
6	Pasig	8
7	Mandaluyong	9
8	Makati	19
Total Barangays affected		211
Total Population affected		2,241,635

(Source: GMA Online)

To complete picture for the rest of the country, there are four hundred twenty-one (421) river basins, eighteen (18) of which are considered by the Department of Environment and Natural Resources (DENR) to be "major". In turn, these 18 major river basins collectively traverse and affect some fifty (50) provinces nationwide. Please refer to the DILG list attached as **Annex "C" (Data from the Department of Interior and Local Government. Taken from the DILG website: www.dilg.gov.ph/PDF_File/resources/DILG-Resources-2012117-11d053bdcf.pdf [accessed on 29 May 2014])**

There are about one hundred forty (140) river watersheds that have been identified as "critical" by the DENR. All in all, these critical watersheds traverse fifty-one (51) provinces, and three hundred eighteen (318) cities and municipalities nationwide. Please refer to **Annex "D"**.

As a result, the efforts have been admittedly described by the DPWH as lacking in coordination, as there is no single and central agency that coordinates and orchestrates all the related functions being exercised by the numerous agencies and LGUs with regard to river management.

Presently, there is the River Basin Control Office (RBCO) under the DENR, which was created in 2006 by virtue of Executive Order Nos. 510 and 810, with the broad mandate of being the "oversight agency for all government efforts and initiatives within the country's river basins", "such as, but not limited to, river basin infrastructure

development, flood control, environmental protection and integrated water resources management." **(Executive Order No. 816, series of 2009)**

The RBCO was envisioned as a central agency that would transcend the perceived challenges and difficulties that normally accompany a river-based management approach. As such, the RBCO was envisioned not only to be an implementing body operating under the DENR, but also to be a central policy-maker that would sit in the policy and project boards of government agencies and that would be consulted by LGUs and non-governmental organizations on planned river-related local programs and projects. It was also created to be the central fund administrator and database manager of matters pertaining to the management of river basins in the country. Highlighting the centrality and focus of its mandate, all other departments, bureaus, offices, agencies or instrumentalities, including government-owned or controlled corporations, were "directed to extend such assistance and cooperation as the RBCO may need in the discharge of its functions." **(Sections 2 & 4, ibid.)**

Indeed, on the particular point of flood management, the RBCO was originally intended to team up with the DPWH and the former National Disaster Coordinating Committee to "develop a national master plan for flood control by integrating the various existing river basin projects and developing additional plan components as needed." **(Section 2, E.O. 510, series of 2006)**

DENR contributions in flood control and management

The Department of Environment and Natural Resources (DENR) is the lead agency In addressing the solution of reforestation and watershed management, being the agency with the mandate of, "management, conservation, development, use and replenishment of the country's natural resources" **(Executive Order No. 192, series of 1987).**

DENR representative Director Noel Gaerlan reported during the hearing that that the Department has a National Greening Program that aims to plant 150 billion trees in 1.5 million hectares of land of forest area nationwide.

In 2011, the National Greening Program of the Government was launched under Executive Order No. 26. With the DENR as lead agency, in partnership with Department of Agriculture (DA) and Department of Agrarian Reform (DAR) and the private sector, the program aimed to consolidate and harmonize all the greening efforts of the Philippine government. The program targets to plant 1.5 billion trees in 1.5 million hectares of public lands nationwide in six years, from 2011 to 2016—more than twice the government's accomplishment for the past 25 years, which adds to about 730,000 hectares. Precisely, one of the outcomes expected from the program is "environmental stability", particularly, stemming from a significant increase in forest cover, thereby increasing the water holding capacity of the ground and reducing downstream flooding and soil erosion, among other benefits.

Under DENR Memorandum Circular No. 2011-01, the program specifically targets, among others, the, "rehabilitation of degraded areas in priority watersheds and protected areas", as well as the "rehabilitation of rivers and stream banks using bamboos". All told, the National Greening Program is a "structural intervention" in itself as it aims to strengthen the structure of the country's ecosystem, particularly the 18 major river basins and 140 critical watersheds. Thus, it is definitely a major step in the right direction towards gradually alleviating the flood problems not only of Metro Manila but of other areas in the country as well.

The DENR reports in its website that as of close of 2013, the National Greening Program has already achieved almost half of its target.

NATIONAL GREENING PROGRAM ACCOMPLISHMENT REPORT

Year	Target Area (hectares)	Area Planted (hectares)	Percent (%) Accomplishment of Area Planted	Number of Seedlings Planted
2011	100,000	128,558	129%	89,624,121
2012	200,000	221,763	111%	125,596,730
2013	300,000	333,160	111%	182,548,862
2014	300,000			
2015	300,000			
2016	300,000			
Total	**1,500,000**	**683,481**	**46%**	**397,769,713**

(Source: DENR)

The DENR also contributes to solving the flood problems of Metro Manila through its "Adopt-an-Estero"/"Linis Estero" program. The program was launched in 2010 as the Department's flagship program, in light of the worsening water pollution and flooding occurrences in Metro Manila and other parts of the country. The program sought to clean up esteros and waterways to address water pollution problems in the country via a stewardship system that integrates the efforts of the local government units, private sector, and the estero communities as well, under the guidance of the DENR.

As of first quarter of 2013, the program has so far yielded partnerships with private sector volunteers, as evidenced by 456 signed Memorandums of Agreement for the cleaning and rehabilitation of 258 of our esteros and rivers all over the country. In this connection, the DENR has reported that of the 18 priority river basins, 12 are now "within the standard level based on their classification." **(Mayuga, Jonathan L. "DENR: Striking a Balance in the Face of Climate Change". Business Mirror. 27 December 2013. Taken from the Business Mirror website: http://www.businessmirror.com.ph/index.php/en/news/economy/24983-denr-striking-a-balance-in-the-face-of-climate-change [accessed on 15 May 2014])**

Role of the Metro Manila Development Authority (MMDA)

The Metro Manila Development Authority (MMDA) was created by virtue of Republic Act No. 7924 in 1995, pursuant to the authority under the 1987 Constitution, particularly under Section 8 of Article XVIII thereof. Under R.A. No. 7924, the MMDA was vested with planning, monitoring, coordinative functions, regulatory and supervisory functions over the delivery of certain "metro-wide services" within the special development and administrative region of Metro Manila, but "without diminution of the autonomy of the local government units concerning purely local matters." **(Section 2, R.A. 7924)**

The "metro-wide services" falling within the mandate of the MMDA are those that "have metro-wide impact and transcend legal political boundaries or entail huge expenditures such that it would not be viable for said services to be provided by the individual local government units (LGUs) comprising Metropolitan Manila." (Section 3, ibid.) Aside from its more popular and publicly known traffic management service, the MMDA also handles "flood control and sewerage management which includes the formulation and implementation of policies, standards, programs and projects for an integrated flood control, drainage and sewerage system." **(Paragraph [d], ibid.)**

For purposes of this legislative inquiry, the MMDA, through its Flood Control and Sewerage Management Office, submitted to the Committee its flood control projects for the periods of 2012 up to 2014. Please see **Annexes "E", "F", "G"**, for reference. In sum, the projects of the MMDA mainly involve drainage improvement, desilting, riprapping, dredging/deepening of esteros and waterways, and also rehabilitation of pumping stations within the control of the MMDA.

Likewise falling within the mandate of MMDA, and connected to the relocation and resettlement component of certain flood control solutions in Metro Manila as discussed above, is the function of "(u)rban renewal, zoning and land use planning, and shelter services which includes the 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, the rehabilitation and development of slum and blighted areas, the development of shelter and housing facilities and the provision of necessary social services thereof." **(Paragraph [e], Sec. 2., R.A. No. 7924)**

Role of the Local Government Units

Republic Act 7160, otherwise known as the Local Government Code of 1991, provides a General Welfare Clause, under Section 16 thereof, where local government units are mandated to exercise powers to benefit their constituencies:

> **Section 16.** *General Welfare.* - Every local government unit shall exercise the powers expressly granted, those necessarily implied therefrom, as well as powers necessary, appropriate, or incidental for its efficient and effective governance, and those which are essential to the promotion of the general welfare. Within their respective territorial jurisdictions, local government units shall ensure and support, among other things, the preservation and enrichment of culture, promote health and safety, enhance the right of the people to a balanced ecology, encourage and support the development of appropriate and self-reliant scientific and technological capabilities, improve public morals, enhance economic prosperity and social justice, promote full employment among their residents, maintain peace and order, and preserve the comfort and convenience of their inhabitants. (underscoring supplied).

The issue of flood management is definitely within the ambit of this statutory obligation among the LGUs.

During the hearing, it was discussed that comprehensive understanding and analysis of the LGUs on the extent of flood and river management is imperative in order to provide concrete and doable solutions to perennial flooding in the metropolis and nearby areas.

Many issues and problems faced by the LGUs contribute to flooding, which include eviction of illegal settlers, and removal of man-made obstructions along esteros, and other areas adjacent to the river banks.

There is no better defense than a thorough planning and preparation of the LGUs. An in-depth local planning therefore, goes hand in hand with disaster risk reduction, in creating a safer, healthier and flood disaster-free community.

Local planning: climate change, disaster risk reduction and management, and land use

According to the Greater Metro Manila Risk Analysis Project (GMMA-RAP)[2], "*Greater Metro Manila: Ready, Safe and Resilient Against Flood*" primer:

> "Flooding remains one of the most challenging issues in the country, and as the flooding occurrences in the Philippines become more severe, the government and the public can expect only higher costs of damages and more lives and families are affected. The case of Tropical Storm Ondoy has also demonstrated that Metro Manila is not exempt from the possibility of severe flooding; given that it is the engine of the country's growth, disasters that are centered in Metro Manila are a cause for alarm as these will certainly adversely affect the entire country's economy. But can the possibility of a flooding hazard be avoided? The key lies with looking beyond planning disaster preparedness and response, and focusing on analyzing the factors that exacerbate disaster situations by using risk information.

The GMMA-RAP project has emphasized the essential role of local governments in the effective control and management of flood risks through timely and efficient planning. Republic Act No. 10121 provides that the approach to the national framework for disaster risk reduction management should not only be comprehensive, all-inclusive, multi-sectoral, and inter-agency, but more importantly, should be "community-based". Precisely, the National Disaster Risk Reduction Management Framework approved in 2011 mentions that one of the principles on which the Framework was based is that disaster risk reduction and management is, "best done through local and customized adoption (and adaptation)".

The recognized solution of strengthening community-based flood risk management and land use planning goes to the very heart of local governance because it calls for local government units to strictly abide by the mandates of Republic Act No. 9729 (Climate Change Act) and Republic Act No. 10121 (Disaster Risk Reduction Management Act) and integrate climate change and disaster risk reduction management in the realm of local comprehensive development and land use planning, i.e., CDPs and CLUPs, respectively, which in turn they are required to do under Republic Act No. 7160, or the Local Government Code of 1991. These laws require the local governments to identify their peculiar and local risks and vulnerabilities and consolidate the information in the form of climate change action plans, local DRRM plans, local risk maps, and the like. In the same way, the National Government, through the Climate Change Commission (CCC) and National Disaster Risk Reduction Management Council (NDRRMC), are mandated to work in tandem in order to come up with national standards and policies on climate change adaptation and disaster risk reduction management, for the guidance and conformity of local government units, from the provinces down to the barangays.

Indeed, the Framework specifically recognizes:

> "The National/Regional/Provincial Physical Framework Plans and the Comprehensive Land Use Plans guide the utilization, and development of the country's land and other physical resources. Mainstreaming DRR in these plans will result to enhanced understanding of the planning environment; more realistic allocation of land uses; potential damages

[2] The GMMA-RAP was a project of the Collective Strengthening of Community Awareness on Natural Disasters (CSCAND) Group chaired by the PHIVOLCS and composed of the Mines and Geosciences Bureau (MGB), National Mapping and Resource Information Authority (NAMRIA), PAGASA, and the Office of Civil Defense (OCD). It was supported and funded by the Australian Government.

and casualties are considered in the development goals and targets; risk reduction measures are prioritized; DRR programs and projects are eventually provided with budgetary resources and implemented; risks are considered in the project design and monitoring indicators; and risk estimates serve as benchmarks for evaluating DRR."

The GMMA-RAP primer emphasized the significance of risk analysis in local planning, in this wise:

Risk Information: the key to creating ready, safe and resilient communities

"Flood is a natural hazard, but its ability to damage and affect lives can be reduced and managed by using the right information. With the risk analysis data, local leaders will not only be able to prepare for disaster, but be guided in creating measures that will remove residents from possible harm. From creating more viable land use plans to ensuring the effectiveness of disaster resilience programs, risk analysis data provides a look into the future to better plan for the present.

By understanding the risks, implementing possible options and investing in long-term welfare, we are able to promote safety, financial security and resiliency to our community.

What the local government can do

Risk analysis data can enable the local government to better manage flood risks. It is a foremost resource when planning for land use to ensure that infrastructure or human settlements in any given area in the city or municipality are safe from the risks of flooding.

It can also be used as a definitive guide for the creation of Disaster Risk Reduction and Management (DRRM) plans. For example, for areas located along river banks, LGUs can construct small dikes—the size of which is based on flood severity predicted by the risk maps—beside natural levees. These dikes, combined with river and flood plain management, help decrease damages that can happen due to flooding.

Eviction and Resettlements

Probably the most sensitive and controversial of all are the concomitant issues of evictions and resettlements of communities in various local government units, which inevitably go hand in hand with the implementation of flood control structural measures, e.g., clearing and removal of man-made obstructions and informal settler families and communities. These are sensitive and controversial issues because they concern shelter, one of the most basic human rights.

The legal basis for the clearing and removal of man-made obstructions and illegal settlements along our waterways and esteros may be found in Presidential Decree No. 1067, otherwise known as the Water Code of the Philippines, in relation to Section 28 of Republic Act No. 7279, or the Urban Development and Housing Act (UDHA) of 1992.

Article 51 of the Water Code provides for the basic waterways easement policy of the country, and prohibits the building of "structures of any kind" within the easement. Article 51 provides:

> Article 51. The banks of rivers and streams and the shores of the seas and lakes throughout their entire length and within a zone of three (3) meters in urban areas, twenty (20) meters in agricultural areas and forty (40) meters in forest areas, along their margins are subject to the easement of public use in the interest of recreation, navigation, floatage, fishing and salvage. No person shall be allowed to stay in this zone longer than what is necessary for recreation, navigation, floatage, fishing or salvage or to build structures of any kind.

The Water Code further vests authority upon the DPWH to declare "flood control areas", and to exercise regulatory jurisdiction over them. Articles 53 to 55 provide:

> Article 53. To promote the best interest and the coordinated protection of flood plain lands, the Secretary of Public Works, Transportation and Communications may declare flood control areas and promulgate guidelines for governing flood plain management plans in these areas.
>
> Article 54. In declared flood control areas, rules and regulations may be promulgated to prohibit or control activities that may damage or cause deterioration or lakes and dikes, obstruct the flow of water, change the natural flow of the river, increase flood losses or aggravate flood problems.
>
> Article 55. The government may construct 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 of the bed or channel of the river.

In relation to the easements of waterways and flood control areas expressed in the Water Code, Section 28 of the Urban Development and Housing Act or the UDHA Law (R.A. No. 7279) recognizes the exceptional exercise of the remedy of eviction and demolition, subject to certain conditions, in cases of encroachment on such easements. Section 28 of R.A. No. 7279 provides:

> Sec. 28. Eviction and Demolition. — Eviction or demolition as a practice shall be discouraged. Eviction or demolition, however, may be allowed under the following situations:
>
> (a) When persons or entities occupy danger areas such as esteros, railroad tracks, garbage dumps, riverbanks, shorelines, waterways, and other public places such as sidewalks, roads, parks, and playgrounds;
>
> x x x.

Unfortunately however, occupying the banks of our esteros, rivers and other waterways nationwide, especially in Metro Manila, are not merely ordinary man-made structures, but rather full-blown and full-grown human settlement communities.

Research made by the Committee reveals that there are 60,130 informal settler families (ISFs) living along waterways in the whole of Metro Manila (as of June 2012 only), with 19,440 of them living along the 8 priority waterways, based on the data gathered by the Department of Interior and Local Government (DILG).

INFORMAL SETTLER FAMILIES (ISFs)
LIVING ALONG WATERWAYS IN METRO MANILA

	LOCAL GOVERNMENT UNIT	NUMBER OF ISFs
1	Caloocan	6,012
2	Las Piñas	2,590
3	Makati	1,810
4	Malabon	3,991
5	Mandaluyong	662
6	Manila	2,249
7	Marikina	430
8	Muntinlupa	3,686
9	Navotas	6,017
10	Parañaque	914
11	Pasay	4,200
12	Pasig	7,449
13	Pateros	1,869
14	Quezon City	10,367
15	San Juan	1,375
16	Taguig	3,672
17	Valenzuela	2,837
TOTAL		**60,130**

(Source: DPWH)

INFORMAL SETTLER FAMILIES (ISFs)
LIVING ALONG PRIORITY WATERWAYS IN METRO MANILA

	PRIORITY WATERWAY	NUMBER OF ISFs
1	San Juan River	4,217
2	Manggahan Floodway	2,997
3	Estero Tripa de Gallina	3,887
4	Maricaban Creek	1,637
5	Tullahan River	3,683
6	Pasig River	1,434
7	Estero de Maypajo	1,415
8	Estero de Sunog Apog	170
TOTAL		**19,440**

(Source: DPWH)

Under the UDHA Law, one of the conditions for the remedy of eviction or demolition is the provision for "adequate relocation, whether temporary or permanent." Thus, if flood control measures are to be fully and legally implemented along our affected esteros and waterways, then the government will have to undertake massive clearing operations, voluntary or otherwise, with accompanying relocation and resettlement programs, in accordance with Republic Act No. 7279.

The relocation and resettlement component of this flood management solution, anywhere in the Philippines, brings again to the fore the indispensable participation of the local government units. Contrary to conventional wisdom and popular notion, resettlement of displaced informal settlers is the obligation of the local government units, first and foremost, in coordination with other government agencies and offices, such as the National Housing Authority and others **(Housing and Urban Development**

Coordinating Council [HUDCC] Meeting, 13 January 2011). Section 29 of the UDHA Law provides:

> Sec. 29. Resettlement. — Within two (2) years from the effectivity of this Act, the local government units, in coordination with the National Housing Authority, shall implement the relocation and resettlement of persons living in danger areas such as **esteros**, railroad tracks, garbage dumps, **riverbanks**, **shorelines**, **waterways**, and in other public places as sidewalks, roads, parks, and playgrounds. The local government unit, in coordination with the National Housing Authority, shall provide relocation or resettlement sites with basic services and facilities and access to employment and livelihood opportunities sufficient to meet the basic needs of the affected families. **(Emphases supplied)**

More specifically, Section 39 states:

> Sec. 39. Role of Local Government Units. — The local government units shall be charged with the implementation of this Act in their respective localities, in coordination with the Housing and Urban Development Coordinating Council, the national housing agencies, the Presidential Commission for the Urban Poor, the private sector and other nongovernment organizations.
>
> They shall prepare a comprehensive land use plan for their respective localities in accordance with the provisions of this Act.

Therefore, to be effective and successful, the relocation and resettlement component of the clearing and eviction measures concomitant to the flood control projects in Metro Manila will require the combined efforts of the local government units, which shall identify suitable lands in their respective localities, and the key shelter agencies (Housing and Urban Development Coordinating Council, National Housing Authority, National Home Mortgage Finance Corporation, etc.), the Presidential Commission for the Urban Poor, the DPWH, the Metro Manila Development Authority, and private sector partners. Republic Act No. 7279 provides for mass housing options that can be undertaken for the resettlement program, such as community mortgage program, socialized housing program, and the like. The HUDCC is the primary agency that has the mandate to coordinate the efforts, and help strategize, as well as form and orchestrate the synergy between and among the program participants.

In regard to actual resettlement efforts of the government, the National Housing Authority reported in 2013 that it had prepared 4,000 "in-city" relocation housing units and "near-city" and "off-city" relocation sites in Rizal, Cavite, Bulacan and Laguna, for the informal settler families that had been evicted from areas near the pumping stations and from along the major waterways and esteros in Metro Manila. **(Press release of the National Housing Authority. "Metro ISFs Relocation Up". Taken from the National Housing Authority website: www.nha.gov.ph/news/articles/metro_isp_reloc_up.html [accessed on 16 June 2014])**

Role of the Laguna Lake Development Authority

It is important to include in this Report another equally important government agency that is involved in the flood control and management: the Laguna Lake Development Authority (LLDA).

Created in 1966 by virtue of Republic Act No. 4850, the LLDA has been mandated by law, "(t)o plan, program finance/or undertake infrastructure projects such as river, flood

and tidal control works, waste water and sewerage works, water supply, roads, portworks, irrigation, housing and related works, when so required within the context of its development plans and programs including the readjustment, relocation or settlement of population within the **region** as may be necessary and beneficial by the Authority x x x," among others. **(Section 4[f], R.A. No. 4850)**

Metro Manila is covered within the ambit of the regulatory mandate of the LLDA, as nine (9) of Metro Manila LGUs are part of the "region" within which LLDA exercises jurisdiction, namely, the cities of Taguig, Pasig, Pasay, Makati, Caloocan, Marikina, Muntinlupa, Manila, Quezon City, and Pateros. **(From the website of the Laguna Lake Development Authority [LLDA]. Website: http://www.llda.gov.ph/dox/factsandfigures/qff.jpg [accessed on 16 June 2014])**

Conclusions and Recommendations

In conclusion, the Committee concurs with the findings and observations of the Department of Public Works and Highways that the current flood problems of Metro Manila have been caused by rapid urbanization overtaking and outpacing the urban planning regulations and efforts by the government. Worse, changes both in the climate and in the weather have also exacerbated the problem, by exposing the weaknesses of, and putting additional strain in, our natural and man-made infrastructures.

The Committee hereby concludes that the resolution of the problems related to flooding in Metro Manila—and in other areas in the country for that matter—primarily rests on the shoulders of our Executive Branch, the special agency that is the Metro Manila Development Authority (MMDA), and the local governments themselves, which are not only on the field, but more importantly are adequately equipped with the technical know-how, the executive and implementing powers based on existing laws, and the necessary funding to physically address all the aspects of the problem falling within their respective mandates and territorial jurisdictions. Thus, it is plain to see that the resolution of the flood problems of Metro Manila concerns mostly executive measures, in the form of programs and projects from, and structural and non-structural interventions by, the offices under our Executive branch and the LGUs, within their respective mandates and areas. These interventions range from public works and infrastructures, to relocation and resettlement, local government coordination, to reforestation, flood forecasting and warning, river and water resource management, to disaster risk reduction and management, etc. All of these matters are already covered and addressed by existing laws, and are in fact already being handled by specific agencies and offices of the government, both national and local.

However, the Committee has also unraveled certain key policy issues and organizational concerns that are related, directly and indirectly, to the flood problem in Metro Manila—and elsewhere—and that would aptly need prompt and effective interventions from the Legislative Branch. Hence, the Committee most respectfully recommends the following measures by the Congress:

1) Hasten the modernization of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) by prioritizing the enactment of laws aiming to improve and upgrade its equipment and research and development on flood forecasting and warning systems, as well as its overall capacity, and likewise improve the competitiveness, productivity and personnel stability in the agency by ameliorating the economic conditions of its employees, scientists, experts and technical personnel.

2) Harmonize the national policy on the use of our land resources and strengthen its enforcement and implementation, without however unduly compromising existing private ownership, as well as the principles of fairness, reasonableness and equity. In this connection, LGUs should be trained and guided in carefully and judiciously crafting their comprehensive land use plans. The country's central and primary land use regulatory office, i.e., the Housing and Land Use Regulatory Board (HLURB), should be strengthened and made more relevant in order to keep apace with the demands of a strengthened national land use policy requirements.

3) The resettlement and relocation programs and initiatives of the government should strictly be in accordance with Republic Act No. 7279, as to ensure a genuine resolution of the concomitant problem of evictions and homelessness that would accompany the structural interventions required by the flood management plan. In this connection, Congress should hasten the creation of the Department of Housing and Urban Development (DHUD) in order to maximize and better coordinate the numerous functions and services offered by key shelter agencies and the private sector.

4) Heightened LGU participation and stronger coordination between the national and local governments—the over-all resolution of the flood problem being their joint responsibility—in order to achieve the objectives of existing legislation. In this connection, there is a need for Congress to increase the Internal Revenue Allotment (IRA) shares of the LGUs, and to legislate the automatic appropriation, and direct and timely remittance to them of their respective shares. Armed and ready with the additional and necessary source of funding, LGUs—from provinces down to the barangays—would be able to more adequately and efficiently finance and pursue its local and community-based flood risk-mapping and planning and implement its flood management projects.

5) Legislative creation of a national agency that shall focus on expert management of the country's river basins and watersheds, which perhaps may be done through expansion of the present office and the organizational structure of the River Basin Control Office of the Department of Environment and Natural Resources. The necessary organizational linkages with other government agencies, such as the DPWH, the LLDA, MMDA, and others, and the LGUs, as well as the harmonization of functions and avoidance of the overlapping thereof, should be carefully studied and mapped out as to ensure a tight and effective operation and coordination of the Office.

6) In order to ensure that the planned projects on flood management are harmonized with the national policies on integrated water resource management, the appropriate Committee may undertake a separate study and evaluation of the operation of Presidential Decree No. 1067, or the Water Code of the Philippines, as well as the roles of the Laguna Lake Development Authority, to properly assess the ramifications thereof and reshape and readjust, and ultimately strengthen, the expressed policy objectives.

7) Having proven its effectiveness in addressing the common and interlocking problems on flood management of the LGUs under Metro Manila, the Metro Manila Development Authority (MMDA) may be considered by Congress as a worthy template for the future creation of other metropolitan development authorities in the country, by legislative enactment. Congress may also consider further strengthening the Metro Manila Development Authority (MMDA) through amendment of its charter, i.e., Republic Act No. 7924.

8) Review and revision of our National Building Code (Presidential Decree No. 1096), which has been enacted way back in 1977, in order to elevate and

upgrade our standards and capacities with regard to building and infrastructure safety and resiliency, on the consumer side. It would also help if our building standards would incorporate "green building" measures to reverse and arrest our otherwise wasteful and imprudent building practices and ultimately contribute to resource conservation and environmental sustainability.

9) In any case, legislation and executive action should respect and follow our international commitments on the matter of environment sustainability, i.e., United Nations Environment Programme's (UNEP) "Agenda 21", which tackles integrated water resources management, among others.

Respectfully submitted.

Table of Contents

Annexes

A – DPWH Flood Management Master Plan for Metro Manila and Surrounding Areas

B – PAGASA Flood Forecasting and Early Warning System

C - DILG List of LGUs Covered by 18 Major River Basins

D - DENR-RBCO – Critical Watersheds

E - MMDA Flood Control and Sewerage Management Office – List of Flood Control Project 2012

F - MMDA Flood Control and Sewerage Management Office – List of Flood Control Project 2013

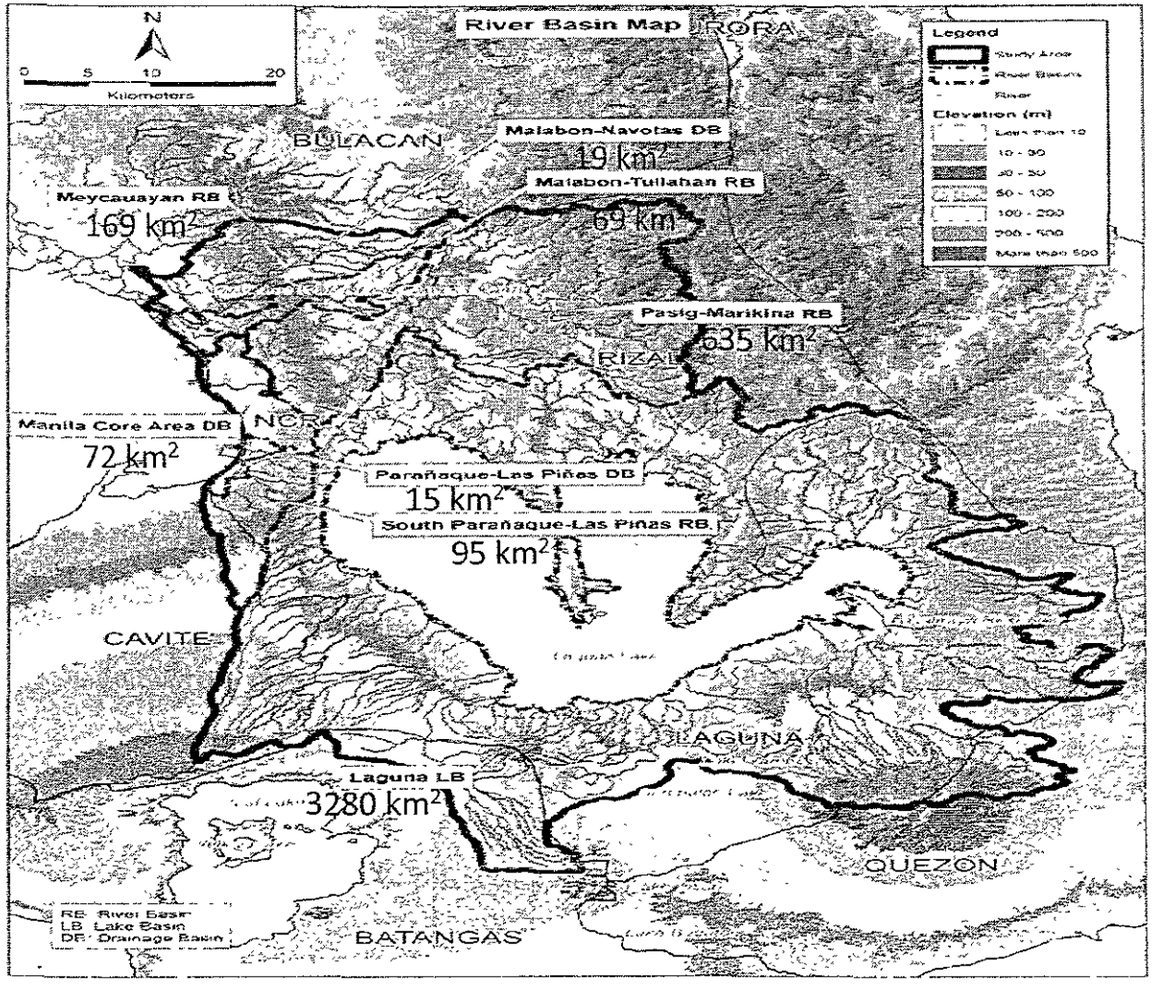
G - MMDA Flood Control and Sewerage Management Office – List of Flood Control Project 2014

Republic of the Philippines
Department of Public Works and Highways
Manila

FLOOD MANAGEMENT MASTER PLAN FOR METRO MANILA AND SURROUNDING AREAS

- September 2013 -

FLOOD MANAGEMENT MASTER PLAN FOR METRO MANILA AND SURROUNDING AREAS

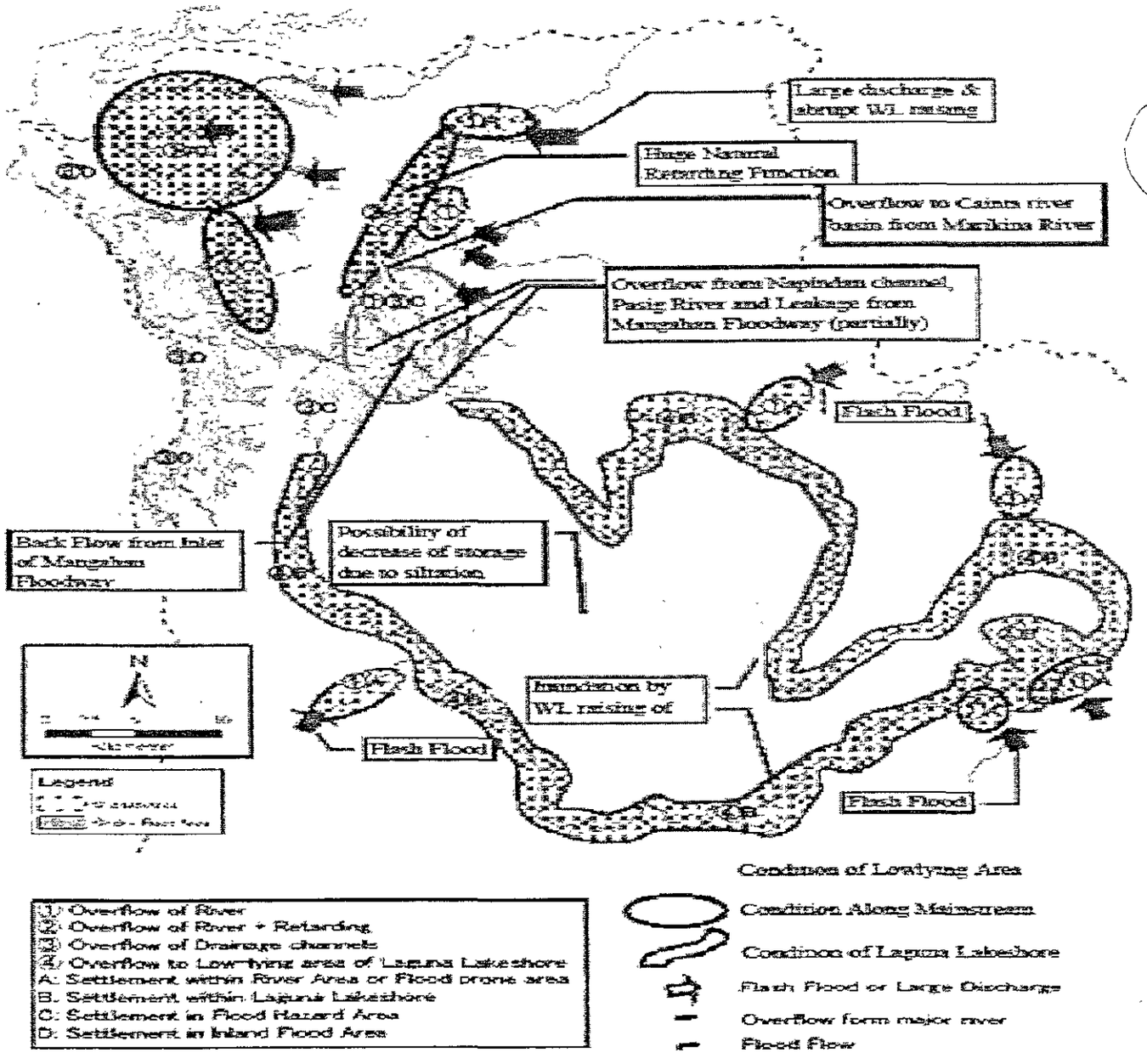


Boundary of Study Area and the River Basins

Based on river basins:

Pasig-Marikina River Basin and Laguna Lake Basin.

- Total area: 4,354 km²
- Total Population: 17.1 M



Source: Study Team

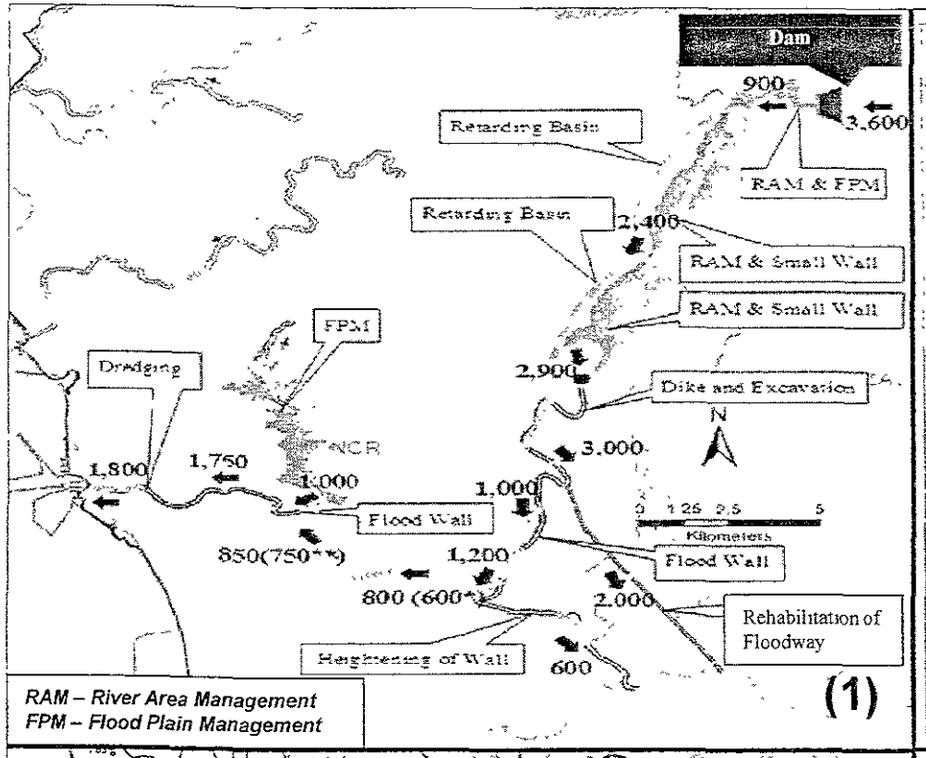
Figure 3.2.1 Mechanism of Flood Occurrence

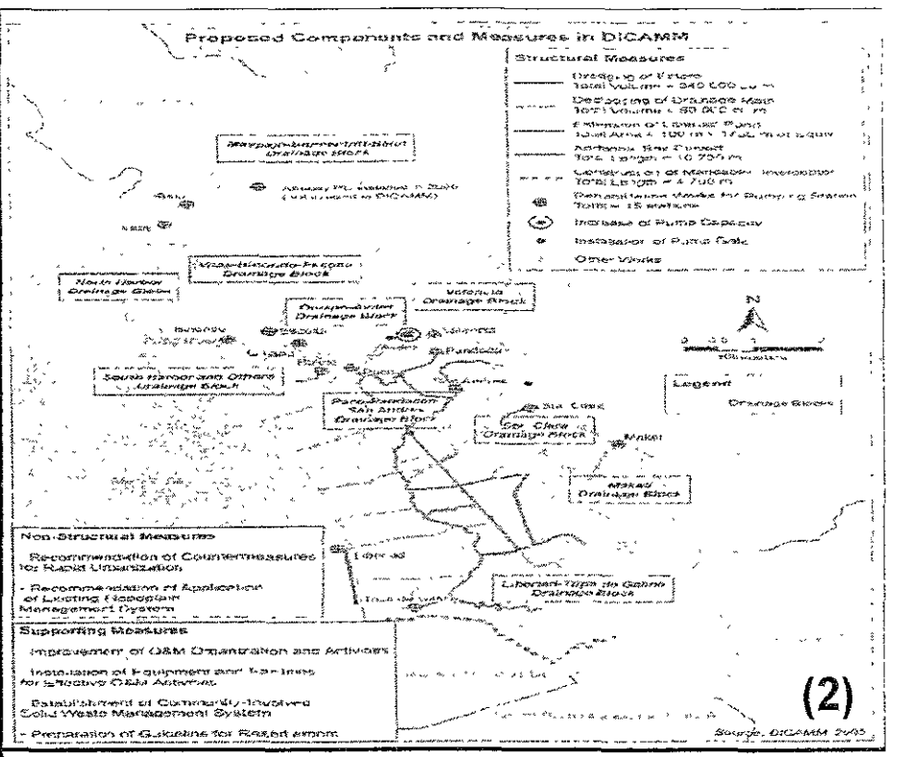
Three Major Flooding Occurrence:

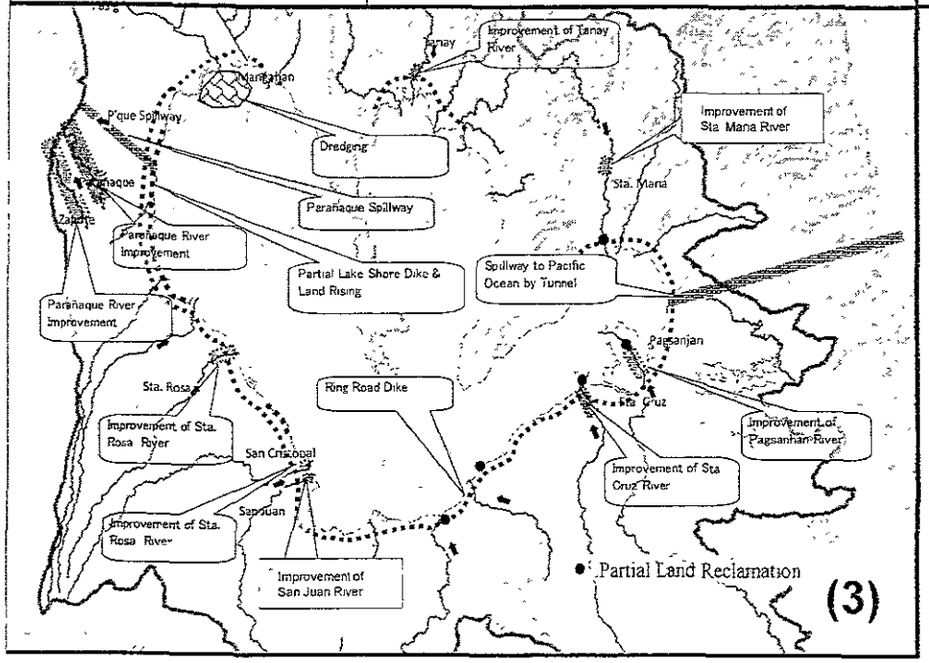
(1) Huge volume of water coming from Sierra Madre

(2) Drainage capacity constraints in core area of Metro Manila

(3) Low lying communities around Manila Bay & Laguna Lake







Long-Term Solution:

(1) Dam, Retarding Basin & River Improvements

(2) Rehabilitation of Pumping Stations & Drainage Channel & Additional Drainage Mains/Box Culverts

(3) Road Dike, Lakeshore Land Raising, Dredging Works and River Improvements

Proposed Structural Measures (Long-Term Solution)

Name of Project	Est. Cost (P'B)
1. Pasig-Marikina River Improvement and Dam Construction	198.435 B
2. Meycauayan River Improvement	14.040 B
3. Malabon-Tullahan River Improvement	21.635 B
4. South Parañaque-Las Piñas River Improvement	17.335 B
5. East Mangahan Floodway (Cainta & Taytay River Improvement)	25.901 B
6. West Laguna Lakeshore Land Raising	25.185 B
7. Land Raising for Small Cities around Laguna Lakeshore	7.158 B
8. Improvement of the Inflow Rivers to Laguna Lake	0.637 B
9. Manila Core Area Drainage Improvement	27.257 B
10. West Mangahan Area Drainage Improvement	5.522 B
11. Valenzuela-Obando-Meycauayan (VOM) Improvement (to be studied further)	8.613 B
Total:	**P 351.718 B**

Proposed Non-Structural Measures

1. **Strengthening of the Flood Information and Warning System (FIWS)**
   - Effective Flood Control Operation and Warning System (EFCOS) improvement
   - New telemetric rainfall and water level gauging stations
2. **Capacity Building for Strengthening Community-based FRM**
   - Update and implement Information and Education Campaign (IEC) programs
   - Rainfall and water level monitoring by Barangay Disaster Risk Reduction and Management Councils (BDRRMCs)
   - Construction of evacuation routes and temporary evacuation centers
3. **Improvement of Management Information System (MIS) for Disaster Risk Management**
   - Improvement and development of MIS
   - Capacity building
4. **Reforestation and Watershed Management**

P 5 Billion Priority High-Impact Flood Control Projects (Short-Term Solution)

NAME OF PROJECT	ORIGINAL COST	REVISED COST	RELEASED AMOUNT
National Capital Region (NCR):			
1. Valenzuela-Obando-Meycauayan (VOM) Project	820.0 M	1,531.025 M	1,531.025 M
2. KAMANAVA Project, Phase I (Kalookan-Malabon-Navotas Area)	700.0 M	600.0 M	600.0 M
3. Manila Bay Seawall Project	700.6 M	211.052 M	211.052 M
4. Upper Marikina River Improvement Project (Nangka River)	222.5 M	222.5 M	222.5 M
5. Marikina River Dredging	50.0 M	50.0 M	50.0 M
6. Mangahan Floodway Dredging	100.0 M	100.0 M	100.0 M
7. West Side of Mangahan Floodway Project	250.0 M	-	-
8. East Side of Mangahan Floodway Project	190.0 M	190.0 M	190.0 M
9. Additional Projects	50.9 M	119.923 M	119.923 M
Region III:			
1. Dredging of Labangan Channel, Hagonoy, Bulacan	100.0 M	100.0 M	100.0 M
2. San Fernando-Sto. Tomas-Minalin Tail Dike	139.0 M	139.0 M	139.0 M
3. Mitigation Measures for Breaches in the San Fernando-Sto. Tomas-Minalin Tail Dike	637.0 M	637.0 M	637.0 M
4. Del Carmen-Balimbing Creek, City of San Fernando, Pampanga	30.0 M	30.0 M	30.0 M
5. Orani Channel, Bataan	50.0 M	50.0 M	50.0 M
Region IV-A:			
1. Sta. Cruz-San Pedro-Biñan Rivers (CP I)	380.0 M	380.0 M	380.0 M
2. Sta. Maria-Mabitac River (CP II)	400.0 M	400.0 M	400.0 M
Nationwide:			
1. Various Dredging Equipment	136.5 M	136.5 M	136.5 M
2. Operation and Maintenance of Dredging Equipment for Pasac-Delta Waterway, Guagua and Sasmuan, Pampanga	43.5 M	43.5 M	43.5 M
Consulting Services:			
1. Consulting Services for Various Proposed Projects	-	59.5 M	59.5 M
GRAND TOTAL:	**5,000.0 M**	**5,000.0 M**	**5,000.0 M**

Priority Project Implementation Schedule

No.	Item	WB-Master Plan					Updated Priority	TIME SCHEDULE OF IMPLEMENTATION	Remarks
		Total Cost (Mil Peso)	EIRR	PAP (1000 person)	Benefitted Pop (1000 person)	Priority		0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	
0	PMRCP IV					I	I		Under JICA
1	Natural Retarding Basin, Upper Marikina	198,433	16.40%	331	1,550	I	I		Mainly Zoning and Land Use
	Marikina Dam						I		Multipurpose Development
2	Meycauayan RI	14,020	22.90%	35	156	II	II		Accesss the implementation
3	Malabon-Tullahan R	21,635	22.30%	34	295	II	II		Advance the implementation
4	South Parañaque - Las Piñas RI	17,305	18.80%	50	104	II	II		Including Update of FS (JETRO)
5	East Mangahan Floodway (Cainta & Taytay Rlet)	25,501	26.80%	25	227	I	I		Stage 1 Floodgates & P S Stage 2 RI
6	West Laguna Lakeshore Land Raising	25,195	17.20%	114	114	I	III		Need to examine alternative plan Lakeshore Ring Dike
7	Land Raising for Small Cities around Laguna Lake Shore	7,156	17.20%	6.6	6.6	III	III		
8	Improvement of the Inflow Rivers to Laguna Lake	637	N.A.	N.A.	N.A.	III	III		After flood control and drainage improvement in Laguna Lakeshore Areas
9	Manila Core Area Drainage Improvement	27,257	19.10%	24	210	II	I		Updating FS (2005) to upgrade the Drainage System
10	West Mangahan Area Drainage Improvement	5,522	11.30%	3.2	25.6	III	II		Additional P S
11	VDM Drainage Improvement	8,613 (Est. cost)				II	I		On-going under ODF
	TOTAL	351,718							

*Projected Priority and Implementation Period in Master Plan of Flood Management in Metro Manila & Surrounding

Priority I : 2011-2020

Priority II : 2011-2025

Priority III : 2025-2035

Legend

: Feasibility Study or Update of Feasibility Study

: Detailed Design

: CONSTRUCTION

Note: Priority of the project is updated based on recent development of flood control project.

End of Presentation

PROJECT BRIEFER

FLOOD MANAGEMENT MASTER PLAN FOR METRO MANILA AND SURROUNDING AREAS

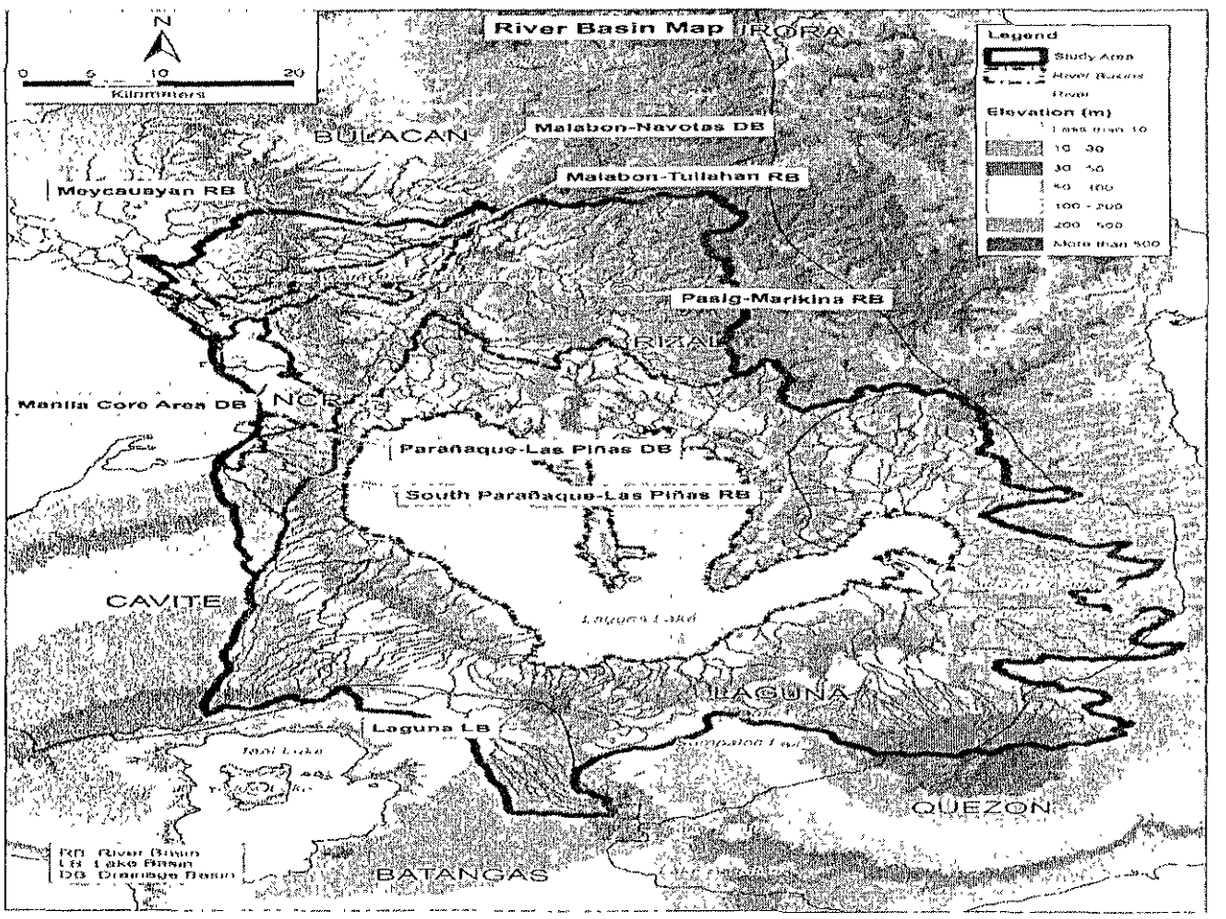
(As of September 15, 2013)

OBJECTIVE:

After the flood events of Ondoy and Pepeng in September and October 2009, respectively that caused severe damages in Metro Manila and Surrounding Areas, the World Bank has provided a Technical Grant in the amount of $1.5 Million under the Global Facility for Disaster Reduction and Recovery Trust Fund of the Australian Agency for International Development (AusAID).

A flood risk assessment study for the entire Metro Manila and Surrounding Basin Area was undertaken from February 2011 to February 2012, to prepare a comprehensive flood risk management plan for the same and to determine a set of priority structural measures, which will still undergo individual feasibility studies and detailed design prior to implementation, including non-structural measures that will provide sustainable flood management up to a designated safety level and serve as the roadmap/vision of the Government until 2035 (23 years from now).

BOUNDARY OF STUDY AREA AND THE RIVER BASINS:



The Study Area covers the entire Metro Manila and Surrounding Areas, particularly, provinces of Rizal, Laguna and parts of Bulacan with a total area of 4,354 sq. km. or 435,400 hectares, which is 7 times the size of Metro Manila and 2/3 that of Singapore.

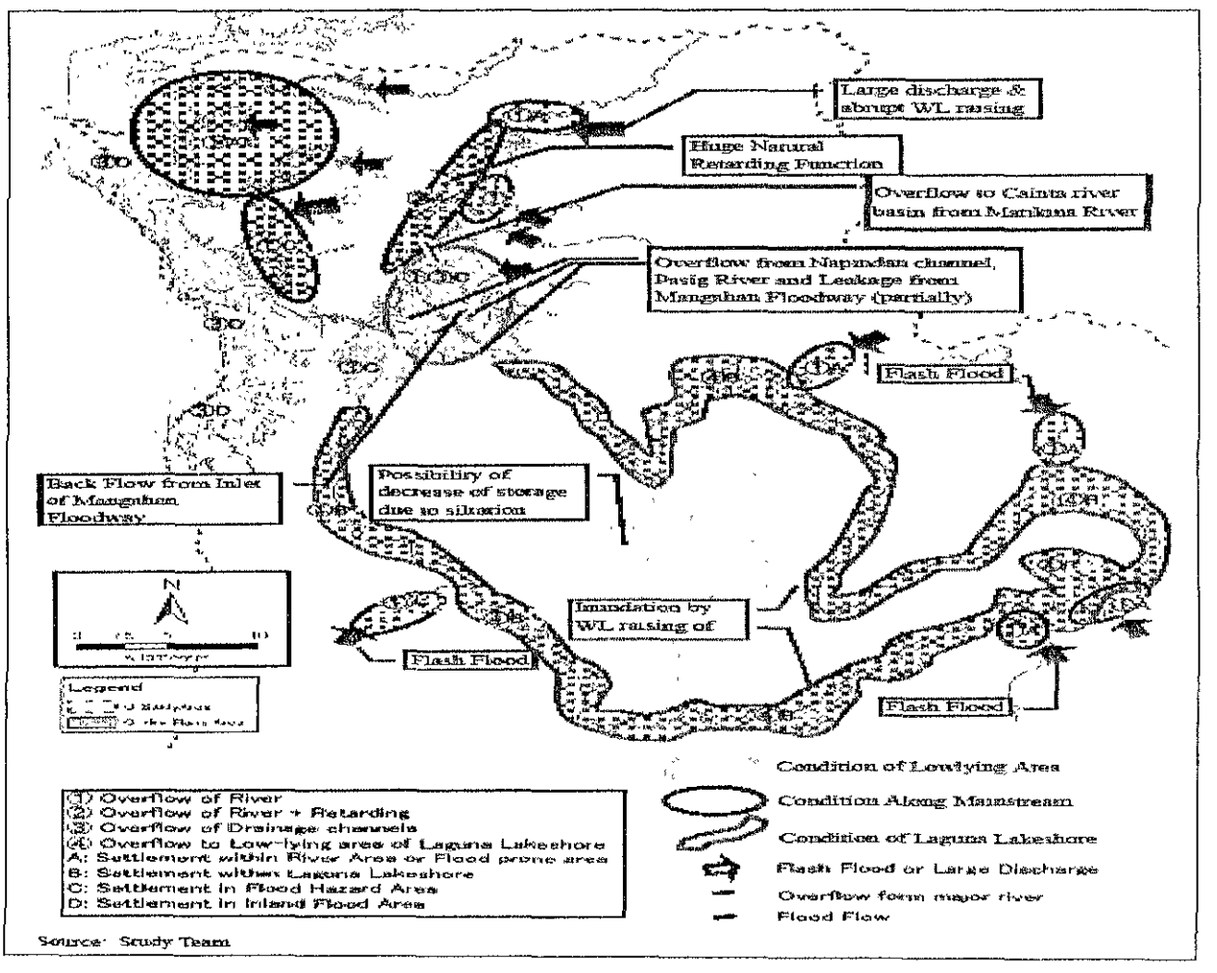
It also encompasses the Pasig-Marikina River Basin, Malabon-Tullahan, Meycauayan, South Parañaque-Las Piñas and Laguna Lake Basins, including drainage basins. Administration Areas in and around the Study Area include sixteen (16) cities and one (1) municipality in the National Capital Region (NCR), sixty three (63) cities/municipalities in the CALABARZON Area and eight (8) cities/municipalities in Bulacan with a population of 20,433,722 in and around the Study Area and estimated population of 17,147,658 in the Study Area.

GUIDING PRINCIPLES FOR MASTER PLAN DEVELOPMENT:

1. Adopt Integrated Water Resources Management Principles and River Basin Approach
2. Develop safe society with resiliency to floods through:
    a. Structural measures for the river basins and waterways
    b. Structural measures for Laguna Lakeshore, and
    c. Improvement of urban drainage system
3. Improvement of the Flood Information and Warning System (FIWS)
4. Establish integrated and consistent Flood Risk Management (FRM) institutional system
5. Strengthen community-based flood risk management – Land Use and Solid Waste
6. Utilization of runoff waters as water resources, etc.
7. Reforestation and watershed management

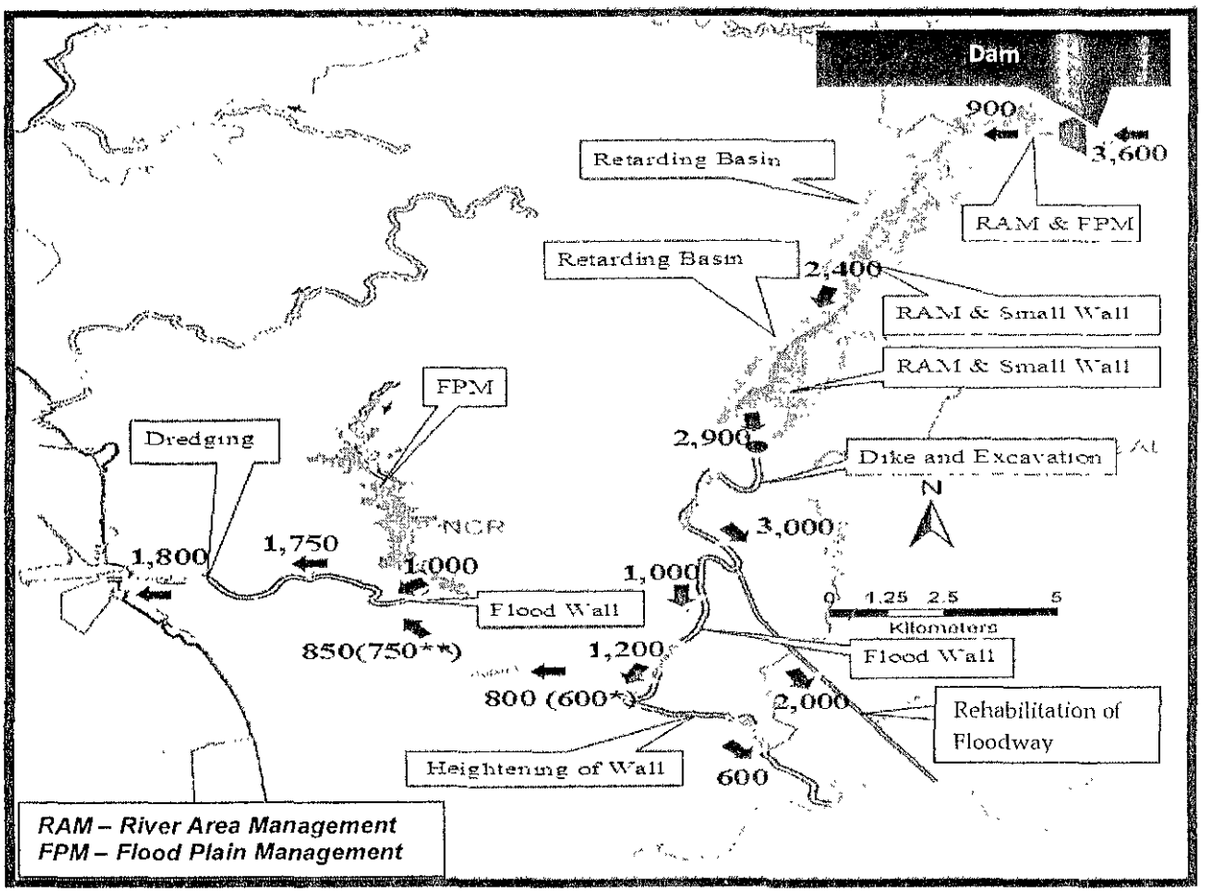
THREE MAJOR FLOODING OCCURENCES:

1. Huge volume of water coming from Sierra Madre
2. Drainage capacity constraints in core area of Metro Manila
3. Low-lying communities around Manila Bay & Laguna Lake



Source: Study Team

RECOMMENDATIONS:

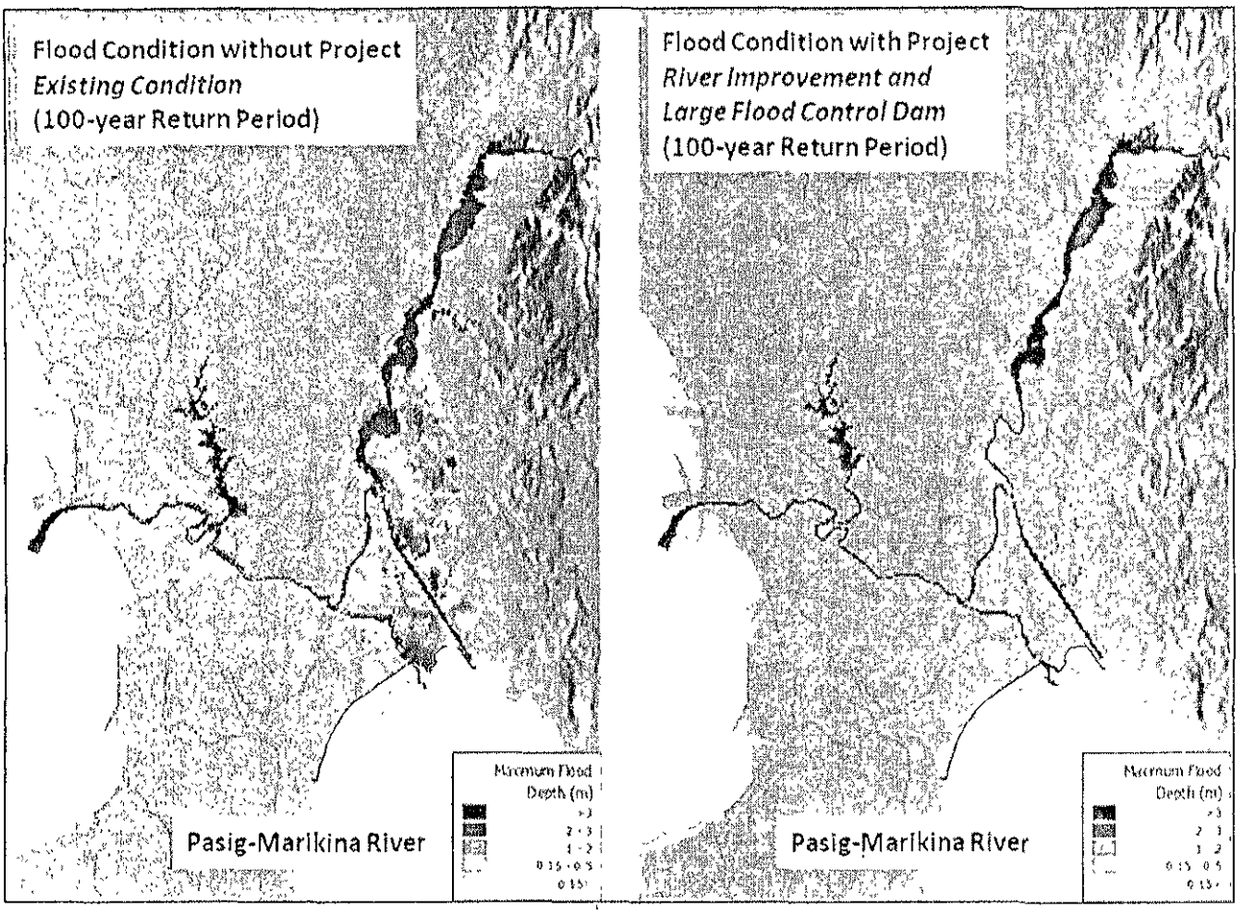


The diagram showed the Master Plan's optimum recommendations for structural measures in combination with non-structural measures for the Pasig-Marikina River Basin and Adjacent Areas In order to reduce the peak discharge of inflow equivalent to 3,600 m3/s under a 100-year return period from flowing downstream, a dam is proposed to be constructed in the upstream portion of Upper-Upper Marikina River in Rodriguez, Rizal (Montalban) so that only 900 m3/s discharge of outflow will go down. To further reduce the peak discharge of 900 m3/s from flowing down the Upper-Upper Marikina River, the area between the Tumana Bridge and the San Mateo Bridge, and the area upstream of the San Mateo Bridge, with a combined total length of 4.0 km and maximum width of 1.5 km will be utilized as a natural retarding basin by constructing small dikes beside natural levees alongside river area management and flood plain management.

In addition to the above, river improvements such as a combination of dike/river wall construction and excavation, dredging/excavation only, or river wall construction only will be carried out at different locations, as applicable, along the Pasig and Marikina Rivers and adjacent areas including river area management and flood plain management when needed, to ensure that the target safety level for mitigation measures will be achieved.

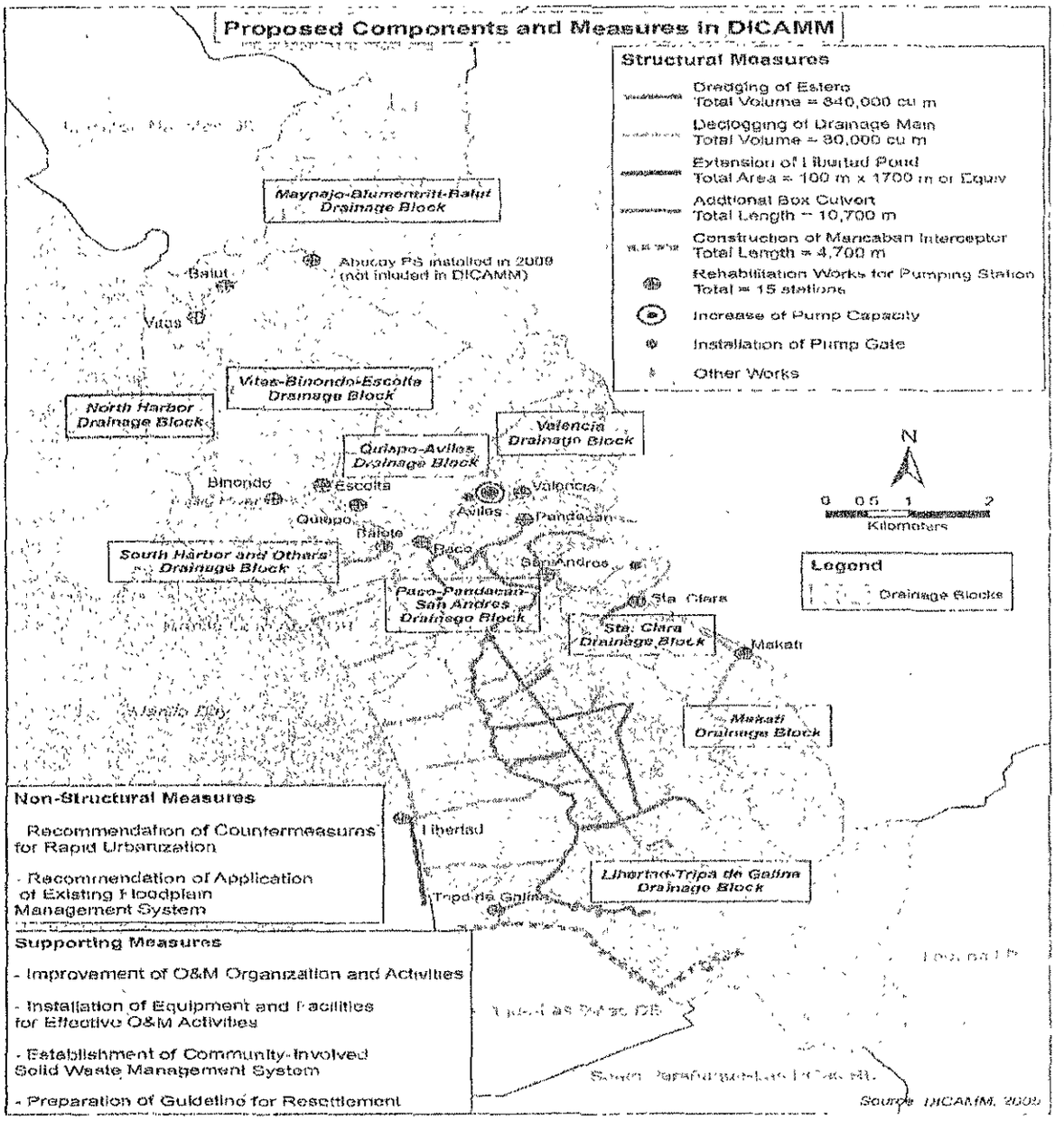
For the other river basins, except Laguna Lake Basin, river improvements combined with river area management and flood plain management were recommended to ensure that the target safety level for mitigation measures for each will be achieved.

PROJECT IMPACT:



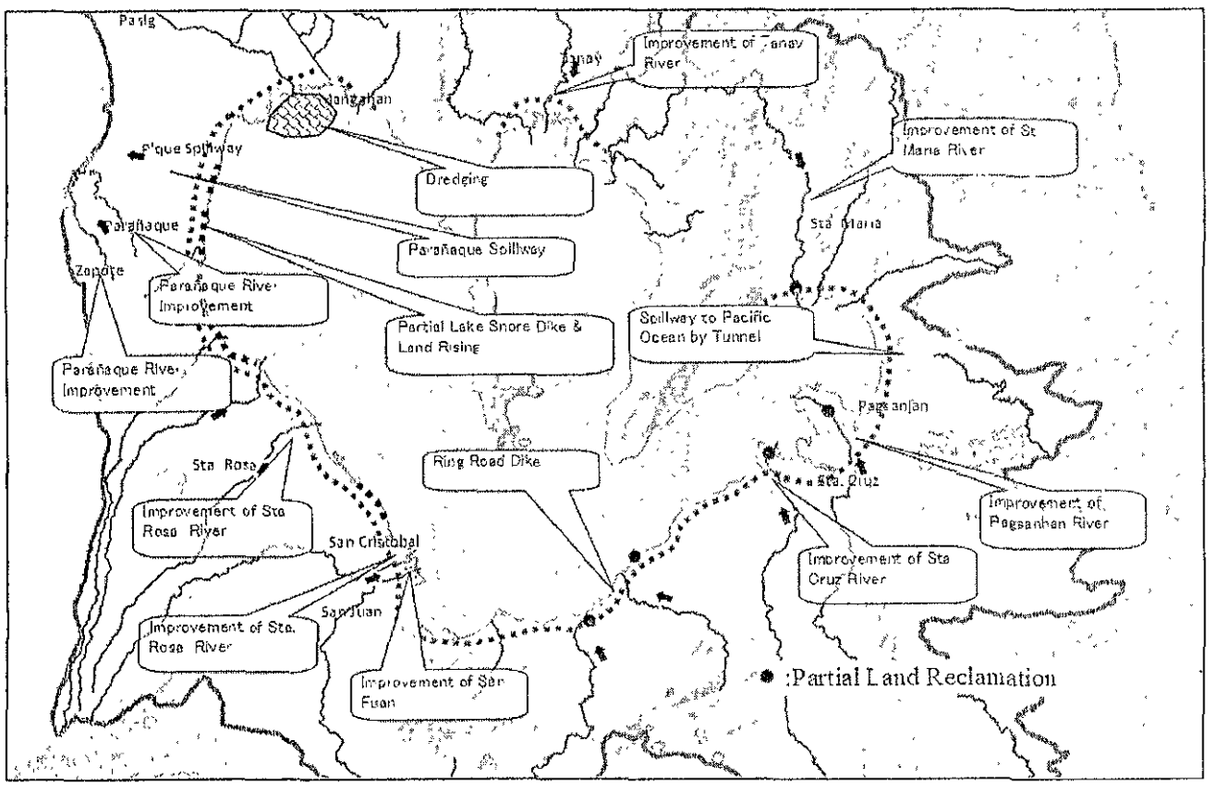
An estimated 1.6 Million people will directly benefit from the mitigating structural measures for the Pasig-Marikina River Basin and adjacent areas and around P43 Billion will be saved from direct damages due to floods.

PROPOSED COMPONENTS AND MEASURES UNDER THE DRAINAGE IMPROVEMENT IN THE CORE AREA OF METROPOLITAN MANILA (DICAMM):



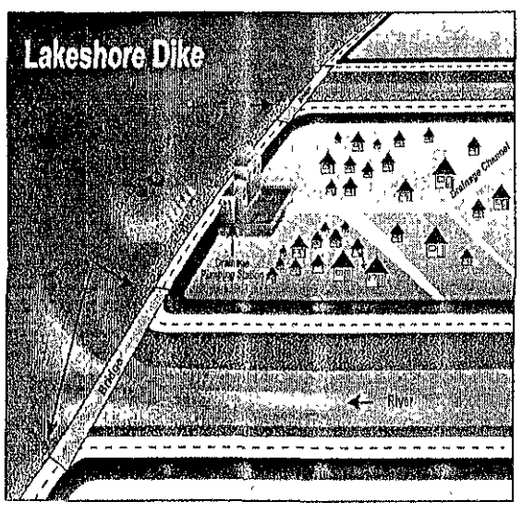
1. Rehabilitation of 15 Major Pumping Stations
2. Rehabilitation of Drainage Channel
    a. Removal of Obstructions within drainage channels with settlements
    b. Dredging and Declogging
    c. Rehabilitation of Drainage Mains
3. Additional Drainage Mains/Box Culverts

LAGUNA LAKESHORE:

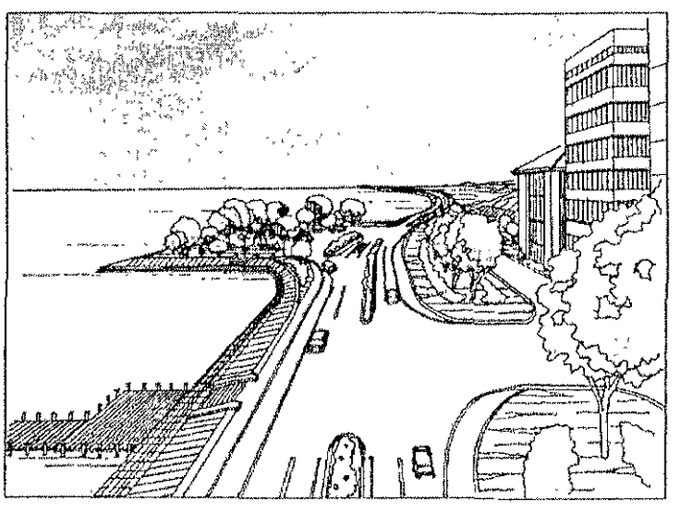


The following are the optimum solution in solving the flooding situation in the Laguna Lakeshore area:

1. Putting up a road dike around the lake with pumping stations
2. Lakeshore land raising with road and future developments
3. Construction of a spillway that will cut through the heavily built-up Parañaque City and another one that will go through the Pacific Ocean
4. Dredging works
5. River improvements for the selected inflow rivers of the lake



Lakeshore Dike with Road



Raising Lakeshore Land with Road and Future Developments

STRUCTURAL MITIGATION MEASURES:

There are eleven (11) recommended short-listed structural mitigation measures under the "Flood Management Master Plan for Metro Manila and Surrounding Areas" that will serve as the roadmap of the Government, which is envisioned to be implemented from today until 2035 (23 years).

These projects were prioritized according to: 1) severity of floods based on flood risk, flood area, duration of floods and flood damage, 2) technical viability, 3) social and environmental viability in preliminary level, and 4) aerial distribution of putting priority for the flood mitigation measures for the rivers and Laguna Lake.

Hereunder are the 11 long-term projects with an estimated cost of around P351.72 Billion but is still subject to validation of individual projects via comprehensive feasibility study and detailed design that can either be financed using GOP funds or requested under ODA assistance

Name of Project	Est. Cost (P'B)
1. Pasig-Marikina River Improvement and Dam Construction	198.435 B
2. Meycauayan River Improvement	14.040 B
3. Malabon-Tullahan River Improvement	21.635 B
4. South Parañaque-Las Piñas River Improvement	17.335 B
5. East Mangahan Floodway (Cainta & Taytay River Improvement)	25.901 B
6. West Laguna Lakeshore Land Raising	25.185 B
7. Land Raising for Small Cities around Laguna Lakeshore	7.158 B
8. Improvement of the Inflow Rivers to Laguna Lake	0.637 B
9. Manila Core Area Drainage Improvement	27.257 B
10. West Mangahan Area Drainage Improvement	5.522 B
11. Valenzuela-Obando-Meycauayan (VOM) Improvement (to be studied further)	8.613 B
Total:	**P 351.718 B**

Each of the above projects is independent, but they form integral measures for mitigating floods in Metro Manila and Surrounding areas. Hence, considering the need for immediate interventions to ease the flooding problems in these areas, several high-impact flood control projects amounting to P5 Billion were identified for immediate implementation, to wit:

Name of Project	Orig. Cost	Rev. Cost	Rel. Amt	SARO No.
National Capital Region (NCR):				
1 Valenzuela-Obando-Meycauayan (VOM) Project	820.0 M	1,531.025 M	1,531.025 M	A-12-01110 dated 11/22/12 A-12-01111 dated 11/22/12 A-12-01112 dated 11/22/12 A-13-00684 dated 03/14/13 A-13-01191 dated 08/02/13

- ✓ Conduct trainings for social preparation of host communities and those who will be relocated to reduce conflict

23. Disaster and climate change resilient infrastructure constructed/reconstructed

Long term recovery ensures that the rehabilitation or reconstruction of infrastructures is disaster and climate-proof.

Key activities

- ✓ Undertake the necessary rehabilitation or repair of damaged infrastructure
- ✓ Implement the building code and promote green technology
- ✓ Conduct monitoring and/or tracking of approval of infrastructure projects and permits

24. An psychologically sound, safe and secured citizenry that is protected from the effects of disasters are able to restore to normal functioning after each disaster

Disasters are devastating and usually leave a trail of human agoniesincluding loss of human life, livestock, property, and livelihood loss, physicalinjuries and damages to development works. Along with relief, rehabilitationand care of physical health and injuries, psychosocial and mental healthissues are also important and they need to be addressed.Emergencies also create a wide range of problems experienced at the individual, family,community and societal levels.

Key activities

- ✓ Develop systems for appropriate risk protection measures
- ✓ Conduct of post-disaster/conflict needs analyses with affected communities
- ✓ Develop systems of support and communication among key stakeholders
- ✓ Build capacities of psychosocial care providers

Priority Projects

The following are the priority and/or flagship projects of the NDRRMP. These are pilot projects and demonstrate sites which aim to either replicate of good DRRM practices or implement projects in areas which need them most. All priority projects are to be implemented within the immediate or short term period or between 2011 to 2013.

In identifying the priority project should be doable; fundable; high impact; interconnected and interdependent; and sustainable

- Development of the following plans:
  - ✓ Joint workplan for DRRM and CCA
  - ✓ Local DRRM plans
  - ✓ National Disaster Response Plan (to include a systm for Search, Rescue and Retrieval SRR; scenario-based preparedness and response plans)
  - ✓ Risk financing
- Development of understandable and consistent IEC and advocacy materials on RA 10121, DRRM and CCA
- Development of guidelines on
  - ✓ Communications and information protocol before, during and after disasters
  - ✓ Creation of DRRM teams
  - ✓ Criteria/standards for local flood early warning systems
  - ✓ Evacuation
  - ✓ Infrastructue redesign and/or modifications
  - ✓ Manual of operations of disaster operations centers

- Development of tools on
  - ✓ DRRM and CCA *mainstreaming* in the national and local-level planning
  - ✓ DANA and Post-DANA
  - ✓ Psychosocial concerns
- Establishment of
  - ✓ DRRM Training Institutes
  - ✓ End-to-End local flood early warning systemsthroughintegrated and sustainable management river basins and water sheds in areas like Bulacan, Leyte, Albay, Surigao del Norte, Surigao del Sur, Agusan del Norte, Butuan City, Cagayan de Oro, Iligan city
- *Establishment of local DRRM Councils and Offices and theri operations centers, as prescribed by* RA 10121
- Conduct inventory of existing DRRM and CCA resources and services
- Development and implementation of DRRM and CCA activities using the 5% of government agency's GAA;
- Hazard and risk mapping in the most high-risk areas in the country (i.e., Community-based DRRM and CCA risk mapping in the municipalities of Kitcharao and Santiago, Agusan del Norte and Butuan City)
- Institutional capability program on DRRM and CCA for decision makers, local chief executives, public sector employees, and key stakeholders
- Mainstreaming DRRM and CCA (i.e., Esperenza Municipality in Agusan del Sur in CARAGA and in San Francisco Municipality in Camotes Island)
- PDNA capacity building for national government agencies, regional line agencies, and local offices.
- Review, amend and/or revise the following
  - ✓ Building Code and integrate DRRM and CCA
  - ✓ Executive Order no. 72 s. 1993, which provides for the preparation and implementation of the CLUPs of local government units
  - ✓ Implementing Rules and Regulations of RA 10121
  - ✓ *Various environmental policies (i.e., EO 26, etc) to integrate DRRM and CCA*

Cross-Cutting Concerns

The NDRRMP recognizes that certain concerns cut across the 4 DRRM priority areas. These include health, human-induced disasters, gender mainstreaming, environmental protection, cultural sensitivity or indigenous practices, and the rights based approach. They are a combination of issues and approaches that should be taken into consideration in each of the priority areas.

Health

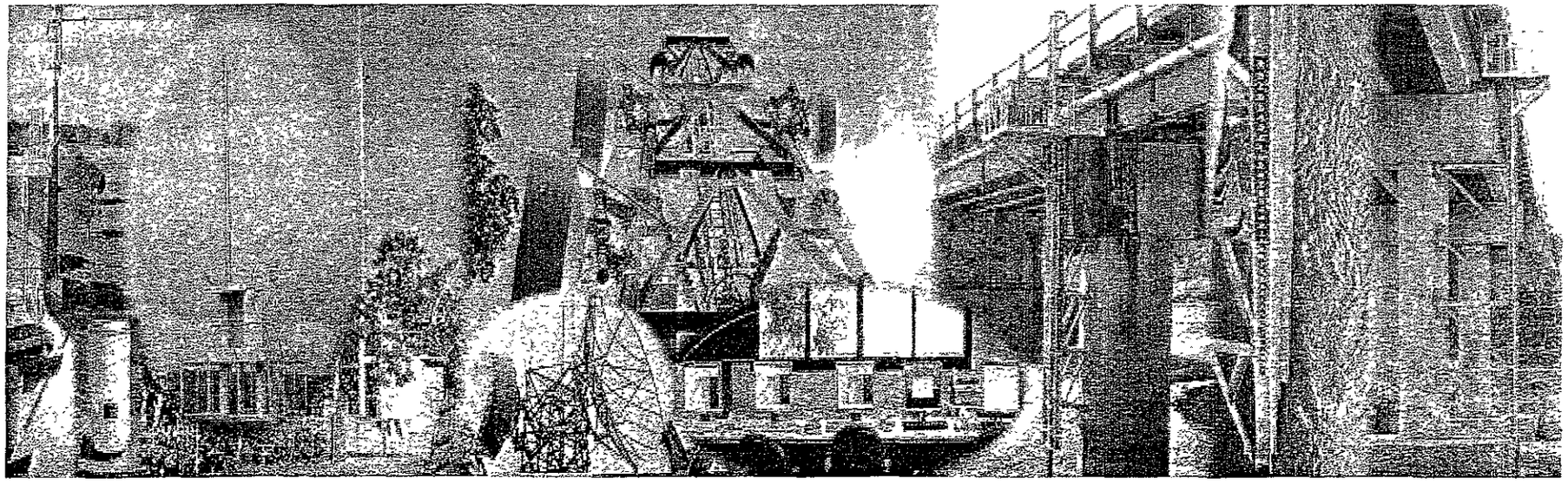
People's vulnerability to disaster has become more complex with the onset of Climate Change. Single hazard events such as floods and heat waves can overlap resulting in a broad range of impact scenarios. Minor disturbances in the environment surrounding the ecosystem can have far reaching consequences on the exposure of humans to health-related hazards like avian influenza (which is related to the changes in habitate of migratory birds); malaria and dengue (which increases mosquito abundance in areas experiencing warmer and damper temperatures respectively). Likewise, rising sea-level and increasing flooding events disproportionately affect the poor through sanitation of their water sources. It is thus important to look at these concerns in each of the priority areas under the NDRRMP.

Human-induced disasters

In the Philippines, people are vulnerable not only because of natural hazards but also due to disasters more commonly associated with armed conflict, terrorism and war. In the entire NDRRMP,

Department of Science and Technology
Philippine Atmospheric, Geophysical and Astronomical Services Administration

PAGASA'S FLOOD FORECASTING AND EARLY WARNING SYSTEM



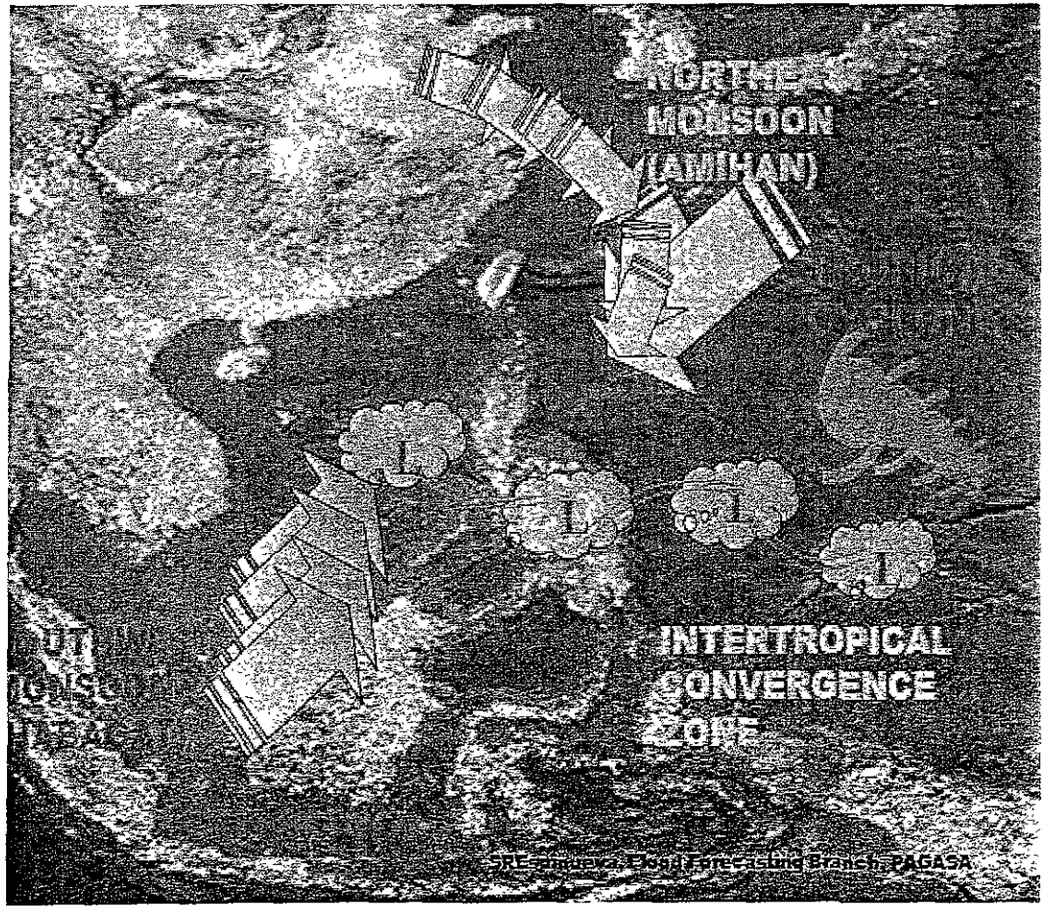
Flood Forecasting and Warning Section
Hydrometeorology Division, PAGASA-DOST

OUTLINE OF PRESENTATION

- *Why is the Philippines prone to flooding?*
- *Flood Early warning systems (FEWS) in the Philippines*

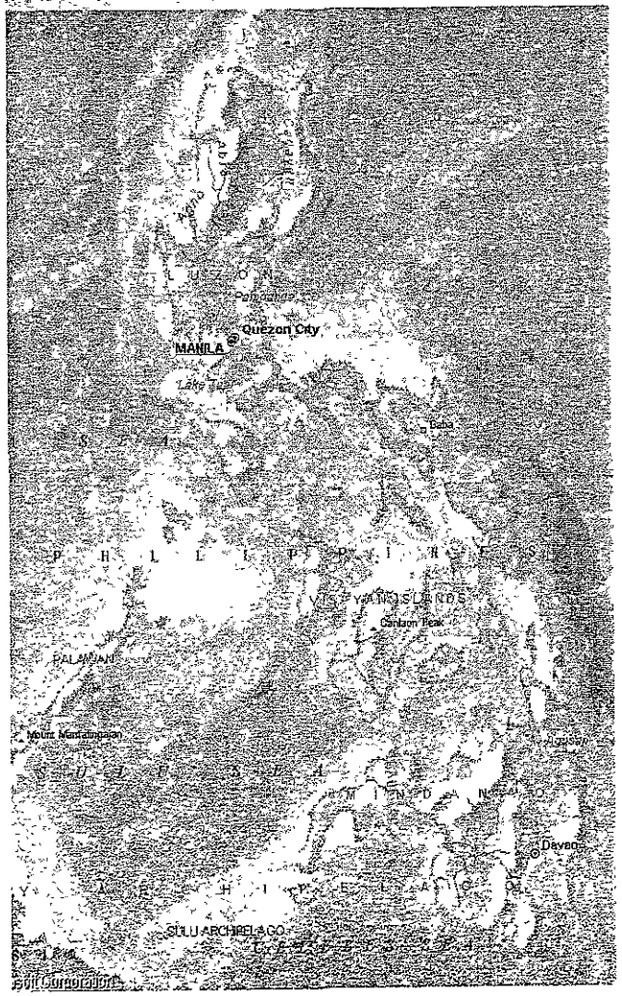
WHY IS THE PHILIPPINES PRONE TO FLOODING?

ıe climate of the PH is influenced by the complex interactions of ırious factors such as :

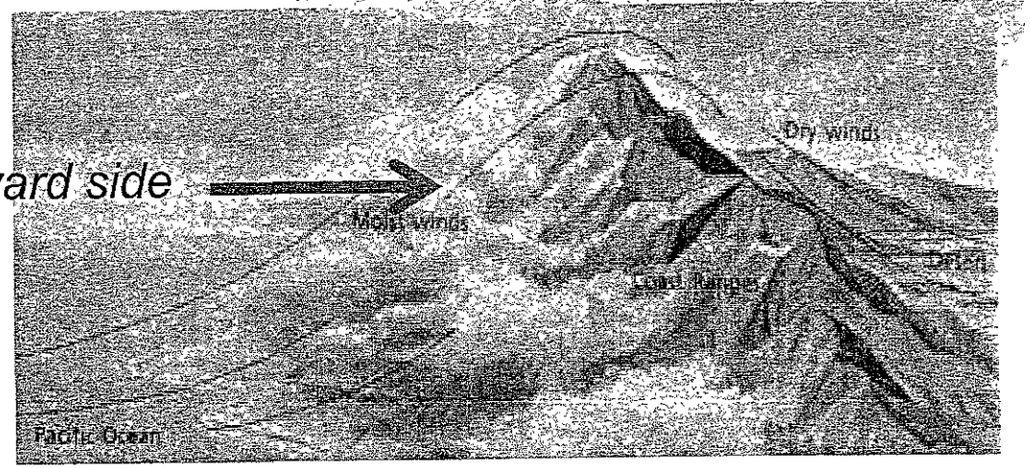


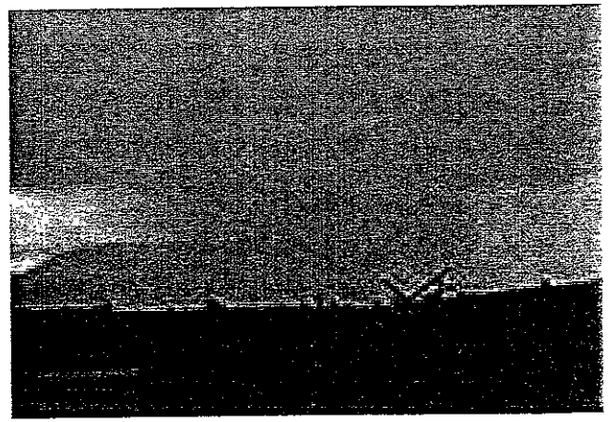
- Philippine Geography and Topography
- Ocean currents
- Semi-permanent cyclones and anti-cyclones
- Principal Air Streams
- Linear systems
- Tropical Cyclones

EFFECT OF TOPOGRAPHY



ography Map of the
ilippines





Associated hazard: flashflood

RAINFALL PATTERN IN THE PHILIPPINES

nfluenced by the different weather systems:

Tropical cyclones – brings about 50 % of the annual average ainfall

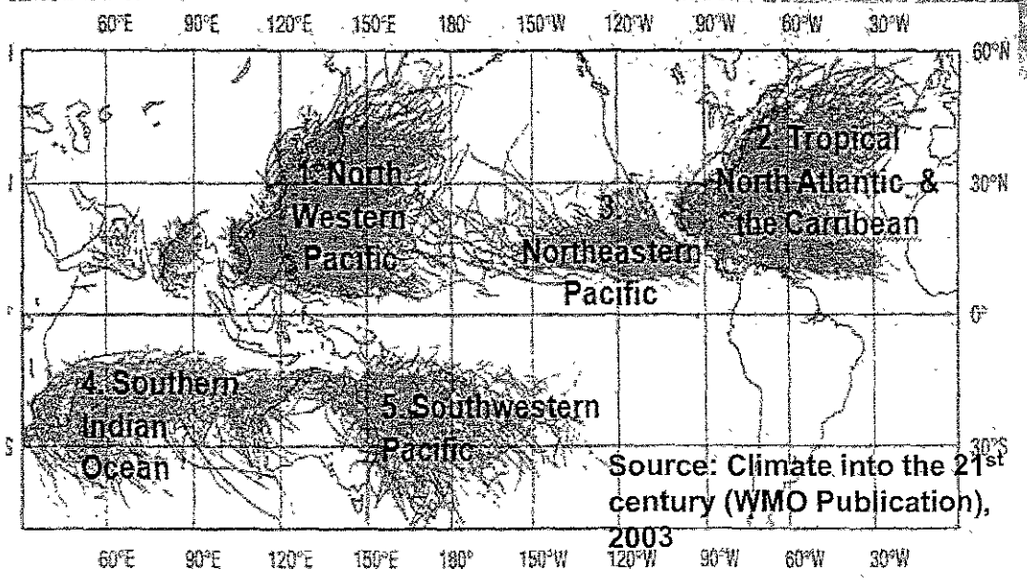
Monsoons – about 12 %

Other systems – about 38 %

(Climate of the Philippines, R.L. Kintanar, 1984)

The varying annual rainfall received by a locality are due to the influence of exposure to the weather systems and the topography of the area.

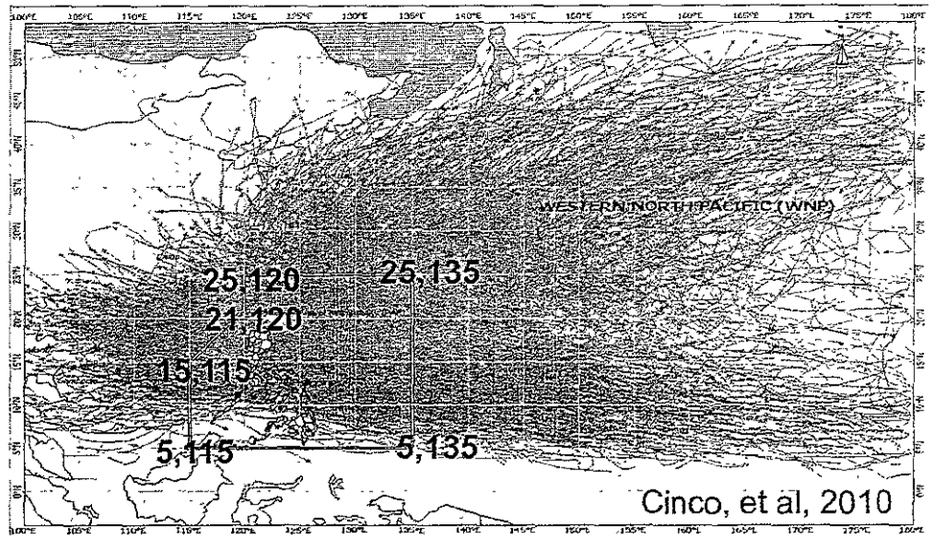
TROPICAL CYCLONE OCCURRENCES



Source: Climate into the 21st century (WMO Publication), 2003

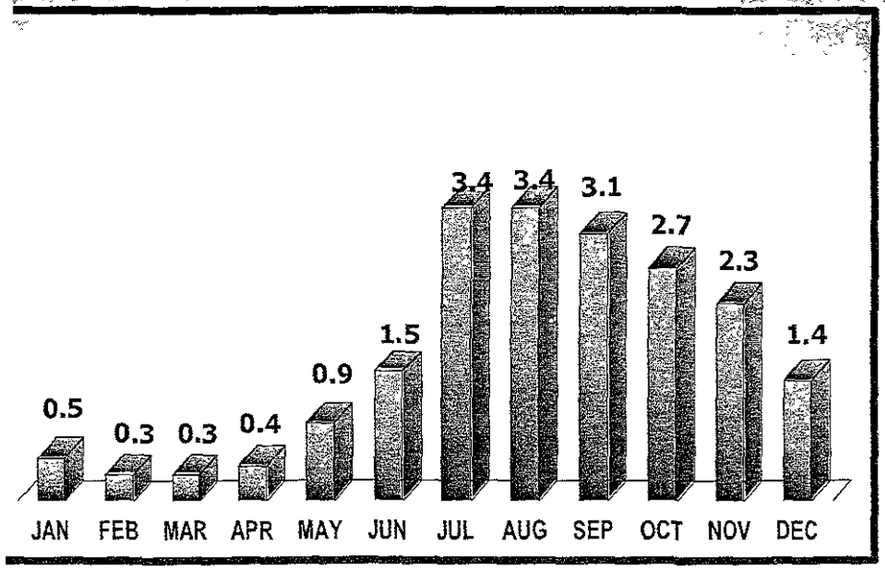
1. North Western Pacific: 30%
2. Trop. North Atlantic & the Caribbean: 24%
3. Northeastern Pacific: 15%
4. Southern Indian Ocean: 12%
5. Southwestern Pacific: 19%

From 1948 to 2010, 1228 tropical cyclones have passed the Philippine Area of Responsibility (PAR).

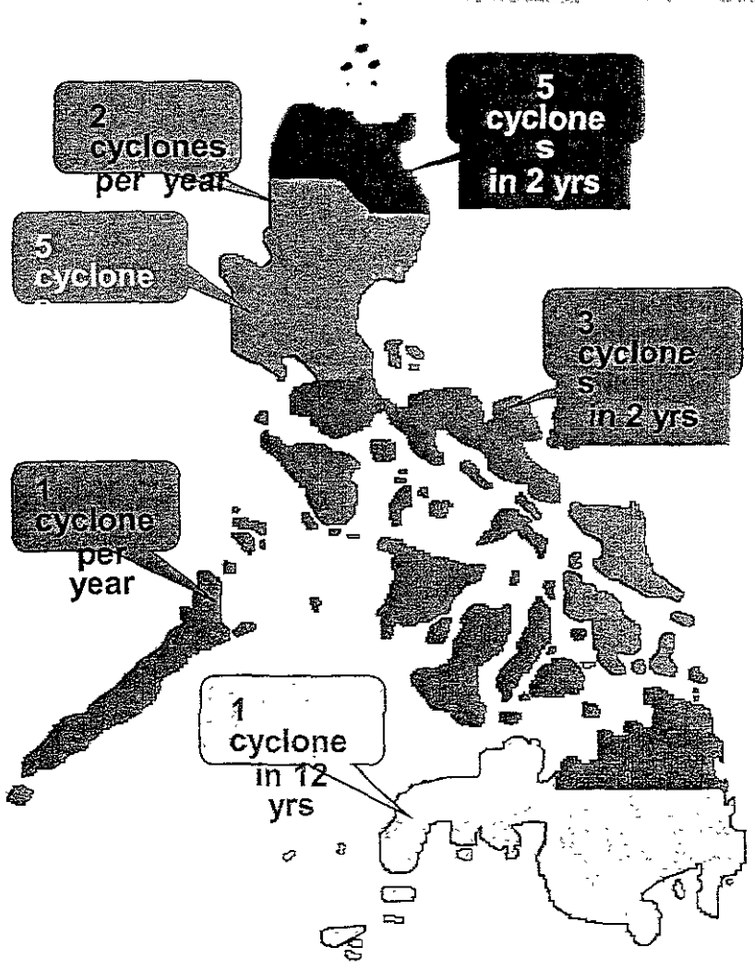


Cinco, et al, 2010

TROPICAL CYCLONE OCCURRENCES WITHIN PAR

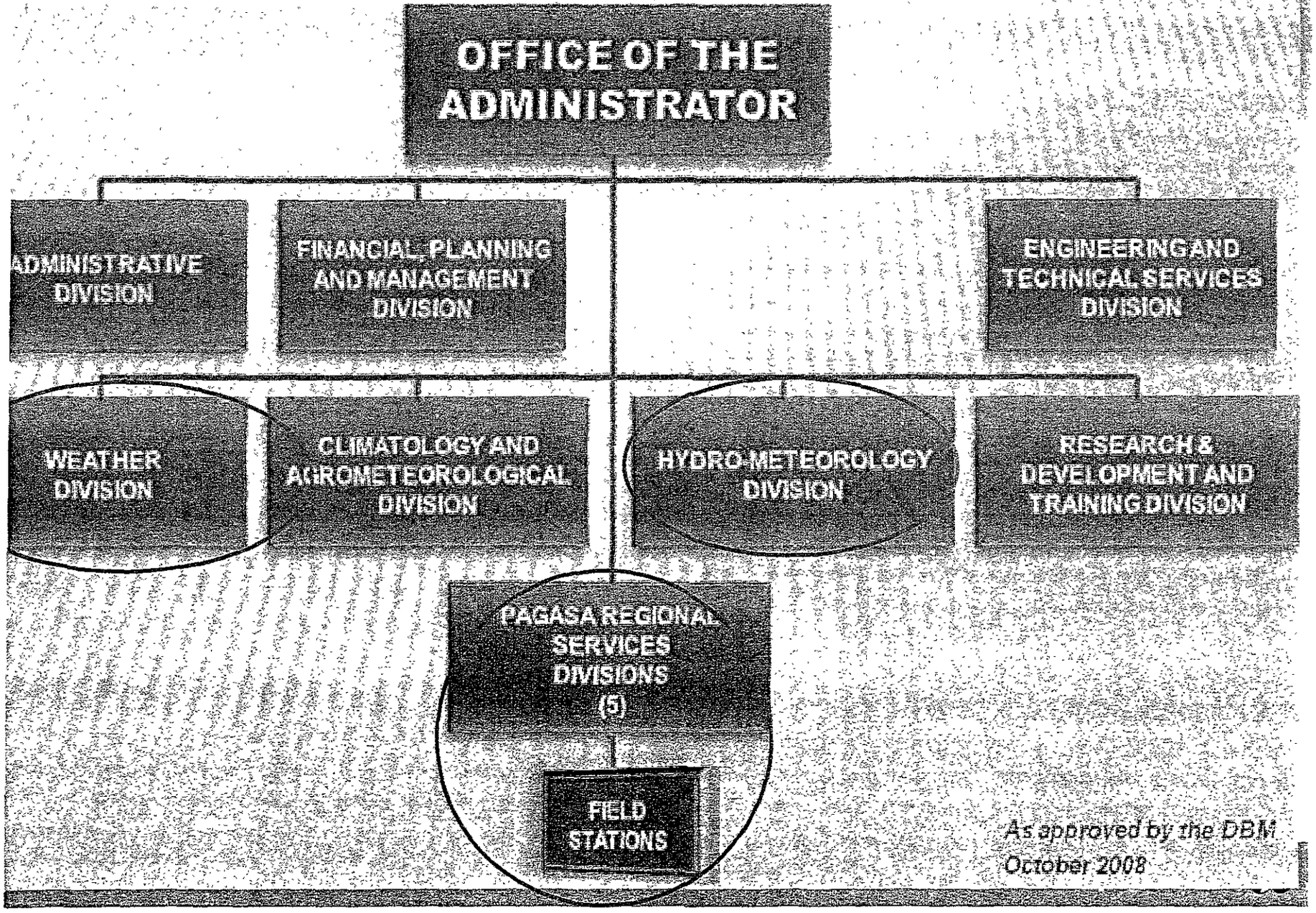


onthly average frequency of occurrence Tropical Cyclones within the PAR



Frequency of passage of Tropical Cyclones by geographical zones in the Philippines

ORGANIZATIONAL CHART



As approved by the DBM
October 2008

PAGASA AND ITS EARLY WARNING CAPACITIES

58 Synoptic Stations

25 Agromet Stations

Upper air stations (Laoag, Tanay, Legaspi,

Palawan, Cebu & Davao)

Doppler Weather Radars

Wind Profilers

Automatic Weather Observing System (NAIA & Mactan)

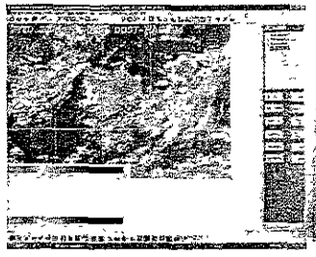
Marine bouys (Inlands of Burias and Bantayan)

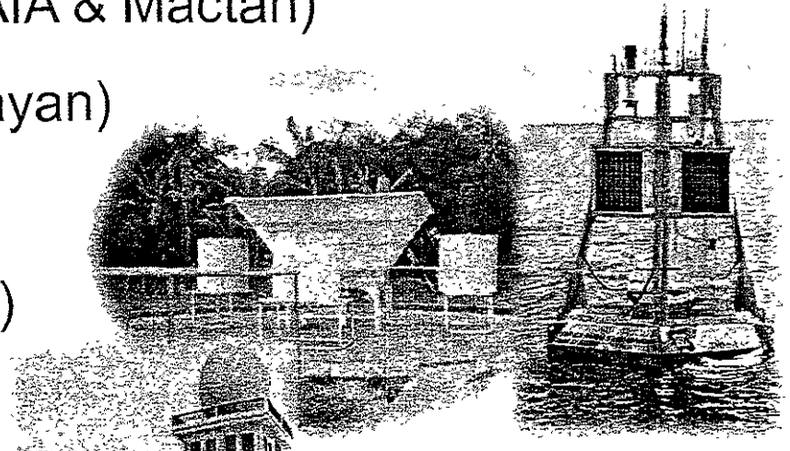
Flood monitoring facilities (**Pampanga,**

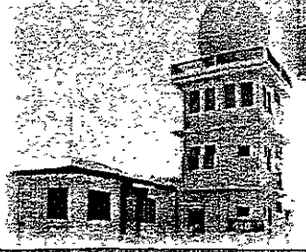
Agno, Bicol, Cagayan and Metro Manila)

Automatic rain gauges

Meteorological satellite receiving facilities







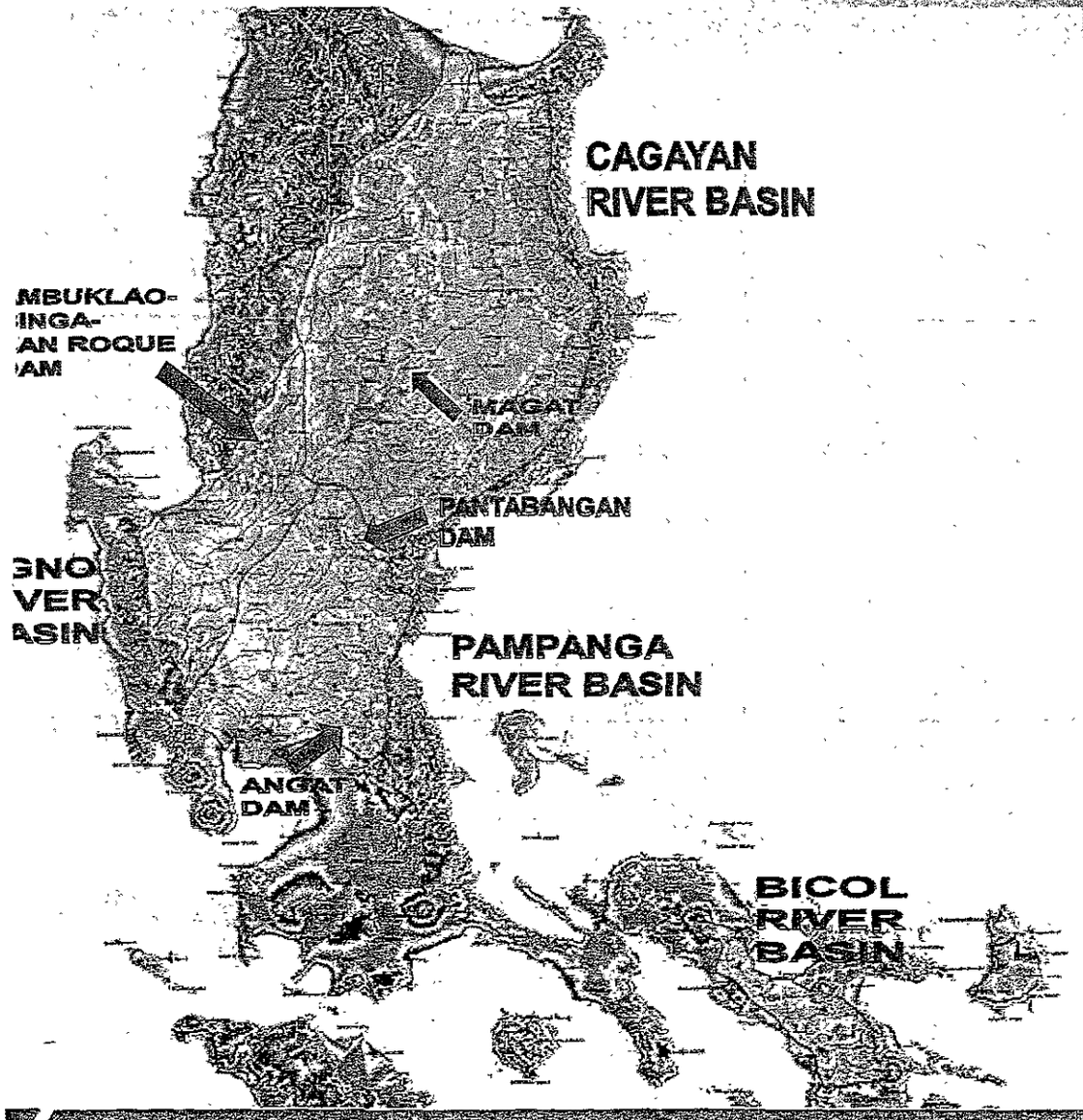
ajor River Basins in the Philippines

Name of River Basin	Drainage Area (square kilometer)	River Length (km)
1. Cagayan	27,280	505
2. Mindanao	23,169	373
3. Agusan	10,621	350
4. Pampanga	9,759	260
5. Agno	5,952	206
6. Abra	5,125	181
7. Pasig-Marikina-Laguna Bay	4,678	78
8. Bicol	3,771	136
9. Abulog	3,372	175
10. Tagum-Libuganon	3,064	89
11. Ilog-Hilabangan	1,945	178
12. Panay	1,843	152
13. Tagoloan	1,704	106
14. Agus	1,645	36
15. Davao	1,623	150
16. Cagayan De Oro	1,521	90
17. Jalaur	1,503	123
18. Buayan-Malangun	1,434	64

Basic functions of Hydrometeorology Division

Undertakes operational activities in flood forecasting and warning covering important/major river basins in the country; develop the systems and facilities necessary to carry-out these functions; improve the techniques and methods used; and coordinate with the other agencies concerned with flood mitigation/control activities, disaster prevention and preparedness and other hydrology-related activities.

ocation of monitored river basins and major eservoirs



Telemetered River Basins:
Pampanga
Agno
Bicol
Cagayan

Telemetered Reservoirs:
Angat
Pantabangan
Magat
Binga/Ambuklao
San Roque

Design of a Flood Early Warning System (FEWS)

1. Telemetered or fully automatic system (equipped with a telecommunication system)
2. Manual system (observation and transmission of observed data by the community)
3. Combination of telemetered and manual systems

bjectives of FFWS

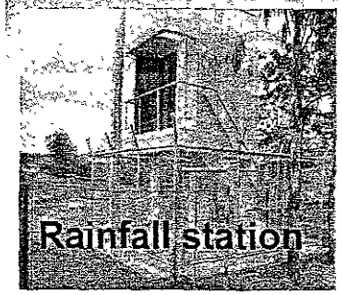
- *to warn the people living in the low-lying areas of the increase in water level of the river and the expected flood situation;*

- *to warn people living in the target area of the dam on the present and expected flood situation; and*

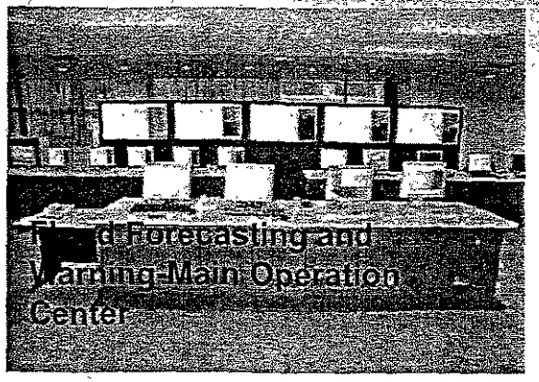
- *to alert the agencies concerned with flood control and /or flood fighting activities in the event of the occurrence of flood.*

Flood Forecasting and warning can only be done if a river system or watershed is equipped with a monitoring facilities, i.e. rainfall and water level monitoring facilities and a good communication system.

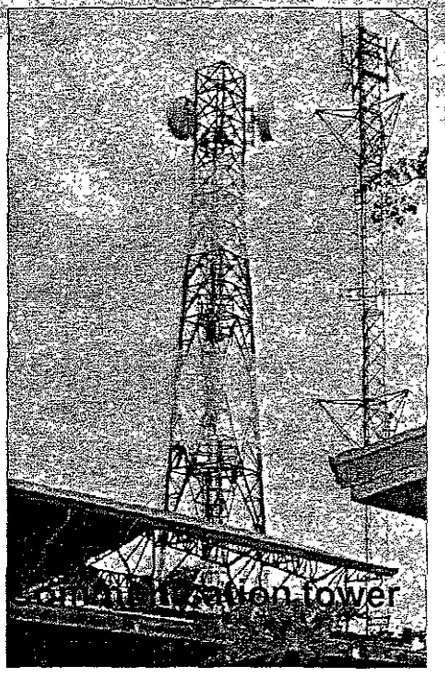
EXISTING FACILITIES FOR FEWS/FFWSDO

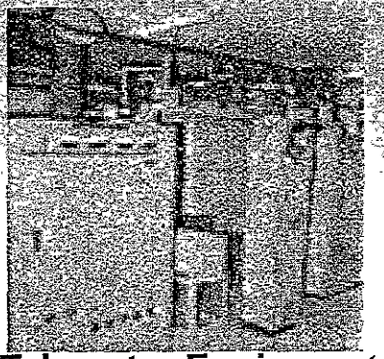


Rainfall station

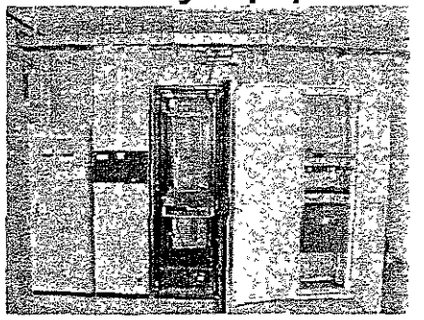


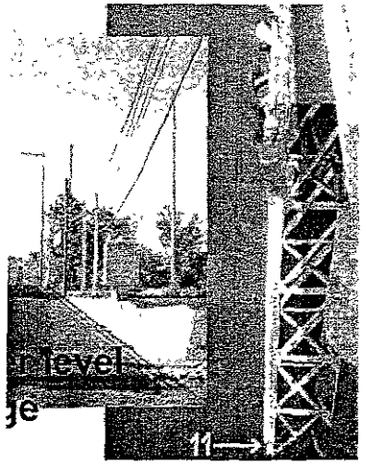
d Forecasting and
arning-Main Operation
Center





Telemetry Equipment





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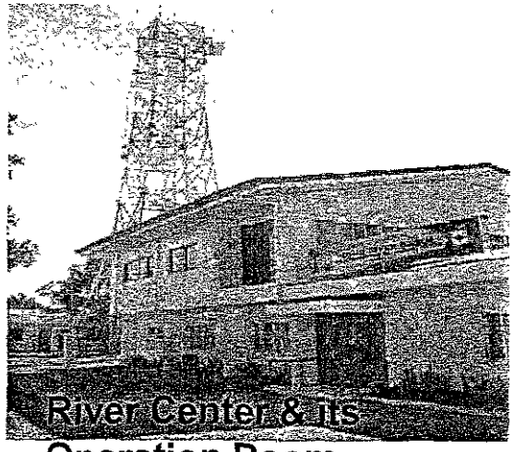
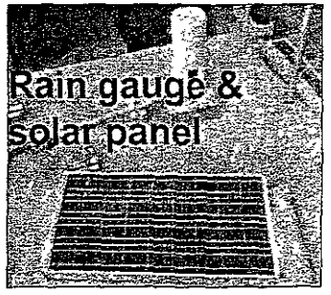
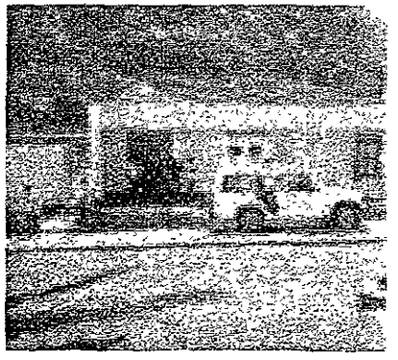


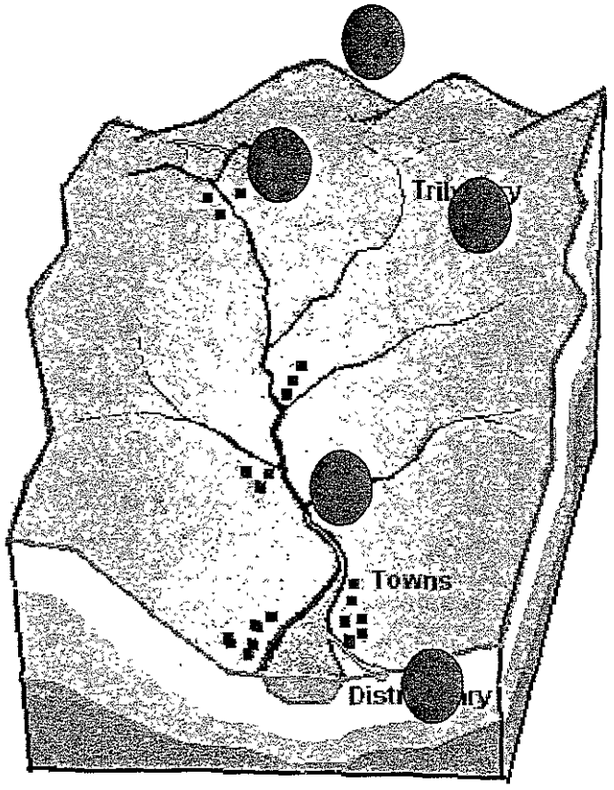
River Center & its
Operation Room



Rain gauge &
solar panel



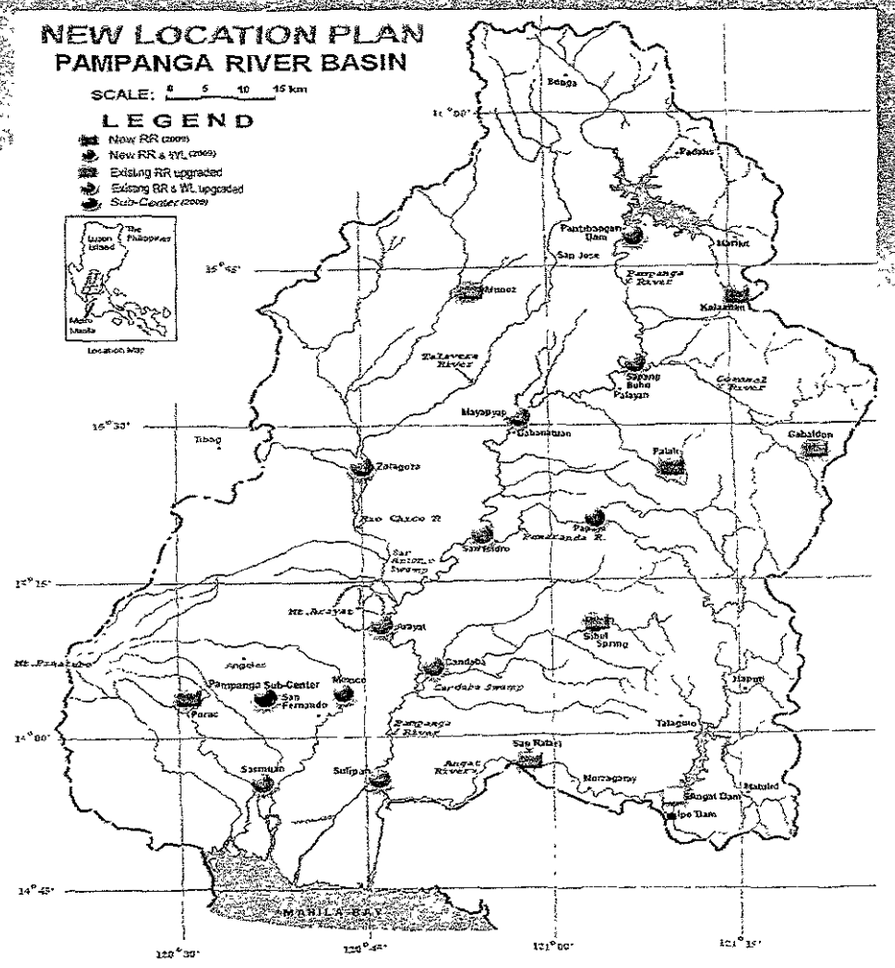
Fixed and mobile warning facilities



A 3-D View of a River Basin

High Elevation

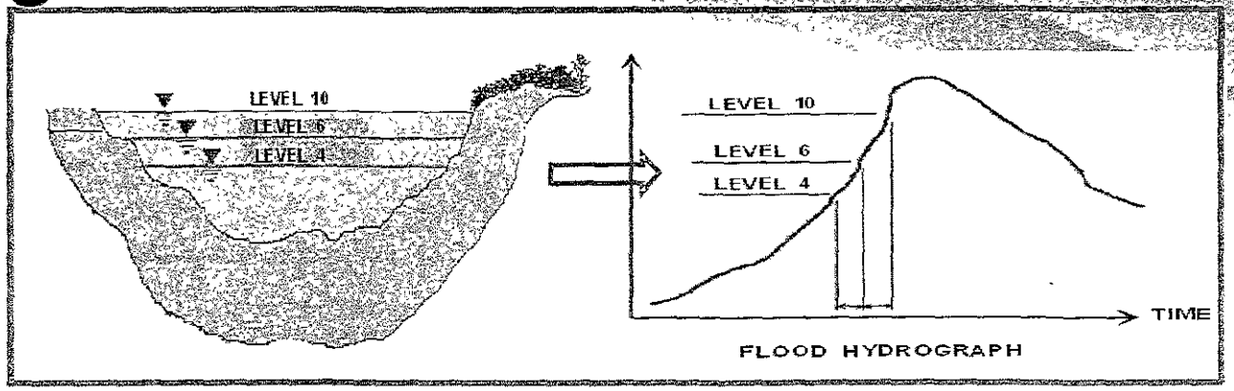
Low Elevation



FFE, PRFFWC 4th - May 2000

Flood Forecasting and warning can only be done if a river system or watershed is equipped with a monitoring facilities, i.e. rainfall and water level monitoring facilities and a good communication system.

Criteria for the issuance of Flood Bulletins

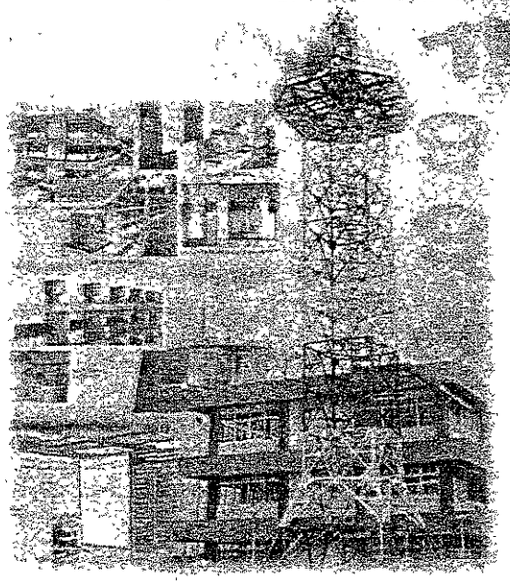


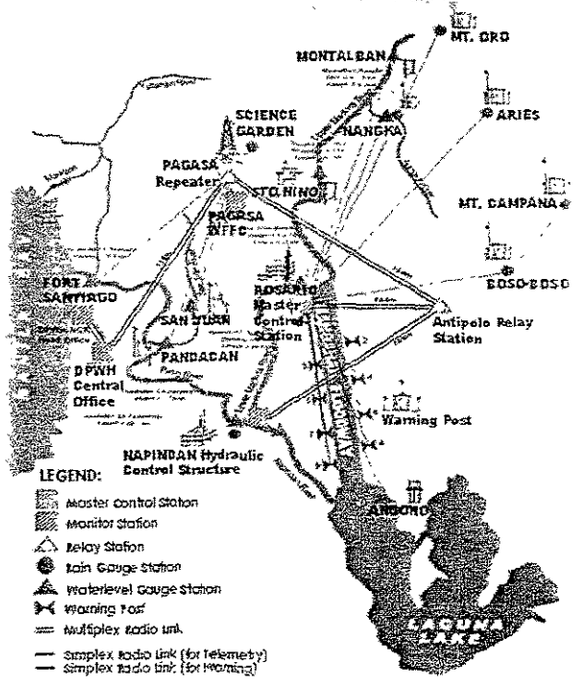
Basin Flood Warning Water Levels	
Alert Level (L4)	The water level at the gauging station when the channel reach/lake/swamp where the station is representing, is estimated to be 40% full on the average.
Alarm Level (L6)	The water level at the gauging station when the channel reach/lake/swamp where the station is representing, is estimated to be 60% full on the average.
Critical Level (L10)	The water level at the gauging station when a certain section of channel reach/lake/swamp where the station is representing, is estimated to be 100% full.

OTHER FLOOD EARLY WARNING SYSTEMS (FEWS)

tracking the sky... helping the county

FFECTIVE FLOOD CONTROL OPERATION SYSTEM (EFCOS) FOR ASIG-MARIKINA-LAGUNA LAKE COMPLEX – UNDER THE MMDA)





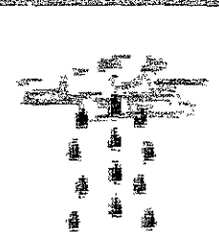
eatures/Components:

- Monitoring system
  - 7 rainfall stations
  - 10 water level stations
- Warning system
  - 9 Warning posts
- Telecommunication system
  - 2 Relay/repeater stations
- Flood gates @Rosario Master Control station
- Hydraulic Structure @ Napindan
- Monitoring Centers @ Rosario (MMDA), PAGASA & DPWH

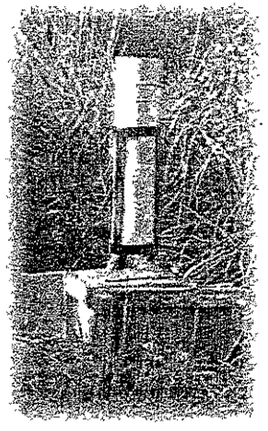
In 2006, the relay station in Antipolo was destroyed by Ty Milenyo & real-time transmission of data was affected.

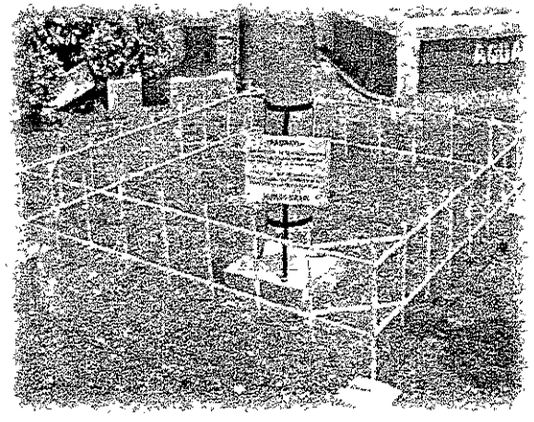
COMMUNITY BASED FLOOD EARLY WARNING SYSTEM (CBFEWS)

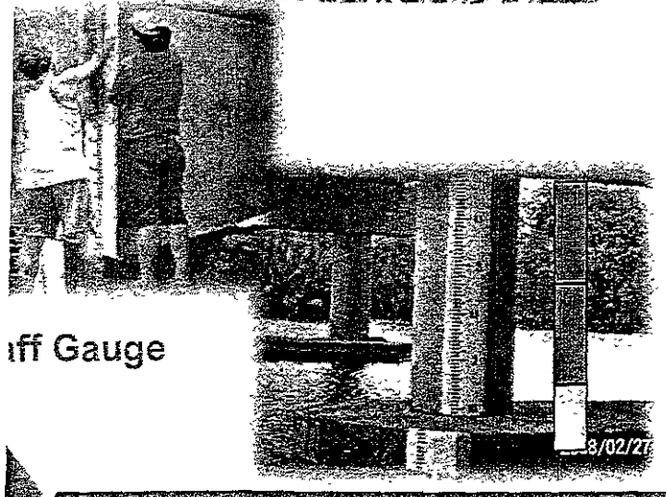
"Non-Structural" flood disaster mitigation/management gram that is based on the operative capability of the nmunity operating it.



Manual/Standard Rain Gauge







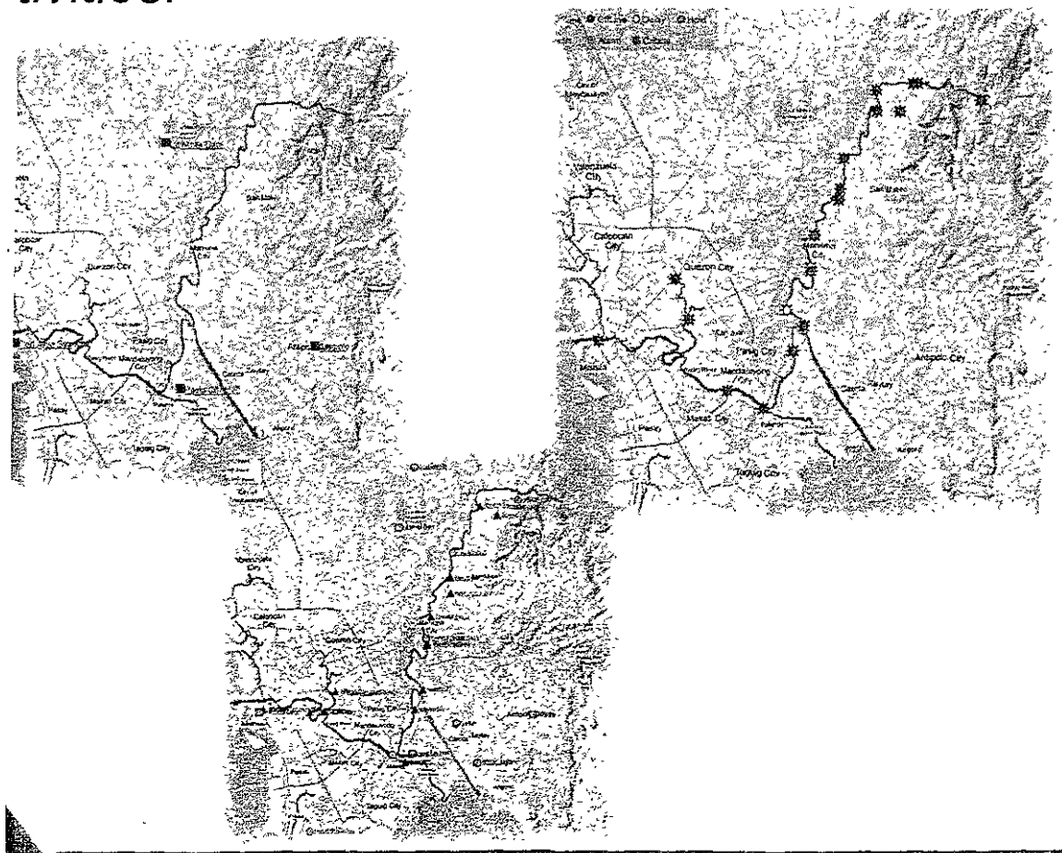
ıff Gauge

Alarm
Critical
levels

Automatic Rain Gauge

KOICA 2 PROJECT: EARLY WARNING AND MONITORING SYSTEM FOR METRO MANILA

)ICA Project – funded by the Korean International Cooperation Agency, ıich involves the installation of monitoring (automatic weather stations, R and WL) and warning facilities along the Pasig-Marikina River System d the development of a Hydrological Model for flood early waning tivities.



Features/Components:

1. Monitoring system
   - 6 rainfall stations
   - 10 water level stations
   - 4 automatic weather stations (AWS)
2. Data processing system
   - rainfall-runoff model
3. Warning system
   - 19 warning posts along Marikina, Pasig, San Juan & Nangka rivers
4. Main Operation Center – PAGASA


Thank you for your kind attention!
DEPARTMENT OF SCIENCE AND TECHNOLOGY
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL & ASTRONOMICAL SERVICES ADMINISTRATION
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929-4865 / 434-2696
Website:
www.pagasa.dost.gov.ph
Dial-A-Weather:
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"tracking the sky...helping the country"
www.pagasa.dost.gov.ph

List of LGUS covered by 18 Major River Basins with Geo-Hazard Maps

Region	Agno River Basin
Region 1	**Pangasinan**
	Binalonan
	Bugalion
	Lingayen
Region 2	**N. Vizcaya**
	Kayapa
	Tarlac
	Camiling
	Gerona
CAR	**Benguet**
	Baguio City
	Kabayan

Region	Abra River Basin
Region 1	**Ilocos Sur**
	Cervantes
	Vigan City
CAR	**Benguet**
	Mankayan
	Abra
	Bangued
	Licuan
	Manabo
	Sallapanan
	Tineg

Region	Abulog River Basin
Region 2	**Cagayan**
	Abulog
CAR	**Apayao**
	Calanasan
	Kabugao
	Pudtol

Regions	Cagayan River Basin
Region 2	**Cagayan**
	Aparri
	Baggao
	Gattaran
	Peñablanca
	Piat
	Tuao
	Tuguegarao City

List of LGUS covered by 18 Major River Basins with Geo-Hazard Maps

Region 2	**Isabela**
	Quezon
	San Mariano
	N. Vizcaya
	Bayombong
	Solano
	Quirino
	Maddela
	Nagtipunan
Region 3	**Aurora**
	Dilasag
CAR	**Ifugao**
	Lagawe
	Mt. Province
	Bontoc
	Paracelis
	Sadanga
	Kalinga
	Lubuagan
	Tabuk

Region	**Pampanga River Basin**
Region 3	**Aurora**
	Maria Aurora
	San Luis
	Pampanga
	Angeles City
	Guagua
	Bulacan
	Angat
	Malolos City
	San Miguel
	Nueva Ecija
	Cabanatuan City
	Gabaldon
	Gen. Tinio
	Palayan City
	Pantabangan
	San Jose City
	Tarlac
	Tarlac City
	Olongapo City

List of LGUS covered by 18 Major River Basins with Geo-Hazard Maps

Region	Pasig-Laguna de Bay
Region 4A	**Laguna**
	Calamba City
	Paete
	San Pablo City
	Batangas
	Lipa City
	Rizal
	Baras
	Quezon
	Lucban
NCR	**Metro Manila**
	Manila
	Muntinlupa City
	Quezon City

Region	Bicol River Basin
Region 5	**Albay**
	Ligao
	Polangui
	Camarines Sur
	Iriga City
	Libmanan
	Naga City
	Sipocot

Region	Panay River Basin
Region 6	**Iloilo**
	Lemery
	Capiz
	Dao
	Dumalag
	ivisan
	Panitan

Region	Jalaur River Basin
Region 6	**Iloilo**
	Passi City

Region	Ilog-Hilabangan
Region 7	**Negros Or**
	Bayawan City

List of LGUS covered by 18 Major River Basins with Geo-Hazard Maps

Region	Tagoloan River Basin
Region 10	**Bukidnon**
	Malaybalay City
	Sumilao

Region	Cagayan De Oro River Basin
Region 10	**Bukidnon**
	Talakag
	Misamis Oriental
	Cagayan De Oro City

Region	Agus River Basin
Region 10	**Lanao del Norte**
	Baloi
	Iligan City
	Linamon
	Matungao
	Pantao-Ragat
	Pantar
ARMM	**Lanao del Sur**
	Bacolod-Grande
	Balindong
	bayang
	Binidayan
	Buadiposo-Buntong
	Bubong
	Butig
	Ganassi
	Kapai
	Lumba Bayabao
	Lumbatan
	Lumbayanague
	Madalum
	Madamba
	Maguig
	Marantao
	Marawi City
	Masiu
	Mulondo
	Poona-Bayabao
	pualas
	Saguiran
	Sultan Dumalondong
	Tamparan
	Taraka
	Tugaya

List of LGUS covered by 18 Major River Basins with Geo-Hazard Maps

Region	Mindanao River Basin
Region 10	**Bukidnon**
	kibawe
	Malaybalay City
	Maramag
	Talakag
	Valencia City
	South Cotabato
	Banga
	Sultan Kudarat
	Tacurong City
ARMM	**Maguindanao**
	Talayan

Region	Davao River Basin
Region 11	**Davao del Sur**
	Davao City

Region	Tagum-Libuganon River Basin
Region 11	**Compostela Valley**
	Laak
	Mawab
	Monkayo
	Montevista
	Nabunturan
	Davao del Norte
	Asuncion
	Braulio E. Dujali
	carmen
	Kapalong
	New Correla
	Sto. Tomas
	Tagum City
	Talaingod

Region	Buayan-Malungun River Basin
Region 11	**Davao del Sur**
	Malalag
	Malita
	Sta. Maria
Region 12	**Sarangani**
	Alabel
	Malungon

List of LGUS covered by 18 Major River Basins with Geo-Hazard Maps

Region 12	**South Cotabato**
	Gen. Santos City
	Tampakan
	Tupi

Region	Agusan River Basin
Region 11	**Davao Oriental**
	Boston
	Cateel
Region 13	**Agusan del Sur**
	La Paz
	Prosperidad
	Talacogon
	veruela
	Agusan del Norte
	Buenavista

SUMMARY TOTAL NUMBER OF WATERSHED PER REGION

Region	No. of Watershed	No. of Affected Provinces	No. of Affected Cities/Municipalities
CAR	4	5	35
REGION 1	18	4	41
REGION 2	8	3	27
REGION 3	13	6	32
REGION 4A	24	5	36
REGION 4B	10	3	14
REGION 5	15	4	19
REGION 6	11	5	32
REGION 7	0	0	0
REGION 8	11	1	27
REGION 9	3	1	1
REGION 10	4	2	4
REGION 11	8	4	17
REGION 12	9	4	19
REGION 13	6	3	12
ARMM	1	1	2
TOTAL	**145**	**51**	**318**

Source: River Basin Control Office - DENR

CRITICAL WATERSHEDS

Region		River Watershed	Province	City/Municipality
CAR	1	Chico River Watershed	Mt. Province	Bauko, Sabangan, Bontoc, Sagada, Sandangan & Barlig
			Ifugao	Tinoc & Hugdungan
			Kalinga	Tanudan, Lubuagan, Tinglayan, Pinukpuk, Tabuk, Balbalan & Pasil
			Apayao	Coner
	2	Mallig River Watershed	Kalinga	Tanudan, Tabuk
			Mt Province	Paracelis
	3	Abulog River Watershed	Apayao	Calanasan, Kabugao, Pudtol, Flora & Coner
			Cagayan	Abulog
	4	Manucotae River Watershed	Cagayan	Pamplona
			Apayao	Luna
REGION 1	1	Bulu River Watershed	Ilocos Norte	Bangui
	2	Laoag River Basin	Ilocos Norte	Sarrat, San Nicolas, Laoag City
	3	Magalis-Papa River Watershed	Ilocos Norte	Espiritu, Nueva Era, & Pinili
	4	Cura River Watershed	Ilocos Norte	
	5	Vintar River Watershed	Ilocos Norte	Vintar,, Burgos, & Bangui
	6	Sta. Maria River Watershed	Ilocos Sur	Burgos, Santiago,
	7	Emilio		Banyuyom, Lidlidia & San Lucia
	8	Buaya River Watershed	Ilocos Sur	Candon, Sta. Lucia, Gregorio del Pilar, Sta. Lucia Salcedo, Sta. Cruz, Suyo, & Sigay
	9	Amburayan River Watershed	Ilocos Sur	Tagudin & Sugpon
			La Union	Sudipen
			Benguet	Atok, Kibungan, Bakun,
	10	Chico-Paduquit River Watershed	Iocos Sur	Suyo, Alilem, Sigay
			Benguet	Bakun
	11	Aringay River Watershed	La Union	Aringay, Tubao & Pugo
			Benguet	Sablan, Tuba & Baguio City
	12	Bued River Watershed	Pangasinan	San Fabian, San Jacinto, Pozorrubio & Sison
			La Union	Pugo & Rosario

CRITICAL WATERSHEDS

Region		River Watershed	Province	City/Municipality
			Benguet	Tuba & Itogon
	13	Dumuloc River Watershed	Pangasinan	Bugallon
			Zambales	Sta. Cruz
	14	Agno River Watershed	Benguet	Buguias, Kabayan, Bokod,
				La Trinidad & Itogon
				La Trinidad & Itogon
			Pangasinan	Sta. Maria, San Nicolas,
				Sto Tomas, Asingan,
				Tayug & San Manuel
			Nueva Vizcaya	Kayapa
	15	Ambayoan River Watershed	Pangasinan	San Nicolas
			Nueva Vizcaya	Sta. Fe & Kayapa
			Benguet	Itogon
	16	Dipalo River Watershed	Pangasinan	Umingan
			Nueva Ecija	Lupao
	17	Agno-Banawan River Watershed	Pangasinan	
	18	Agno-Sinucalan-Tuboy Watershed	Pangasinan	San Manuel
			Benguet	Itogon
REGION 2	1	Magat River Watershed	Nueva Vizacaya	Sta Fe, Kayapa, Bambang,
				Dupax del Norte, Dupax del
				Sur, Aritao, Bayombong,
				Solano, Bagabag & Diadi
			Isabela	Ramon, Naguilian, Ilagan & Gamu
			Ifugao	Lagawe & Mayayao
	2	Baua River Watershed	Cagayan	Gonzaga
	3	Dummun River Watershed	Cagayan	Capissayan
	4	Pared River Watershed	Cagayan	Baggao, Penablanca
	5	Zinundangan River Watershed	Cagayan	Sto. Nino
			Apayao	Kabugao
	6	Pinacanauan de Tuguegarao River Watershed	Cagayan	Penablanca, Maconacon
	7	Pinacanauan de San Pablo Watershed	Isabela	San Pablo, Maconancon
	8	Pinacanauan de Tumauini River Watershed	Isabela	Tumauini, Cabagan, Divilacan, Maconancon
REGION 3	1	Tarlac River Watershed	Tarlac	Capas, Bamban, Tarlac City
			Zambales	Botolan

CRITICAL WATERSHEDS

Region		River Watershed	Province	City/Municipality
	2	Camiling River Watershed	Tarlac	Mayantoc
			Zambales	Candelaria, Masinloc
	3	Upper Pampanga River Watershed	Nueva Ecija	Pantabangan, Caranglan
	4	Pampanga -Coronnel River Watershed	Nueva Ecija	Palayan City, Bongabon
	5	Caulaman River Watershed	Zambales	San Marcelino, Castillejos. & Subic
			Pampanga	Floridablanca
	6	Nayom River Watershed	Zambales	Sta. Cruz
			Pangasinan	*Infanta* & Bugallon
	7	Cabaluan River Watershed	Zambales	Sta. Cruz & Candelaria
	8	Sto. Tomas River Watershed	Zambales	San Narciso
	9	Bucao River Watershed	Zambales	Botolan, Cabangan, San Felipe, Iba & San Marcelino
	10	Porac-Gumain River Watershed	Pampanga	Porac & Floridablanca
	11	Angat-Maasim River Watershed	*Bulacan*	Angat, Norzagaray, San Ildefonso & San Rafael
			Pampanga	San Luis
	12	Angat-Ipo River Watershed	Bulacan	Norzagaray & San Jose del Monte
			Rizal	Rodriguez (Montalban)
	13	Pinulot River Watershed	Bataan	Dinalupihan, Hermosa & Morong
			Zambales	Ologapo City & Subic
REGION 4A	1	Balanac River Watershed	Laguna	Magdalena, Majayjay &
			Quezon	Lusiana and Lucban
	2	Mabacan River Watershed	Laguna	Calauan
	3	Llano River Watershed	Laguna	Sta. Maria, Siniloan
			Quezon	Real
	4	Sta. Cruz River Watershed	Laguna	Sta. Cruz, Magdalena, & Nagcarlan
	5	San Antonio River Watershed	Laguna	Sta. Maria
			Rizal	Tanay
			Quezon	Real
	6	NPC Tailrace & Lewin Creek	Laguna	Lumban
	7	Macabling River Watershed	*Laguna*	*Cabuyao*
	8	San Cristobal River Watershed	Laguna	Cabuyao, Canlubang and Calamba
			Cavite	Silang & Tagaytay City
	9	San Juan River Watershed	Laguna	Calamba
			Batangas	Sto. Tomas, Tanauan and Malvar
	10	Maragondon River Watershed	Cavite	Naic

CRITICAL WATERSHEDS

Region		River Watershed	Province	City/Municipality
	11	Caisobo River Watershed	Cavite	Indang
	12	Labac-Alemang River Watershed	Cavite	Naic, Indang
	13	Timalan River Watershed	Cavite	Tanza
	14	Canas River Watershed	Cavite	Gen. Trias, Tanza
	15	Ylang-ylang River Watershed	Cavite	Imus, Gen. Trias, Dasmarinas,
	16	Lasong Camachile River Watershed	Cavite	Gen.Trias
	17	Imus River Watershed	Cavite	Imus, Dasmarinas
	18	Zapote River watershed	Cavite	Bacoor
	19	Palico River Watershed	Batangas	Tuy & Nasugbu
	20	Lagnas River Watershed	Quezon	Candelaria
	21	Janagdong River Watershed	Quezon	Candelaria & Sariaya
	22	Dumacao River Watershed	Quezon	Tayabas
	23	Agos River Watershed	Quezon	Gen. Nakar, Infanta, Real
			Rizal	Tanay, Teresa
	24	Marikina River Watershed	Rizal	Tanay, Montalban, Antipolo, Baras, Teresa
REGION 4B	1	Bansud River Watershed	Mindoro Oriental	Bongabong & Pinamalayan
	2	Catuiran - Bucayao River Watershed	Mindoro Oriental	Baco, Naujan, & SanTeodoro
			Mindoro Occidental	Sablayan & Sta. Cruz
	3	Pula River Watershed	Mindoro Oriental	Pinamalayan
	4	Mag-asawang Tubig-Mapalo Rivers	Mindoro Oriental	Naujan
			Mindoro Occidental	Sablayan
	5	Pagbahan River Watershed	*Mindoro Oriental*	*San Teodoro & Puerto Galera*
			Mindoro Occidental	Mamburao & Sta Cruz
	6	Amnay-Patrick River	Mindoro Occidental	Sta. Cruz & Sablayan
			Mindoro Oriental	Baco & San Teodoro
	7	Mongpong River Watershed	Mindoro Occidental	Sablayan
	8	Cagaray River Watershed	Mindoro Oriental	Mansalay & Bulalacao
			Mindoro Occidental	San Jose
	9	Lumintao River Watershed	*Mindoro Occidental*	*Sablayan*
	10	Malasgao River Watershed	Palawan	Quezon & Aborlan
REGION 5	1	Ponso Watershed	Albay	Pulnagui & Oas
	2	Basay River Watershed	Albay	Ligao & Oas
	3	Nasisi River Watershed	Albay	Ligao & Guinobatan
	4	Bublusan Watershed	Albay	Guinobatan & Camalig
	5	*Buhi-Iriga River Watershed*	*Camarines Sur*	*Buhi, Nabua & Iriga City*
			Albay	Tiwi

CRITICAL WATERSHEDS

Region		River Watershed	Province	City/Municipality
			Camarines Sur	Buhi & Iriga City
	6	Nabua River Watershed	Camarines Sur	Baao, Buhi & Iriga City
	7	Daet River Watershed	Camarines Norte	Daet, San Vicente, & Basud
	8	Talisay River Watershed	Camarines Norte	Daet & San Vicente
	9	Sipocot-Pulantuna Watershed	Camarines Sur	Libmanan, Sipocot, Lupi, Ragay & Del Gallego
			Camarines Norte	Daet
	10	Pili River Watershed	Camarines Sur	Pili
	11	Tigman River Watershed	Camarines Sur	Calabanga & Tinambac
	12	Hinagyanan River Watershed		
	13	Inainigan/Inarihan		
	14	Sabang River Watershed	Sorsogon	
	15	Tubugan River Watershed	Sorsogon	Bulan, Irosin & Matnog
REGION 6	1	Tipuluan River Watershed	Antique	Sibalom & San Jose
	2	Mambusao River Watershed	Capiz	Sapian, Jamindan & Mambusao
			Aklan	Altavas
	3	Aganan River Watershed	Iloilo	Alimodian & Maasin
	4	Barotac Viejo River Watershed	Iloilo	Barotac Viejo, Lemery & A-juy
	5	Jalaur River Watershed	Iloilo	Dingle, Pototan, Janiuay, Passi, Dueñas, Calinog, Lambunao, Anilao, Banate & & Barotac Viejo
	6	Jalaur-Suage River Watershed	Iloilo	Janiuay, Maasin, Cabatuan, & Lucena
	7	Sibalom River Watershed	Iloilo	Leon, Alimodian & Tigbauan
	8	Tigum River Watershed	Iloilo	Cabatuan, Maasin & Janiway
			Antique	Valderama & San Remigio
	9	Bago River Watershed	Negros Occidental	Bago, Murcia, Talisay, San
	10	Pagiplan River Watershed	Negros Occidental	Binalbagan
	11	Ibajay River Watershed	Aklan	Ibajay
REGION 7	NO DATA			
REGION 8	1	Magon-Bucan River Watershed	Leyte	La Paz, Macarthur & Inayupan
	2	Bao River Watershed	Leyte	Ormoc City, Kananga, Capoocan & Cariagara
	3	Binahaan River Watershed	Leyte	Ormoc City, Jaro, Pastrana & Dagami

CRITICAL WATERSHEDS

Region		River Watershed	Province	City/Municipality
	4	Bito River Watershed	Leyte	Inayopan, Abuyog, & Baybay
	5	Daguitan River Watershed	Leyte	Burauen, Albuera, & Dagami
	6	Gibuga River Watershed	Leyte	Burauen, Julita, Dulag, La Paz & Sta. Cruz
	7	Guinarona River Watershed	Leyte	Dagami & Burauen
	8	Mainit River Watershed	Leyte	Carigara, Jaro, & Alangalang
	9	Pongso River Watershed	Leyte	Cariagara. Barugo & Tunga, Ormoc City
	10	Palo River Watershed	Leyte	Palo, Jaro, Sta Fe, & Alangalang, Tacloban City
	11	Salug River Watershed	Leyte	Hindang, Hilongos & Inopacan
REGION 9	1	Dipolo River Watershed	Zamboanga del Sur	Molave
	2	Labangan-Pulusan-Lantian-Tiwagan Rivers	Zamboanga del Sur	
	3	Sibuguey-Dipili Rivers	Zamboanga del Sur	
REGION 10	1	Manupali River	Bukidnon	
	2	Muleta-Kulaman River Watershed	Bukidnon	Pangantukan & Maramag
	3	Roxas Kuya River Watershed	Bukidnon	Maramag
	4	Dipolo-Maranding River Watershed	Lanao del Norte	Nunuñgan & Kapatagan
REGION 11	1	Batutu Watershed	Compostela Valley	Compostela
	2	Libuganon River Watershed	Davao del Norte	Kapalong, Sto. Tomas, Asuncion, San Vicente, New Correla Tagum City
			Compostela Valley	Nabunturan Moncayo & Montevista
	3	Saug River Watershed	Davao del Norte	Kapalong, Asuncion
			Compostela Valley	Nabunturan
	4	Lasang River Watershed	Davao del Norte	Kapalong & Panbo & Davao City
	5	Matanao River Watershed	Davao del Sur	Digos
	6	Padada River Watershed	Davao del Sur	Digos
			North Cotabato	Makilala
	7	Sumlog River Watershed	Davao Oriental	Lupon, Banay-banay & Mati
			Davao del Norte	Panutukan
	8	Buayan-Tinagacan Rivers	Davao del Sur	Malalag, Sta. Maria & Malita
			Sarangani	Malungon, Alabel
			South Cotabato	Polomolok, Gen Santos City
REGION 12	1	Kabacan River Watershed	North Cotabato	Kabacan & Kidapawan

CRITICAL WATERSHEDS

Region		River Watershed	Province	City/Municipality
	2	Libungan River Watershed	North Cotabato	Libungan
	3	M'lang River Watershed	North Cotabato	M'lang & Makilala
	4	Malasila River Watershed	North Cotabato	Tuluran & Makilala
	5	Allah River Watershed	South Cotabato	T'Boli, Norala, Surallah
	6	Banga River Watershed	South Cotabato	Banga
	7	Silway River Watershed	South Cotabato	Dadiangas, Polomolok
	8	Palian River Watershed	South Cotabato	Marbel & Tupi
	9	Alip River Watershed	Sultan Kudarat	Columbio, Lutayan
REGION 13	1	Cabadbaran River Watershed	Agusan del Norte	Cabadbaran
	2	Taguibo River	Agusan del Norte	Butuan City & Cabadbaran
	3	Andanan River Watershed	Agusan del Sur	Bayugan
	4	Simulao River Watershed	Agusan del Sur	Bunawan & Trento
			Surigao del Sur	Bislig & Lingig
	5	Caracan River Watershed	Surigao del Sur	Madrid
			Agusan del Norte	Jacupit
	6	Tago River Watershed	Surigao del Sur	Tago, Cagwit
			Agusan del Sur	Bayugan
ARMM	1	Gata River Watershed	Lanao del Sur	Maguing & Lumba-Bayabaao
Total	145			

Source: River Basin Control Office - DENR

Metropolitan Manila Development Authority
Flood Control and Sewerage Management Office
List of Flood Control Project 2012
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Name of Project	Date of Completion
Caloocan City	
Proposed Drainage Improvement and Construction at Brgy. 173, Lower NPC, Camarin, District I, Caloocan City	December 3, 2012
Proposed Drainage Improvement, Riprapping and Dredging at Silangan NPC, Brgy 167 Llano, Cadena De Amor St., Brgy. 174 & Brgy 178, Camarin,	March 10, 2013
Declogging of Drainage Laterals at Brgy, 53, 54, 55, 57, 58, 60 & 61, Gracer Park, District II, Caloocan	July 22, 2012
Proposed Declogging of Drainage Laterals at Brgys 5, 6, 7, 8, 9, 10, 12, 14 & 16 Caloocan City	December 23, 2012
Proposed Declogging of Drainage Laterals at Brgys. Casili Creek, 103, 104, 111, 112,and 115, District II Caloocan	February 4, 2012
Las Pinas City	
Proposed Rehabilitaion of Riprap Wall & Desilting of *Tuntong Creek, Manuyo I, Las Pinas City*	December 21, 2012
Proposed Improvement/Riprapping of Marulas Creek, Manuyo II, Las Pinas City	July 20, 2012
Proposed Drainage Improvement at Mapayapa *Village and Rehabilitation of Slope Protection at* Balihatar Creek,Casimiro Subdivision, Las Pinas City	December 22, 2012
Proposed Rehabilitation of Riprap Wall and Desilting of Talon Creek, Talon V, Las Pinas City	December 31, 2012
Makati City	
Proposed dredging/Desilting of PNR Open Canal, Brgy. San Antonio, District I, Makati City	October 7, 2012
Proposed Riprapping and Desilting along Makati-Pateros River (Phase VII), Brgy. Comembo, Makati City, District II	October 2, 2012
Proposed Drainage Improvement along Buendia Ave. / Pasong Tamo (South Super highway Estero Tripa de Gallina / Arnaiz Ave. - PDIC) Dredging and deepening to designed Elevation of Estero Tripa De Gallina, (Brgy. Bangkal - Brgy. San Isidro) Makati City, (Trust Fund-Special Projects) Proposed Dredging/Deepening to the designed elevation of Estero Tripa De Gallina/Brgy Bangkal-San Isidro Makati City, P 17, 499,240 23 - **For Bidding December 27, 2013**	The allocation for this project was realigned to finance the additional works at the RCBC Project along Don Bosco and Mojica Streets, Makati City, comprised of 3 phases, to wit: Phase I-Php 2,503,522.12 Phase II-Php 21,542,281.23 and Phase III-Php 1,254,956.42. The remaining balance of Php 17,499,240.23 was allocated for the dredging/deepening of Estero tripa De Galina. Except for RCBC Phase II which is on - going, all the above projects are completed.
Malabon City	
Proposed Improvement/Construction of Drainage System along Dagat-Dagatan Avenue, Longos, Malabon City	November 19, 2012
Mandaluyong City (Lone District)	
Drainage Improvement along P. Cruz St., Brgy. San Jose and Brgy. Zaniga, Mandaluyong City	November 7, 2012
Dredging of Creeks in Mandaluyong City	October 31, 2012
Proposed Drainage Improvement along P. Cruz at Brgy. San Jose, Mandaluyong City (Phase VII) sta.1+011-sta. 1+194	With Earmark, for Bidding
Manila	
Proposed Rehabilitarion of Relief Pumping Station at H. Lopez Blvd. Balut Tondo Manila	June 6, 2013
Proposed Riprapping/Dredging of Antipolo Creek, Tondo, Manila (Phase II) Dist. II	November 15, 2012
Proposed Desilting Along Fugoso Drainage Main, Sta. Cruz, Manila Dist. III	October 23, 2012

Metropolitan Manila Development Authority
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List of Flood Control Project 2012
As of June 2014

Name of Project	Date of Completion
Proposed Improvemen/Desilting along Visayan Drainage Main, Sampaloc, Manila District IV	October 16, 2012
Proposed Dredging along Estero De Sampaloc, Sampaloc, Manila District IV	July 24, 2012
Proposed Drainage Improvement and Maintenance along Estrada St. And Its Vicinity, Sta Ana Manila, District V	October 23,2012
Proposed concreting Inside Pandacan Station premises, City of Manila	September 19, 2012
6th District Manila, Proposed Drainage Improvement, and maintenace at Brgy. 590 and 591 and vicinity, Sta. Mesa Manila	Feb 5, 2014
Marikina City	
Proposed Drainage Improvement along Honda Street and Vicinity, Brgy. Malanday, Marikina City, District I	November 18, 2012
Proposed Drainage Improvement along Road III and Road V, Doña Petra, Brgy. Tumana, District II, Marikina City	Dec. 18, 2012
Proposed Restoration of Damaged Riprap along Usiw Creek, Brgy. Concepcion, Uno, Marikina City	September 14, 2012
Muntinlupa City	
Proposed Riprapping of River Including Improvement/Rehabilitation of Drainage System, Purok I, Cupang, Muntinlupa City	October 4, 2012
Proposed Construction/Rehabilitation of Flood Control Project at Brgy. Tunasan, Muntinlupa City	April 17, 2012
ProposedConstruction/Improvement/Rehabilitation of Drainage System, Summitville, Brgy. Putatan, Muntinlupa City	April 15, 2013
Construction/Rehabilitation of Flood Control Arandia and Rodriguez, Brgy. Tunasan, Muntinlupa City	April 1, 2013
Navotas City	
Proposed Improvement/Construction of Drainage System along Northbay Blvd. Navotas City	November 19, 2012
Proposed Improvement of Drainage System along Northbay Blvd., (Vifel-2 & Agora Left Side) and C-3 Road, Navotas City	Feb. 1, 2013
Parañaque City	
Proposed Contruction of Riprap/Desilting of Sapang Buwaya Creek, Green Heights Subdivision, Brgy. San Isidro, Paranaque City, District I	September 19, 2012
Proposed riprap Wall/Desilting of Sun Valley Creek Tributary (Intermittent) Brgy. Sun Valley, Paranaque City, Dist II	June 6, 2012
Proposed Riprapping/Desilting of Sapang Buwaya Creek, Fortunata Village Brgy. San Isidro, Paranaque City (Dist II)	March 21, 2012
Pasig City	
Proposed Riprapping Along Sapang Liwanag Creek, Brgy. San Miguel, Pasig City (Sta. 0+120 to Sta. 0+230, Left Bank), Phase III	Nov. 30, 2012
Pateros - Taguig Dist. I	
Proposed Drainage Improvement Along Masagana St., Brgy. Sta Ana, Pateros, Metro Manila	17-Nov-12
Quezon City	
Proposed Dredging along san Francisco River (Sta. 1+025 to Sta 1+250) District I, Quezon City	June 25, 2012
Proposed Riprapping and Dredging along Mariblo Creek, Dist. I, Quezon City	September 17, 2012

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List of Flood Control Project 2012
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Name of Project	Date of Completion
Proposed Drainage Improvement along Arayat Street, Barangay Nagkaisang Nayon, District II, Quezon City	Nov 12, 2012
Proposed Construction of Drainage System along Riosa St. Zytex Riosa Sub., Brgy. Pasong Tamo, District II, Q. C.	March 2,2012
Proposed Drainage Improvement and Concreting at Castelo Vile, Brgy. Bagbag, Dist. II, Q. C	January 27, 2013
Proposed Additional Reinforced Concrete Manholes with Cover along 15th Avenue, (Liberty to P. Tuazon Blvd., District III, Q. C.	September 27, 2012
Proposed Drainbage Improvement along Matulungin Street, Brgy. Central District IV Quezon City	June 26, 2012
Proposed Drainage Improvement along Sto. Tomas Extension and Vicinity, Brgy Doña Aurora, Dist. IV, Quezon City	July 27, 2012
Proposed Drainage Improvement along Scout Ojeda St., Brgy. Obrero, Dist. IV, Quezon City	July 16, 2012
Proposed Drainage Improvement along Mother Ignacia St. Brgy. South Triangle and along Tomas Morato Ave., Dist. IV, Quezon City	November 20, 2012
Pasay City	
Dredging/Desilting to the designed elevation of estero de sto nino at brgy 145, Pasay City	January 25, 2014
San Juan (Lone District)	
Proposed Pumping Station and Drainage Improvement at Brgy. Balong Bato, San Juan City	August 9, 2013
Proposed Pumping Station and Drainage Improvement at Brgy. Salapan, San Juan City	Feb. 28, 2014
Proposed Pumping Station at Brgy. Rivera, San Juan City	November 13, 2013.
Taguig District II	
Proposed Drainage Improvement along Block 18, Phase 2, Brgy. Pinagsama, Taguig City	November 10, 2012
Valenzuela City	
Proposed Repair and Rehabilitation of the Drainage System at Brgy. Malinta, Valenzuela City	May 6, 2013
Proposed Drainage Improvement at De Lupio St., Fortune I, Gen. T. De Leon, Dist II, Valenzuela City	January 15, 2013
Valenzuela City, 1st District Proposed raising of Existing Flood control Wall along Veinte Reales Creek, Dist. I, Valenzuela City (Php 1, 789,926.16)	December 25, 2013

Priority FC Special Projects 2012

Name of Project Location	Remarks
Proposed RCBC along Mojica and Don Bosco Street, Makati City	
Phase I	January 8, 2014
Phase II	On going
Phase III	January 15, 2014

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Flood Control and Sewerage Management Office
List of Flood Control Project 2012
As of June 2014

Name of Project	Date of Completion
Proposed Rehabilitation/Riprapping/Dredging /Deepening of Estero Tripa De Galina, Brgy Palanan, District I, Makati-Pateros River (Phase VI), Comembo, District II, Makati City	May 31, 2012
Proposed Repair/Rehabilitation of Riprap and Construction of Covered Lined Canal and Drainage System along Bayanan and Summit Circle Subd., *Bayanan, Muntinlupa City*	August 15, 2012
Proposed Drainage Improvement along Pearl St., Deva Village, Brgy. San Miguel and along Balesser St., Brgy. Signal , Taguig City	September 25, 2012
Proposed Widening/Riprapping along Veinte reales St., Veinte Reales, Dist I, Valenzuela City Philippine Guns Club, Marulas, Valenzuela City	September 20, 2012

Name of Project Location	Remarks
Proposed Riprap Along Hagonoy River, Brgy. Hagonoy, Taguig City	September 4, 2012
Proposed Construction of Pump House/Sump Pit and Installation of Pumps/Generator Set w/Control Panel and Appurtenances (Including Testing & Commisioning) along EDSA (Aurora Blvd P. Tauzon Underpasses) Quezon City	January 17, 2013
Proposed Dredging of Makiling Creek (Tributary of Valencia Creek), District IV, Q. C	July 25, 2012
Proposed Dredging/Deepening/Widenning and Bank Improvement along Talayan Creek and San Juan River (E. Rodriguez to Del Monte Avenue), Quezon City	January 26, 2013
Proposed Dredging/Deepenning/Widening and Repair/Construction of Riprap along Maricaban Creek (from South Super Highway to Retarding Pond)	October 30, 2012
Proposed Construction of Riprap and Desilting of Coastal Creek Brgy. Don Galo, Paranaque City	January 11, 2013
Proposed Restoration of Damaged Riprap along Usiw Creek, Brgy. Concepcion Uno Marikina City	September 14, 2012
Proposed Dredging of Marikina River from Rosario Weir to Marcos Highway Bridge Pasig City	74 % on-going

Proposed RCBC along Mojica and Don Bosco Street, Makati City, PHASE II
a.1 - Construction of RCBC along Osmeña Highway (North & South Bound) and RCBC across PNR
b.) Causes of Delay
b.1. - Time suspension due to·
b.1.a - Weather Condition
b.1.b - Acquisition of Permits & MOA between
b. 1.c -Underground Utilities to be relocated (Globe Lines) Located at Don Bosco St.,Cor. Estacion St.
b.1.d - Supplemental Agreement is not yet approved.(Osmeña Highway & PNR)

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FLOOD CONTROL AND SEWERAGE MANAGEMENT OFFICE

List of Flood Control Projects 2013

AS OF JUNE , 2014

Name of Projects	Date of Completion
District I – Drainage improvement/declogging of Juan Luna St. Tondo *Manila*	April 25, 2014
District II – Desilting/Cleaning of Estero De San Lazaro Tondo Manila	July 18, 2013
District III – Desilting of V. Fugoso drainage main, Sta. Cruz Manila	April 10, 2014
District IV – Improvement/desilting of Visayan drainage main Sampaloc Manila	June 19, 2013
District V – Drainage improvement along San Marcelino St. (Concepcion-Estero De Balite) Manila	June 17, 2013
District IV – Dredging of Estero De Pandacan, Pandacan Manila	July 21, 2013
District I – Improvement of Mariblo Creek, District I Quezon City	June 22, 2013
District II – Improvement of Ilang-Ilang Creek Quezon city	June 17, 2013
District III – Improvement of Duyan-duyan Creek Quezon City	July 3, 2013
District IV – Improvement of Valencia Creek Quezon City	June 21, 2013
Riprapping along Sapang Liwanag Creek, Phase II Marikina City	July 5, 2013
District I – Construction of floodgate at Provident Village Marikina City	November 18, 2013
District II – Drainage improvement along Road III, Dona Petra, Brgy. Tumana, District II, Marikina City	Sept. 5, 2013
Drainage improvement along P. Cruz St. (Phase V)	August 22, 2013
Drainage improvement along Katubusan St. Brgy. Rivera San Juan City	October 30, 2013
Dredging/Improvement of Pateros River	Oct. 17, 2013
Dredging and improvement of Pinagsama Creek, Taguig City	July 17, 2013
Drainage improvement along Gov. Pascual Potrero, Malabon	Aug. 1, 2013
Drainage improvement along Northbay Blvd.,Brgy. Bangkulasi Navotas City	July 25, 2013
District I – Riprapping of Camarin Creek Caloocan City	January 17, 2014
District II – Drainage improvement along TullinganSt. Caloocan City	April 9, 2014
District I – Desilting of Dulong Duhat Tangke St. Valenzuela	July 14, 2013
District II – Desilting of Marulas Creek, District II, Valenzuela City	August 15, 2013
District I – Dredging of Sta. Clara Creek, Makati City	July 5, 2013
District II – Improvement of riprap and dredging along Maya Creek, Makati City	July 3, 2013
Drainage improvement/floodgate at Vitas St. Tondo Manila.	Suspended due to Informal Settler
Improvement/riprapping with perimeter fence along North and South Antipolo Open Canal, Manila	November 18, 2013
Drainage improvement along Guadal Canal St. Phase II Sta. Mesa Manila	February 28 2013
Drainage improvement along Romualdez St. from U.N Avenue to Estero De Balite Ermita Manila	Suspended due to change of limits/station from the original plan & with moratorium for excavation
Drainage improvement along Banawe St. Quezon City	Sept. 15, 2013
Drainage improvement along Regalado St. District II, Quezon City	Sept. 20, 2013
Drainage improvement along 18th Avenue (20th Ave.- Boni Serrano Ave.) District III, Quezon City	Oct. 18, 2013
Improvement of San Juan River (Aurora Blvd. to E. Rodriguez Ave.) Quezon City	Aug. 16, 2013
Dredging/Riprapping along Concepcion Creek and Usiw-Bangkaan Creek, Brgy. San Roque, Marikina City Dist. I	November 3, 2013
Restoration of damaged riprap at intermittent section along Concepcion Creek Brgy. Concepcion Dos, Marikina City	October 11, 2013
Dredging of Marikina River downstream of Rosario Weir Pasig City	On - Going

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Name of Projects	Date of Completion
Riprapping of Sapang Liwanag, Brgy. Pinagbuhatan, Pasig City	October 20, 2013
Drainage improvement along Eustaquio St. Brgy. Progreso San Juan City	September 19, 2013
Drainage improvement along F. Ortigas St. Mandaluyong City	Negotation to private property owner in progress
Construction of gravity wall along Camarin Creek, Caloocan City	January 11, 2014
Bank improvement along Urduja Creek Caloocan City	January 23, 2014
Drainage improvement along Dagat-Dagatan Avenue Caloocan City	January 31, 2014
Dredging of Santolan Creek, Valenzuela City Dist. I	July 19, 2013
Dredging of Marulas Creek, District II, Valenzuela City	Aug. 15, 2013
Repair of gravity wall along Tullahan River, Valenzuela City	Sept. 8, 2013
Improvement of drainage system along Roxas Blvd. at the approach of Buendia Flyover and vicinity	Temporary suspended due to Maynilad Pipeline project
Dredging of Amorsolo Creek Brgy. San Antonio, Makati City	June 5, 2013
Dredging of Malabon River, Tanong Malabon City	May 22, 2013
Dredging of Navotas River, Bangkulasi, Malabon	July 11, 2013
Riprapping/desilting of Dahlig Creek, Brgy. San Dionisio Dist. I Paranaque City	July 16, 2013
Riprapping/desilting at Talon Creek Brgy. Talon, Las Pinas City	June 14, 2013
Riprapping/desilting of Poblacion River, Brgy. Poblacion, Muntinlupa City	Nov. 18, 2013
Flood Control at JPA Subd.,Brgy. Tunasan, Muntinlupa City	December 9, 2013
Riprapping/desilting of Sapang Buwaya, Brgy. Severina, Paranaque City	June 5, 2013
Riprapping/desilting of Sto. Rosario River, Brgy. Sto. Rosario, Silangan, Pateros	July 25, 2013
Riprapping of Daang Kalabaw Creek, Brgy. Hagonoy Taguig City	January 14, 2014
Drainage improvement along Block 18, Phase II, Brgy. Pinagsama, Taguig City	February 19, 2014

Note:
One project is on-going and other projects suspended because of change of limits / stations, the present of informal settlers, negotiation of private owner

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List of Flood Control Projects 2014

AS OF JUNE , 2014

NAME OF PROJECT LOCATION	% ON GOING	REMARKS
MANILA CITY		
DISTRICT I		
Drainage Improvement / desilting Buendia Main Outfall and vicinity of revetment wall along Estero de Sunog Apog		Preparation of Plans & POW
Proposed improvement / riprapping with perimeter fence along North and South Antipolo Open Canal Dist. I		Preparation of Plans & POW
Improvement / desilting of Revelment Wall Along Estero de Vitas, Tondo Manila District I		Schedule for Bidding w/ POW & Plans
DISTRICT II		
Drainage Improvement / desilting of Solis Tecson drainage main (Earnshaw to Antipolo st.) District II, Tondo Manila		Preparation of Plans & POW
Drainage Improvement along Abad Santos L = 115 Tondo Manila District II		
Drainage Improvement / installation of additional manhole and inlet along Tayuman (from Estero de San Lazaro to Abad Santos) Manila District II		Schedule for Bidding W/ Plans & POW
DISTRICT III		
Proposed construction of additional manhole and desilting of Antipolo drainage main Sta. Cruz, Manila Dist. III	30%	
Proposed drainage improvement along Rizal Ave. Sta. Cruz Manila district III	60%	
Desiltng of Severino drainage main, Quiapo Manila District III		Completed
DISTRICT IV		
Proposed Drainage Improvement along Ramon Magsaysay Blvd. Sampaloc, Manila Dist. IV	50%	
Proposed desilting of Washington-Piy-Margal drainage main, Sampaloc, Manila Dist. IV	90%	
Desilting of Josefina-Lepanto drainage main Sampaloc Manila Dist. IV		No NTP

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FLOOD CONTROL AND SEWERAGE MANAGEMENT OFFICE

List of Flood Control Projects 2014

AS OF JUNE , 2014

NAME OF PROJECT LOCATION	% ON GOING	REMARKS
DISTRICT V		
Drainage Improvement along Pasig Line (A. Francisco to Pedro Gil) District V, Manila		Preparation of Plans & POW
Drainage improvement along A. Francisco St. (Pasig Line St. to Tejeron) Manila District V	75%	
Drainage improvement along Onyx St. from Estrada to Francisco St., *Manila District V*		Preparation of Plans & Pow
Drainage improvement within Intramuros Area, Manila Dist. V		permit
Declogging of Line Canal along Taft Ave. (Pedro Gil to Padre Fuara) Manila		Preparation of Plans & POW
DISTRICT VI		
Deepening of Estero de Pandacan from Jesus St.- Zamora St., Pandacan Manila District VI	For Realignment to Drainage Improvement including restoration along Makisig St. and Vicinity Bacood, Sta.Mesa Manila	
Declogging of drainage lateral along Cagayan Syquia St. cor. Cagayan St. Sta. Ana Manila District V		
QUEZON CITY		
DISTRICT I		
Proposed drainage improvement along EDSA fronting Philippine Rabbit District I Quezon City	30%	
Drainae improvement along Commonwealth Ave. (cor. Winston St.) District I, Quezon City	33%	
Improvement of Mariblo Creek, District I, Quezon City	Mobilization	
DISTRICT II		
Proposed drainage improvement along Tandang Sora Ave. to Mindanao Ave. Banlat Road Dist. II, Quezon City		
Drainage improvement along Tandang Sora fronting New Era Elementary School Dist. II, Quezon City	95%	
DISTRICT III		

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NAME OF PROJECT LOCATION	% ON GOING	REMARKS
Proposed drainage improvement along Diego Silang St. and 20th Ave. Brgy. San Roque Dist III, Quezon City	85%	
Proposed drainage improvement along P. Gomez and Monterey St. Brgy San Roque Dist. III, Quezon City	80%	
Improvement of Buwaya Creek, Dist. III, Quezon City	20%	
DISTRICT IV		
Proposed drainage improvement along Scout Tuazon St. Brgy. Obrero Dist IV., Quezon City		January 3, 2014
Proposed drainage improvement along Scout Ojeda St. Brgy. Obrero Dist. IV, Quezon City		December 27, 2013
Drainage improvement along Elliptical Road Brgy. Old Capitol Site Dist. IV, Quezon City		December 26, 2013
MARIKINA CITY		
DISTRICT I		
Rehabilitation of existing pump at Provident Village (St. Mary's St.) Marikina City Dist I		Preparation of Plans & POW
Drainage improvement along Provident Village (St. Mary's St.) Phase II, Marikina City	18%	
Drainage improvement along Provident Village (St. Mary's St.) Phase I, Dist. I, Marikina City	16%	
DISTRICT II		
Drainage improvement along Angel Santos St Brgy. Tumana Marikina City	50%	
Riprapping of Tumana Creek Brgy. Tumana, Marikina City Dist. II	15%	
Drainage improvement along Gil Fernando St. to Marcos Highway, Dist. II, Marikina City		
PASIG CITY		
Riprapping along Kalawaan Creek (Kalawaan and San Joaquin) Pasig City		For Realignment to Riprapping of Buli Creek Brgy.

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List of Flood Control Projects 2014

AS OF JUNE , 2014

NAME OF PROJECT LOCATION	% ON GOING	REMARKS
Drainage improvement along Ortigas Ave. going to Floodway, Pasig City	Pinagbuhatan, Pasig City	
SAN JUAN CITY		
Construction of RCBC at Valenzuela Outfall (F. Blumentrit-Valenzuela, F. Manalo St. vicinity) San Juan City		No NTP
Drainage improvement along Katubusan and Domingo St. Brgy. Rivera, San Juan City		Schedule for Bidding POW. already Submitted
MANDALUYONG CITY		
Construction and raising of Haig Bridge Brgy. Daang Bakal, Bagong Silang, Mandaluyong City		
Drainage improvement along P. Cruz St. Brgy. San Jose, Mandaluyong City	20%	
CALOOCAN CITY		
DISTRICT I		
Drainage improvement along Zapote Road (from Road I to Caloocan Sub - City Hall) Caloocan City Dist. I		
Drainage improvement along Deparo Road, Dist. I Caloocan City		
DISTRICT II		
Drainage Imprvement along C-3 Road (from Dagat-Dagatan Ave. to Tanague Peripheral Canal) Caloocan City District II		
Drainage improvement along Dagat-dagatan Ave. (from Langaray to *Tanigue) Dist. II, Caloocan City*		
VALENZUELA CITY		
DISTRICT I		
Drainage improvement along Maysan Road, Phase II, Valenzuela City District I	For Realignment to Viente Reales Slope Proetection Viente Reales, Valenzuela City	
Drainage improvement along Maysan Road, Phase I Dist. I, Valenzuela City		Schedule for Bdding Pow already Submitted

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FLOOD CONTROL AND SEWERAGE MANAGEMENT OFFICE

List of Flood Control Projects 2014

AS OF JUNE , 2014

NAME OF PROJECT LOCATION	% ON GOING	REMARKS
DISTRICT II		
Construction of drainage system along Mac Arthur Highway, Phase II, Valenzuela City		
Construction of drainage system along Mac Arthur Highway,Phase I, Valenzuela City		
PASAY CITY		
Proposed improvement of drainage system along Roxas Blvd. Pasay City	Mobilization	
Drainage improvement along Taft Ave., cor. Protacio St. to Sanches St. Pasay City	Mobilization	
Drainage Improvement along F.B. Harrison st. Pasay City	15%	
MAKATI CITY		
DISTRICT I		
Proposed dredging of Amorsolo Creek, Brgy. Bangkal Makati City	Mobilization	
Riprapping / deslting of Maricaban Creek, (Pasong Tamo to Mckinley St.) Makati City	35%	
Riprapping / desilting of Calatagan Creek, Dist I, Makati City		Completed
DISTRICT II		
Drainage improvement at C5 Kalayaan Makati City	20%	
Riprapping / dredging of Balisampan Creek Guadalupe Viejo, Makati City	30%	
Riprapping / dredging along Makati-Pateros River Phase VIII	Mobilization	
PATEROS		
Drainage improvement / road upgrading along Rayos Del Sol St. Brgy. Sta. Ana, Pateros	15%	
Drainage improvement and upgrading along Bagong Calzada St. Pateros, Manila		For Implementation. No NTP

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AS OF JUNE , 2014

NAME OF PROJECT LOCATION	% ON GOING	REMARKS
MALABON CITY		
Deepening of Malabon River, Concepcion, Malabon City		Approved Contract. For NTP Approval
Improvement of drainage system along Dagat-Dagatan and Lapu-Lapu Ave., Longos Malabon City		Approved Contract. For NTP Approval
NAVOTAS CITY		
Deepening of Navotas River Northbay Blvd., Navotas City		
Improvement of drainage system along Northbay Blvd. (Fravel) Navotas City		For Approval of Contract
PARAÑAQUE CITY		
DISTRICT I		
Drainage improvement / cleaning and declogging at Evacon-Canaynay St. going to Sucat Rd. infront o Lianas Market Dist. 1 Parañaque City		
Rehabilitation of riprap wall along Dongalo Coastal Canal, Brgy Tambo, District I Parañaque City		January 28, 2014
Riprapping / desilting along Villanueva Creek at UPS V. Parañaque City disttrict I		January 15, 2014
DISTRICT II		
Riprapping / desilting along Tributaries of Baloc-Baloc Creek Brgy. Moonwalk Parañaque City		January 3, 2014
Riprapping / desilting along Sapang Buwaya Tributaries Brgy. San Antonio Dist. II, Parañaque City		
Riprapping / desilting along Sun Valley Creek, Airport Village Brgy. Moonwalk Dist. II, Parañaque City		January 6, 2014
LAS PIÑAS CITY		
Drainage improvement along Quirino Ave. going to Aldana St., Las Piñas City		Preparation of Plans & POW
Drainage improvement along Quirino Ave. Near Naga Road going to Golden Haven Las Piñas City		January 28, 2014

Metropolitan Manila Development Authority

FLOOD CONTROL AND SEWERAGE MANAGEMENT OFFICE

List of Flood Control Projects 2014

AS OF JUNE , 2014

NAME OF PROJECT LOCATION	% ON GOING	REMARKS
Construction of riprap wall along Naga Creek, Brgy. Pulang Lupa Dos Las Piñas		
Rehabilitation of Riprap wall along Tributaries of Pasong Baca Creek, Brgy. Talon V, Las Piñas City		January 3, 2014
Drainage improvement along J.P. Rizal St. going to Alabang-Zapote Road Las Piñas City		
MUNTINLUPA CITY		
Drainage improvement at Liberty Homes Brgy. Cupang Muntinlupa City	86.66%	
Riprapping / desilting along Pasong Diablo River Brgy. Cupang, Muntinlupa City		
Riprapping / desilting at Magdaong River, Brgy. Sto. Niño, Muntinlupa		No NTP
Covered line canal along PNR site, Putatan, Muntinlupa City		January 6, 2014
TAGUIG CITY		
Dredging of Panday Pira Creek, Brgy. Ligid Tipas vicinity Taguig City		Approved Contract for NTP Approval
Dredging of Sto. Rosario Creek Brgy Ligid Tipas vicinity Taguig City		Approved Contract for NTP Approval
Repair / rehabilitation of Floodgate Brgy. Napindan Taguig City		Preparation of Plans. & POW
Drainage improvement along Gen. Espino St. Brgy. Central Signal, Taguig City		No NTP