International Centre for Water Hazard and Risk Management

9th GEOSS Asia Pacific Symposium

THE RESILIENT ARCHIPELAGO:

THE CASE OF DISASTER RISK MANAGEMENT IN THE PHILIPPINES

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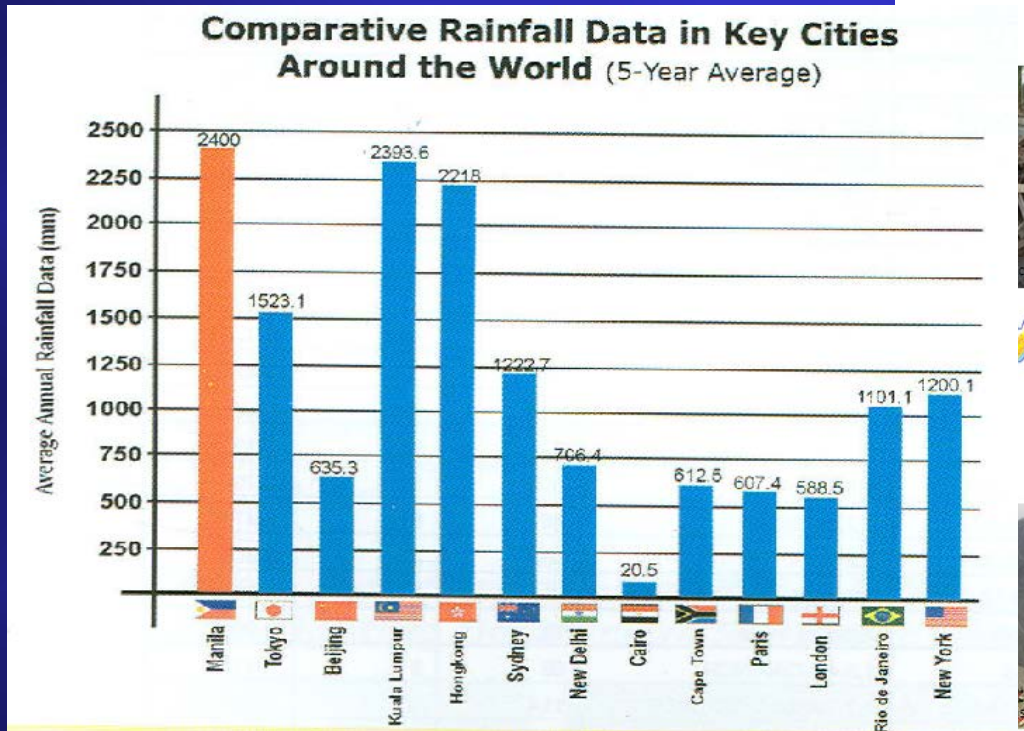
Outline of Presentation

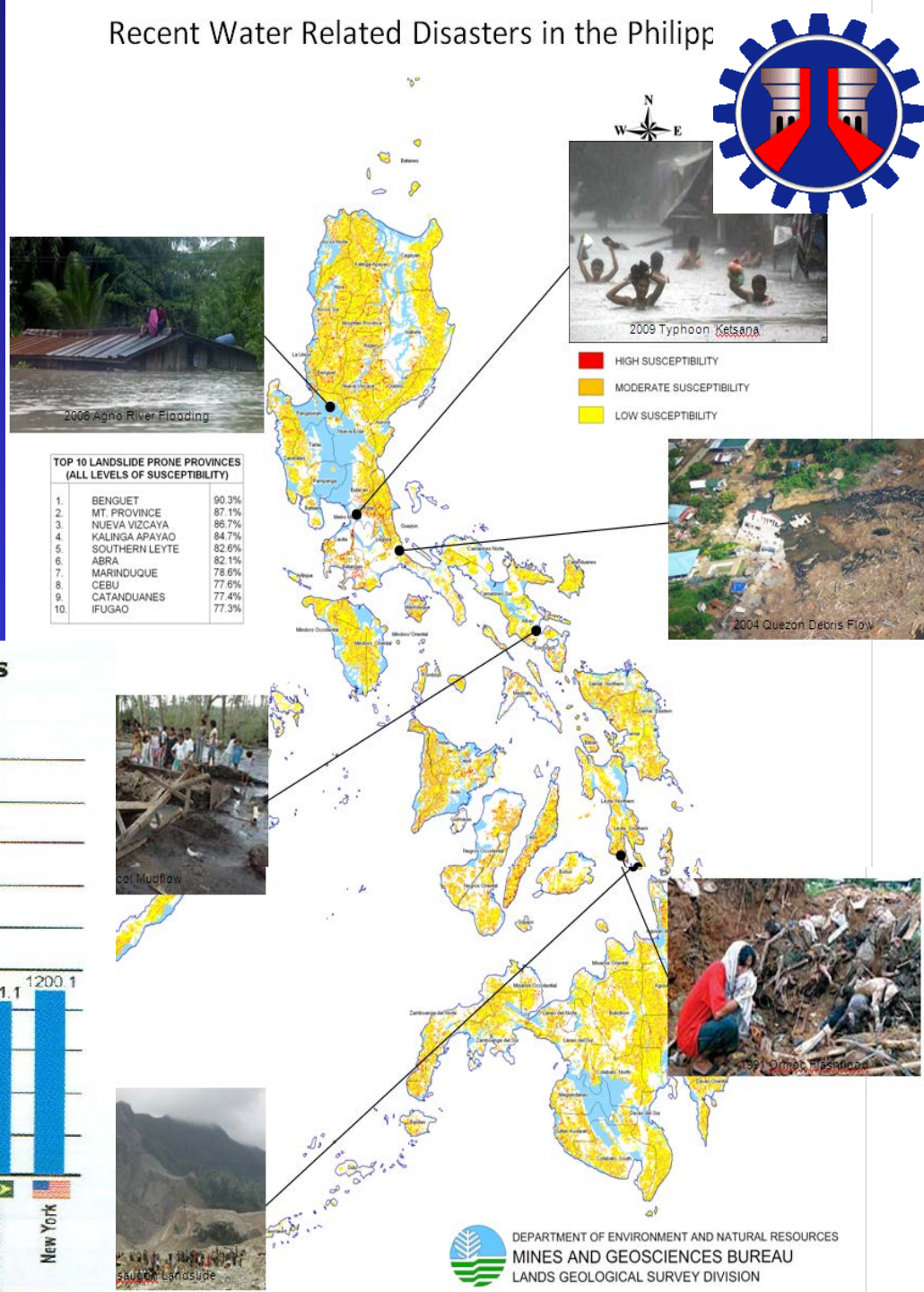
1. Overview
   - Philippines' Disaster Scenario
   - Impact of Natural Disasters
   - Natural Disasters in the Philippines: *The Force That Knows No Boundaries*
2. Policy Frame Work and Key Directions
   - Legal Framework
   - Mandate of DPWH
   - Other DPWH Policy Initiatives
3. Actions to Mitigate Flooding
   - Nationwide, Medium Term Projects
4. Challenges
   - Metro Manila, Long Term Projects/ Pipeline Projects
   - Other Long Term Programs

The Philippines

Water-Related Disaster Data

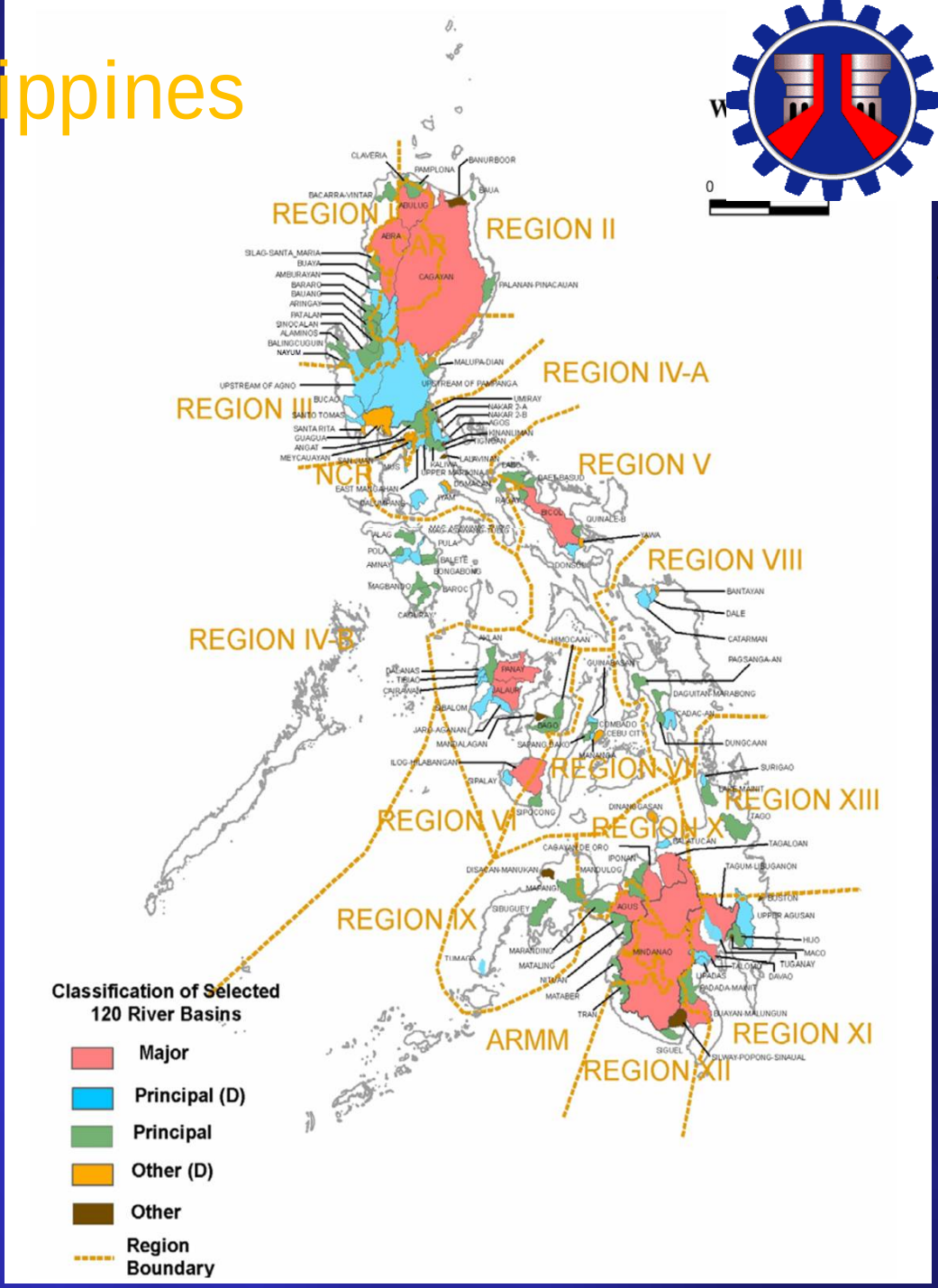
- 7, 107 islands
- Land Area : 298,170 km^2
- Population : 105 Million
- Annual rainfall : 2,400 mm





River Basins in the Philippines

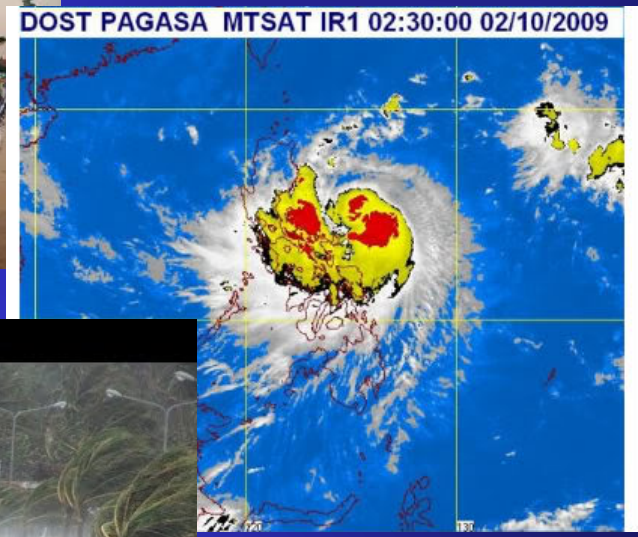
- 18 Major River Basins
  - Catchment Area > 1,400 km^2
- 421 Principal River Basins
  - Catchment Area > 40 km^2
- With intense rainfall:
  - ✓ overflowing of waterways
  - ✓ inundation and deposition of sediment in flood plains
  - ✓ extensive flood damages often result.



The Philippines

World Risk Index		
Rank	Country	Risk (%)
1	Vanuatu	36.28
2	Tonga	29.33
3	Philippines	26.7
4	Guatemala	19.88
5	Bangladesh	19.17
6	Solomon Islands	19.14
7	Brunei Darussalam	17
8	Costa Rica	17
9	Cambodia	16.58
10	Papua New Guinea	16.43
11	El Salvador	16.05
12	Timor-Leste	15.69
13	Mauritius	15.53
14	Nicaragua	14.62
15	Guinea-Bissau	13.56
148	Germany	2.95
157	Israel	2.3
158	Egypt	2.29
159	Singapore	2.27
160	Finland	2.21
161	Norway	2.19
162	Sweden	2.12
163	United Arab Emirates	1.97
164	Kiribati	1.78
165	Bahrain	1.69
166	Iceland	1.52
167	Grenada	1.42
168	Barbados	1.32
169	Saudi Arabia	1.14
170	Malta	0.6

- Philippines ranks 3rd in the World Risk Index



PHILIPPINES: WORLD RISK INDEX,2011-2016

Year	Rank	World Risk Index	Exposure	Vulnerability	Susceptibility	Lack of Coping Capacities	Lack of Adaptive Capacities
2011	3	24.32%	45.09%	53.93%	34.99%	82.78%	44.01%
2012	3	27.98%	52.46%	53.35%	33.92%	83.09%	43.03%
2013	3	27.52%	52.46%	52.46%	33.74%	80.47%	43.16%
2014	2	28.25%	52.46%	53.85%	33.35%	80.03%	48.17%
2015	3	27.98%	52.46%	53.33%	32.00%	80.06%	47.94%
2016	3	26.70%	52.46%	50.90%	31.83%	80.92%	39.96%

It is no longer about a country's exposure to natural disasters but the capacity to build back, stand up and move forward from the adversities

PHILIPPINES

Impact of Disasters (Typhoons and Flooding)

- Economic Cost of the Damages

Table 1 : Top 10 natural Disasters in the Philippines for the Period 1900 to 2014 sorted by Economic Damage Costs :		
Disaster	Date	Damage (000 US $)
Storm	08/11/2013	10'000'000
Flood	13/08/2013	2'190'000
Storm	04/12/2012	898'352
Flood	04/09/1995	700'300
Storm	29/09/2009	585'379
Storm	12/11/1990	388'500
Earthquake (seismic activity)	16/07/1990	369'600
Storm	24/09/2011	344'173
Storm	21/06/2008	284'694
Storm	18/10/2010	275'745
Source : "EM-DAT : the OFDA/CRED International Disaster Database www.em-dat.net - Universite Catholique de Louvain - Brussels - Belgium		

Impact of Disasters

- Number of Affected Population

Table 2 : Top 10 Natural Disasters in the Philippines for the Period 1900 to 2014 sorted by Numbers of Total Affected People :		
Disaster	Date	No Total Affected
Storm	08/11/2013	16'106'807
Storm	04/12/2012	6'246'664
Storm	12/11/1990	6'159'569
Storm	24/09/2009	4'901'763
Storm	21/06/2008	4'785'460
Storm	29/09/2009	4'478'491
Flood	06/08/2012	4'451'725
Storm	21/10/1998	3'902'424
Storm	27/09/2006	3'842'406
Storm	20/11/1973	3'400'024
Source : "EM-DAT : the OFDA/CRED International Disaster Database www.em-dat.net - Universite Catholique de Louvain - Brussels – Belgium		

Impact of Disasters (Typhoons and Flooding)

- Number of Deaths

Table3 : Top 10 Natural Disasters in the Philippines for the period 1900 to 2014 sorted by Numbers of Deaths :		
Disaster	Date	No of Deaths
Storm	08/11/2013	7'986
Earthquake (seismic activity)	16/08/1976	6'000
Storm	05/11/1991	5'956
Earthquake (seismic activity)	16/07/1990	2'412
Storm	04/12/2012	1'901
Storm	29/11/2004	1'619
Storm	13/10/1970	1'551
Storm	15/12/2011	1'439
Storm	01/09/1984	1'399
Storm	30/11/2006	1'399
Source : "EM-DAT : the OFDA/CRED International Disaster Database www.em-dat.net - Universite Catholique de Louvain - Brussels - Belgium		

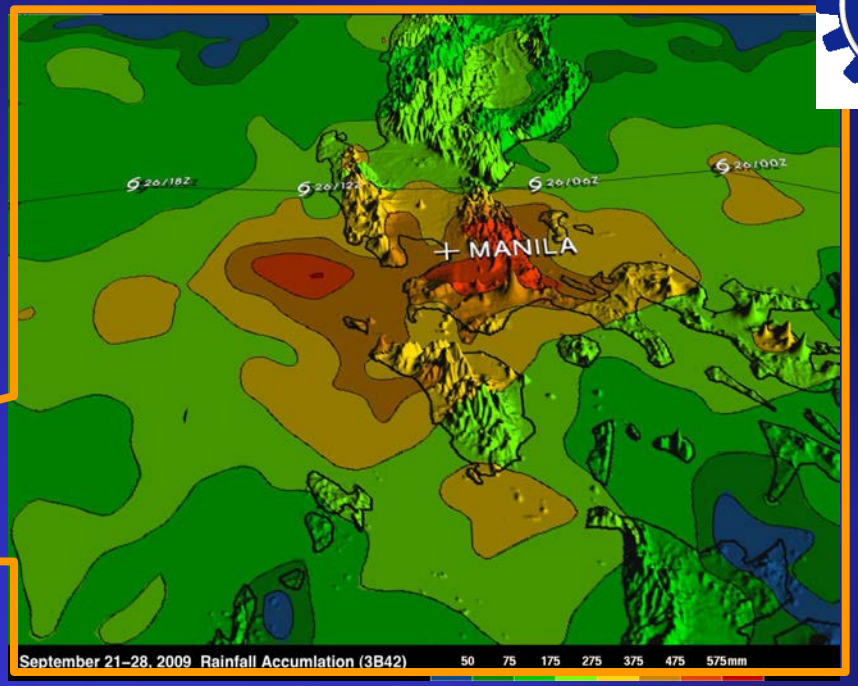
Natural Disasters in the Philippines:

The Force That Knows No Boundaries

- On the average 20 typhoons frequent the Philippines annually
- Climate Change has caused the unprecedented shift of the Philippine Typhoon Belt from Batanes and Bicol Region to the Visayan Region
- Pacific-Visayas-West Philippines Sea Path of Typhoons
- Approximately 4 to 5 have speeds of up to 220 kph classifying them as category 4 or 5 typhoons
- 60% Increase in Wetness (Wet Season)
- 60% Increase in Dryness (Dry Season)

Luzon 2009

Typhoon Ondoy (Ketsana)



- Tropical Rainfall Measuring Mission (TRMM) / NASA – Multi Satellite Precipitation Analysis (MPA) showed Typhoon 'Ketsana' poured 575mm of rainfall (6hr Rainfall)
- Monthly Ave. (September) rainfall record in manila was poured over in 1 day.

2009 Luzon Flooding

Typhoon Ketsana (26 Sept 2009)

Luzon: 2009

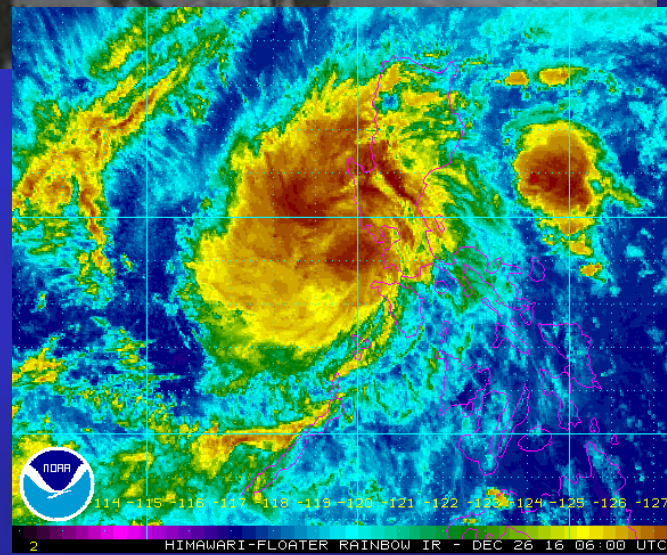
Typhoon Pepeng (Parma)

- Destroyed 5,486 barangays in Regions I, II, III, V, VI, CAR and NCR
- Disrupted the lives of about 15,000 people
- Claimed the lives of about 500 Filipinos
- Damages: Php 27 Billion

Luzon: 2016

Typhoon Nina (Nock-Ten)

- Category 5 Typhoon
- Caused Havoc to portions of CALABARZON, MIMAROPA, the Bicol Region and portions of Eastern Visayas
- Agricultural and Infrastructure Damage is approximated to Php 681 Million
- Affected 206,812 families
- No. of Deaths: 9 fatalities, 10 missing
- In Bicol Region: 30,897 houses were damaged



Visayas: 2008

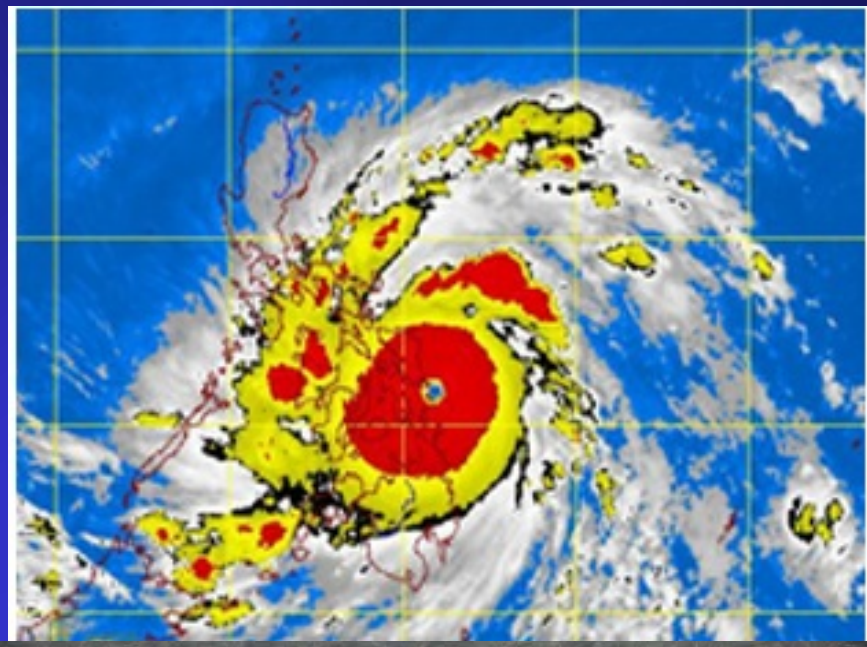
Typhoon Frank (Fengshen)

- Agricultural Damage: Php 7.5 Billion
- Infrastructure Damage: Php 5.9 Billion
- Affected: 4,784,634 persons
- Death: 1403 including victims of the capsizing of MV Princess of the Stars
- 87 missing, 826 injured

Visayas: 2013

Typhoon Yolanda (Haiyan)

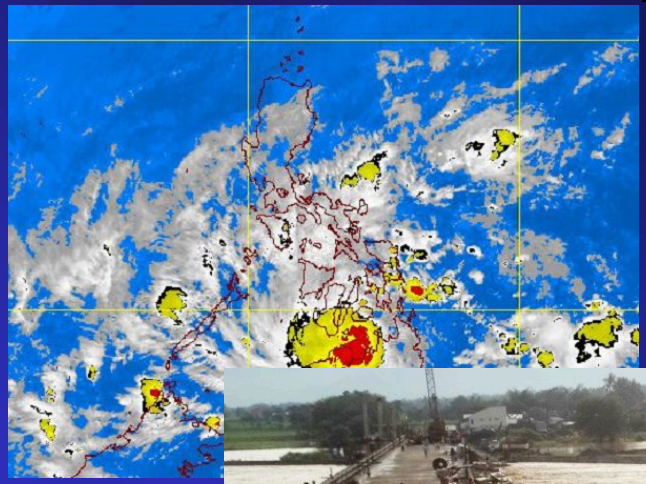
- Category 5: max sustained wind of up to 315kph and gustiness of up to 279kph
- Affected Population: 16 Million
- Total Deaths: 6,300
- Displaced People: 4.1 Million
- Damages (houses) 1.1 Million
- The Deadliest Typhoon that has ever set foot in Philippine Land



Mindanao: 2011

Typhoon Sendong (Washi)

- Most destructive tropical storm in 2011
- Death: 1,268
- Affected 131,618 families
- Affected Area: Regions VI,VII,IX,X,XI, CARAGA and ARMM
- Hard Hit: Cagayan de Oro City (Misamis Oriental) and Iligan City (Lanao del Norte)
- Total Damages: Php 2 Billion



Policy Framework and Key Directions

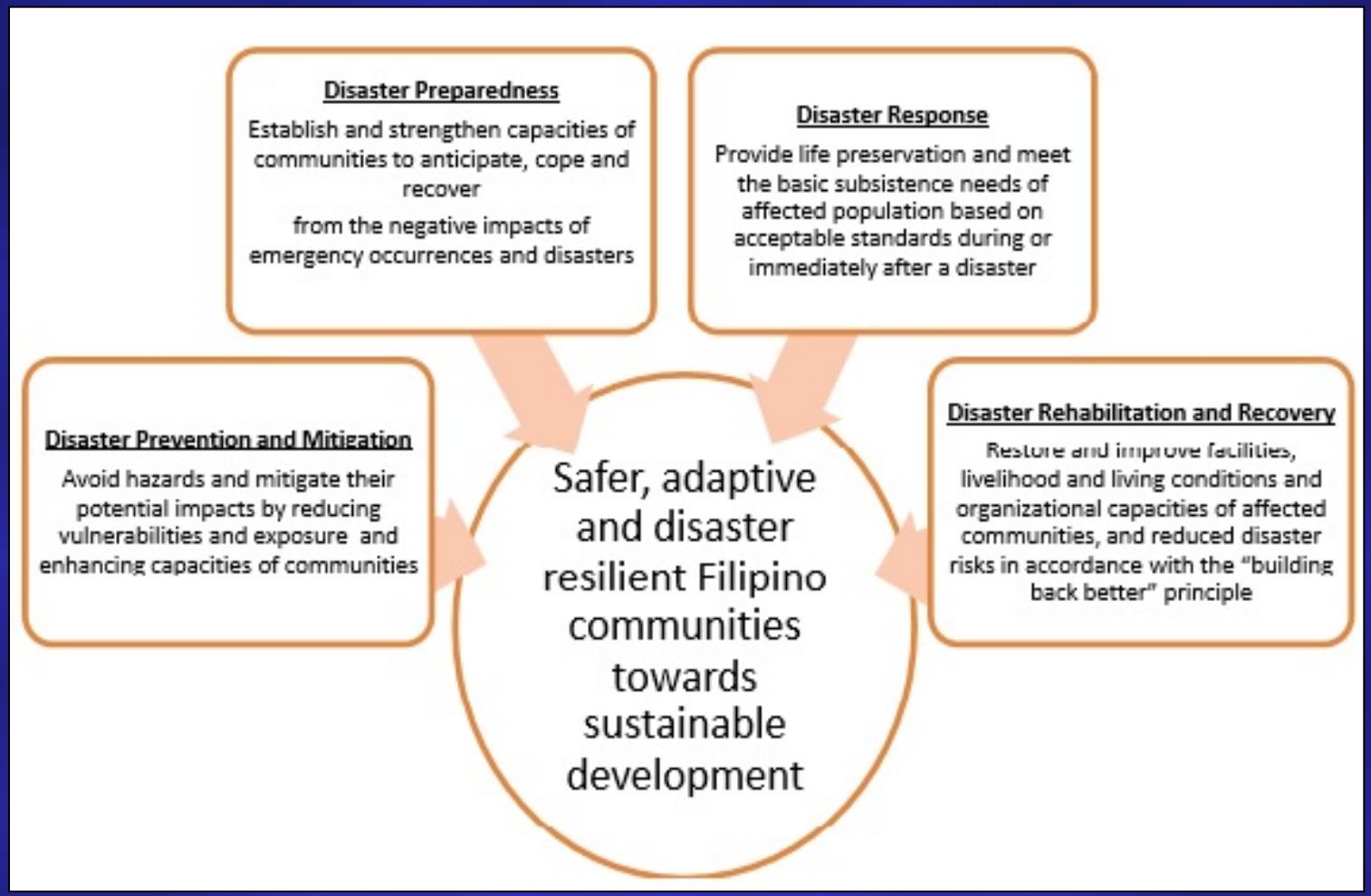
National Disaster Risk Reduction and Management in the Philippines

1. Legal Framework

- Republic Act 10121 or the Philippine Disaster Risk Reduction and Management Act (May 2010)
- Created in response to the global call of mainstreaming Disaster Risk Management and Climate Change Adaptation
- It is a holistic, integrated, proactive and collaborative approach to Disaster Management
- Vision: Safer , Adaptive and Disaster Resilient Filipino Communities towards Sustainable Development (National Risk Reduction Plan 2011-2028)
- The agency who shall coordinate amongst other concerned agencies for the attainment of this goal is the National Disaster Risk Reduction and Management Council (NDRRMC)

Policy Framework and Key Directions

National Disaster Risk Reduction and Management in the Philippines



Policy Framework and Key Directions

The Mandate of the Department of Public Works and Highways

1. Mandate of DPWH

- The Government's champion in engineering and construction; responsible for the planning, design, construction and maintenance of infrastructure facilities particularly, national highways, flood control and water resource development systems and other public works (PIDS, 2001).

2. DPWH on Disaster Risk Reduction and Management

- Disaster Prevention and Mitigation
- Disaster Rehabilitation and Recovery.

Policy Framework and Key Directions

The Mandate of the Department of Public Works and Highways

Thematic Area 1: Disaster Prevention and Mitigation

Overall responsible agency: Department of Science and Technology (DOST)

Outcome	Lead agency(ies)
1. DRRM and CCA mainstreamed and integrated in national, sectoral, regional and local development policies, plans and budget	Office of Civil Defense (OCD)
2. DRRM and CCA-sensitive environmental management	Department of Environment and Natural Resources (DENR)
3. Increased resiliency of infrastructure systems	Department of Public Works and Highways (DPWH)
4. Enhanced and effective community-based scientific DRRM and CCA assessment, mapping, analysis and monitoring	OCD
5. Communities access to effective and applicable disaster risk financing and insurance	Department of Finance (DOF)
6. End-to=end monitoring (monitoring and response), forecasting and early warning systems are established and/or improved	Department of Science and Technology (DOST)

Policy Framework and Key Directions

The Mandate of the Department of Public Works and Highways

Thematic Area 4: Disaster Rehabilitation and Recovery Overall responsible agency: National Economic and Development Authority (NEDA)	
Outcome	**Lead agency(ies)**
20. Damages, losses and needs assessed	OCD
21. Economic activities restored, and if possible strengthened or expanded	Agency to be determined based on the affected sectors
22. Houses rebuilt or repaired to be more resilient to hazard events; safer sites for housing	National Housing Authority (NHA)
23. Disaster and climate change-resilient infrastructure constructed/reconstructed	DPWH
24. A psychologically sound, safe and secure citizenry that is protected from the effects of disasters is able to restore to normal functioning after each disaster	DOH and DSWD

Policy Framework and Key Directions

Other DPWH Policy Initiatives

1. Flood Management Master Plan

- Prioritize the construction of flood structures in highly flood prone areas

2. Bureau of Design Upgrades on Flood Control and Drainage Standards

a) Min. flood return periods of drainage pipes (15 yr flood); esteros/creeks (15 yr flood);

b) principal and major rivers (50 yr flood)

3. Construction of vital infrastructures for flood mitigation and management

4. Reducing flood risk in floodplains through revisiting building code enforcement, i.e., adapting in the National Building Code, the flood provisions of the 2015 International Building Code

5. Reducing flood risk through Sustainable Urban Drainage Systems (SUDS) in urban watersheds

Completed and On-going Initiatives

DPWH Efforts to Mitigate Flooding

Completed and Ongoing Flood Control Projects

Pasig – Marikina River Improvement

Ormoc Flood Mitigation Project

Anilao Slit-Type Sabo Dam

Pinatubo Groundsills

Camiguin Sabo Dam

KAMANAVA Flood Control Project

Actions to Mitigate Flooding (Medium Term)
Completed and On-going Projects- Luzon

Southwest Mega Dike

Objective:

Prevent the frequent mudflow/flood disasters in the Pasig Potrero River Basin in the Luzon Central Plan through engineering works (dikes)

PINATUBO HAZARD URGENT MITIGATION PROJECT PHASE II

Actions to Mitigate Flooding (Medium Term) Completed and On-going Projects- Luzon

Closure Dike

Agno River
(post improvement)

T-Head Spur Dike

Objective:

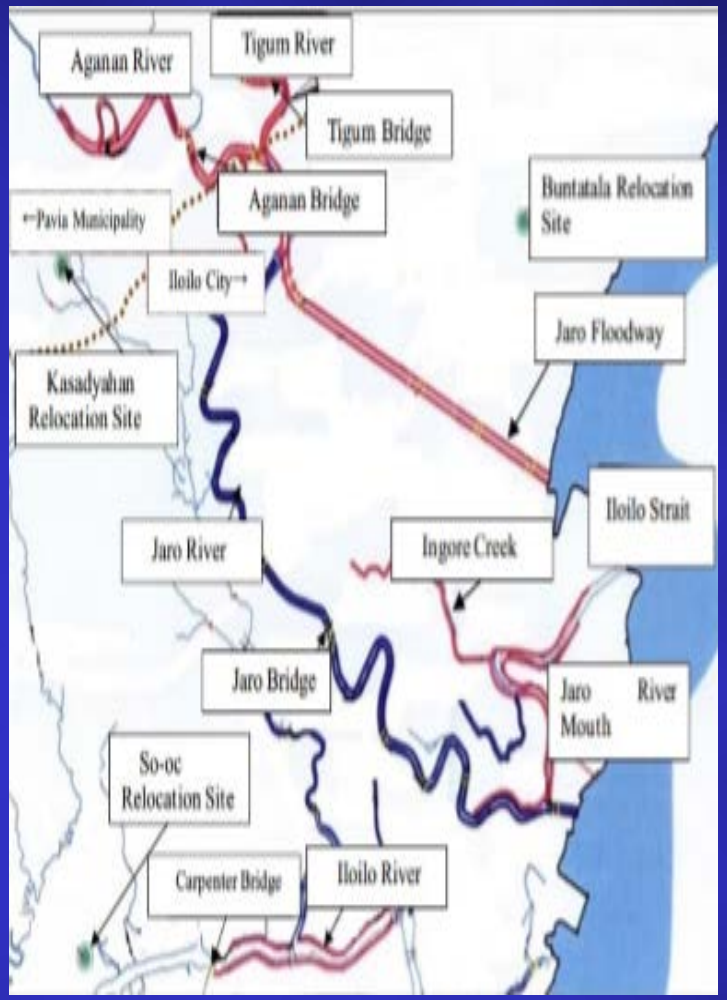
Reduction of Flood Damage in the Project Area by Constructing Floodway and diversion structures, river improvement and construction of bridges

AGNO RIVER FLOOD CONTROL PROJECT PHASE II

Actions to Mitigate Flooding (Medium Term)
Completed and On-going Projects- Visayas

Tigum River
with River Improvement
Works

Jaro Floodway



Development Plan

Objective:

Reduction of Flood Damage in the Project Area by River Improvement Works for Aganan River, Tigum River, Jaro River, Ingore Creek and Construction of a Floodway

ILOILO FLOOD CONTROL PROJECT I & II

Actions to Mitigate Flooding (Medium Term) Completed and On-going Projects- Mindanao

Agusan River Basin

Flood Sluice Gate

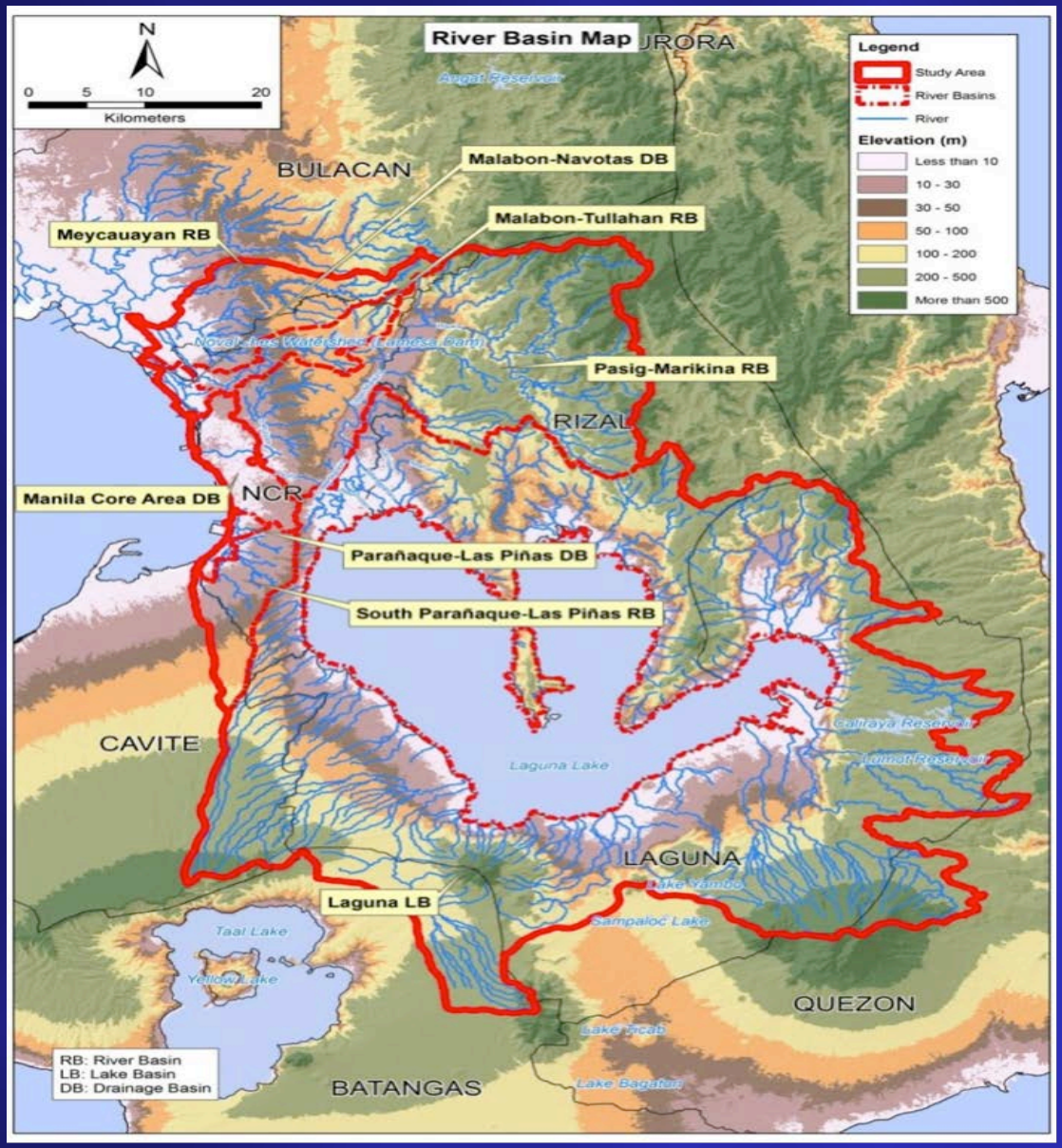
Objective:

Reduction of Flood Damage in the Project Area by, in Phase I, Embankment Levee, Construction of Floodwall, Dredging Works, Urban Drainage System Construction of Flood Gates and Soil Bank Yard Treatment. Phase II included the Improvement of the West Banks, Construction of Magsaysay Viaduct, Banza River Improvement and the Masao River and Urban Drainage System Improvement

LOWER AGUSAN FLOOD CONTROL PROJECT

Long Term Flood Control Projects for Metro Manila

METRO MANILA FLOOD RISK MANAGEMENT MASTER PLAN



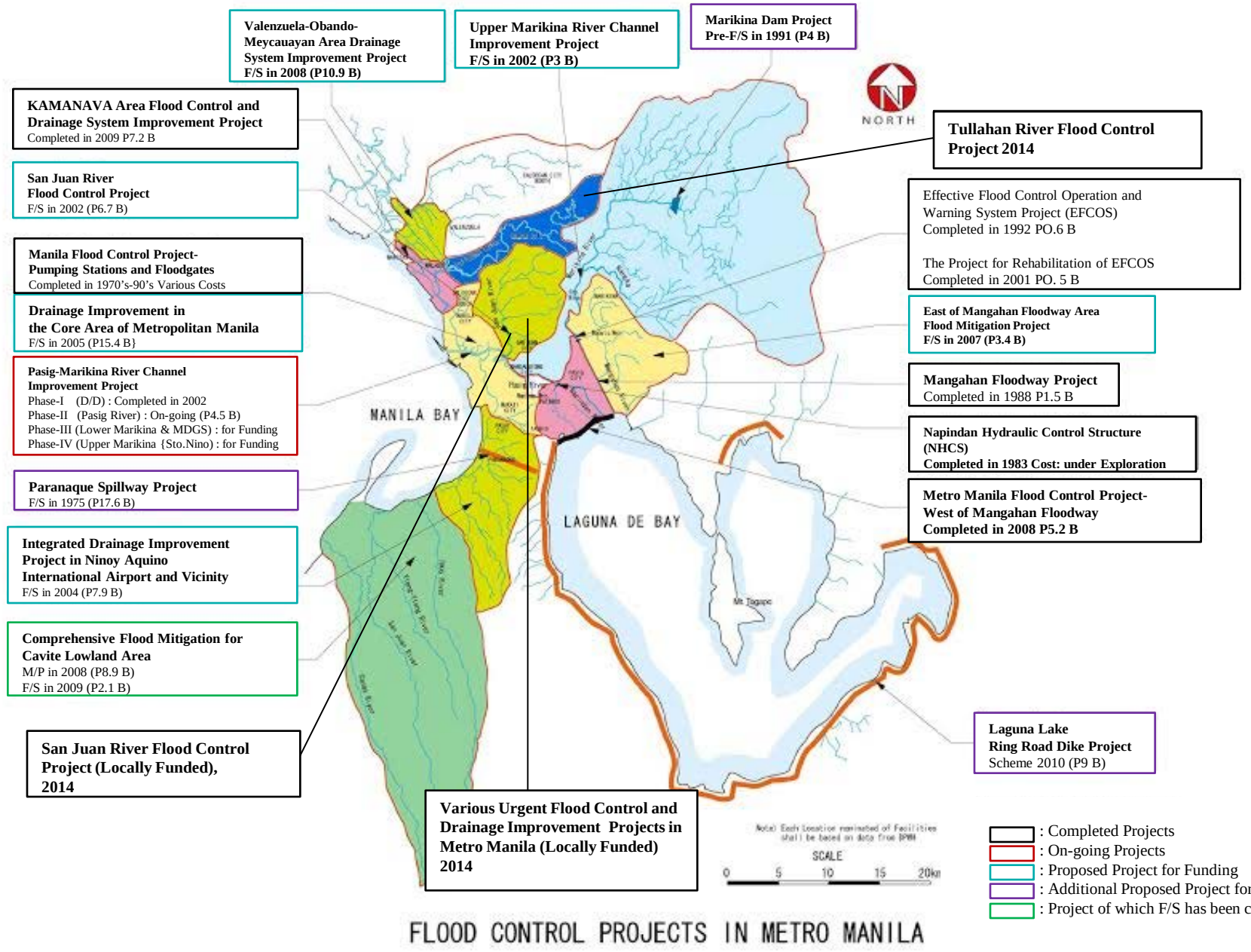
Vision: to provide a long term solution to flooding through structural and non-structural measures.

Timeline: 2011 to 2035

Structural Measures: Major Water Impounding Dams, Retarding Basins, Drainage Improvements, River Wall Construction, Dredging, Desilting, Sea Wall Construction and Upgrading of Existing Pumping Stations and Road Dikes

Non-Structural Measures: flood modelling, forecasting and warning systems, community awareness and information campaign and the resettlement of over 100,000 families living in informal settlements and along the vulnerable water ways

Long Term Flood Control Projects for Metro Manila



FLOOD CONTROL PROJECTS IN METRO MANILA

Long Term Flood Control Projects for Metro Manila

LAGUNA LAKE FLOOD CONTROL PROJECTS

East Manggahan Floodway Project

Objectives: Flood mitigation in the eastern area of Manggahan Floodway against the intrusion of Laguna lake water and floods of Buli, Cainta and Taytay rivers

Components: Construction of Slope Protection along Cainta and Taytay Rivers (9.2km); Restoration of Damaged Slope Protection along Marikina River (45m); Rehabilitation of Tullahan River (387m), Repair of Damaged Slope Protection along Lakeshore Dikes, and Construction and Repair of Napindan Revetment Wall (136m)

Extension West of Manggahan Floodway

Objectives: Flood mitigation in the eastern area of Manggahan Floodway against the intrusion of Laguna lake

Components: This will be a 47 km flood control dike, with six(6) lane expressway. The project shall include the construction of interchanges fridges, floodgates and pumps from Taguig to Los Banos

Parañaque Spillway

Objectives: Shortening the duration of flooding along the Laguna Lakeshore area by discharging the lake water to Manila Bay

Components: Open channel (partly arched tunnel of 200m) of 8.3km connecting Laguna Lake to Manila Bay together with control gate

Long Term Flood Control Projects for Metro Manila

LAGUNA LAKE FLOOD CONTROL PROJECTS

San Juan River Flood Control Project

Objectives: Flood mitigation in the eastern area of Mangahan Floodway against the intrusion of Laguna lake water and floods of Buli, Cainta and Taytay rivers

Components: Protection of San Juan and Quezon cities from the overflow flood of less than a 30-year return period

Various Flood Control and Drainage Improvement Projects in Metro Manila

Objectives: Prevention of perennial flooding in the core area (73km2) of Metro Manila

Components: Rehabilitation of drainage channel and pumping stations, and construction of additional channels and pumping stations

Marikina Dam Project

Objectives: Regulation of floods from Marikina Watershed to 2,900m3/s at Marikina Bridge (a 30-year return period flood)

Components: 70m high concrete gravity type dam at Montalban gorge. With 200ha of reservoir, a 100-year flood is regulated to be a 30-year flood.

Long Term Flood Risk Management Initiatives

- Prioritization of Master Planning amongst other studies for the seven (7) Major River Basins that have no Master Plan yet
- Inventory and thorough review of all studies conducted for the 18 Major River Basins and including those for immediate implementation in the pipeline
- Review and strict implementation of the resettlement laws and policies ensuring that there will be no settlement in proximity to water ways

Long Term Flood Risk Management Initiatives

- GIS-based digitization of the whole Metro Manila drainage networks
- Review of the allocation of funds for disaster risk reduction by the Local Government Units (LGUs)
- Creation of Environmental Crimes Strike Force under the Philippine National Police (PNP)
- The framework of Disaster Risk Reduction and Management should consider institutionalizing a feedback mechanism through a strict conduct of post disaster assessment

THANK YOU!