THE REPUBLIC OF THE PHILIPPINES

DATA COLLECTION SURVEY FOR STRATEGY DEVELOPMENT OF DISASTER RISK REDUCTION AND MANAGEMENT SECTOR IN THE REPUBLIC OF THE PHILIPPINES

FINAL REPORT

FEBRUARY 2017

JAPAN INTERNATIONAL COOPERATION AGENCY

ORIENTAL CONSULTANTS GLOBAL CO., LTD.
CTI ENGINEERING INTERNATIONAL CO., LTD.
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Data Collection Survey for Strategy Development of Disaster Risk Reduction and Management Sector in the Republic of the Philippines

Summary

Background and Objectives: The JICA cooperation strategy on DRRM formulated in 2008 included the promotion of non-structural measures such as the support for policy making and community enhancement based on the Hyogo Framework for Action (HFA) adopted in 2005 into the conventional cooperation projects mainly focusing on the implementation of structural measures. Since then, both Japan and the Philippines have experienced catastrophic disasters such as the Great East Japan Earthquake and Typhoon Yolanda, and both countries undertook efforts to respond and rebuild from unexpected and extraordinary disasters.

Other countries have also experienced several catastrophic disasters, and new frameworks such as the Sendai Framework for DRR (SFDRR) were agreed and some targets to achieve their goals are being discussed through recently conducted international dialogues. From those international trends, several well-known keywords arose such as “Mainstreaming DRR” and “Build Back Better: BBB” which were originally used in Japan.

Based on the consideration of the Philippines’ situation and international trends, this study was conducted in order to review and renew JICA’s strategy in the DRRM sector of the Philippines through the strengthening of the consistency between JICA’s strategy and Government of the Philippines’ DRRM policy.

The major results of the study are shown below.

Disaster Risks in the Philippines: The number of natural disasters and the number of affected people have increased recently. The disaster risk in Metro Manila and other highly urbanized areas is increasing and the vulnerability against disaster risk is also high in rural regions of which economic conditions are comparatively poor or low.

International Trends on DRRM: In the 1990s, the importance to shift from a post disaster emergency response and recovery into a pre-disaster mitigation and prevention approach was advocated; and in the 2000s, the term “DRR mainstreaming” started to be used by the international community. Even with the adoption of HFA, priorities were still set on disaster response and early warnings, and the reduction of damage (especially economic losses) during recent large scale disasters was limited. Under such circumstances, the fact that DRRM has to be considered as an issue for development was emphasized during the third UNWCDRR and weight was put on pre-disaster DRRM, pre-disaster investment and BBB.

Legal Framework on DRRM Sector in the Philippines: Based on the disaster risk in the Philippines and the international trends on DRRM, the Government of the Philippines started to consider the shift from a “post-disaster response and anticipation” into a “pre-disaster Disaster Risk

Reduction and Management as an issue to eradicate poverty" in the 1990s. In 2010, the Disaster Risk Reduction and Management Act (RA10121) replacing PD.1566 was enacted. This new law emphasized the need for a coherent, integrated and proactive approach to DRRM across levels and sectors, governmental agencies and communities. In the Philippines Development Plan (PDP) formulated in 2011, issues on DRRM and Climate Change issues are mentioned to be crucial to reach the goals on sustainable growth and are positioned as issues crossing all of the sectors. During the formulation of the recent Ambisyon Natin 2040, natural disasters were identified as one of the three factors causing instability. In other words, natural disasters were recognized as an issue that has to be prioritized by the Government of the Philippines in order to ensure Filipinos' safety and prosperity.

Major Challenges on DRRM Sector in the Philippines: Interviews and consultation meetings were conducted to understand the gaps and challenges related to DRRM. Major challenges on overall DRRM systems are that implementation of the National DRRM Plan (NDRRMP) and preparation and implementation of Local DRRM Plans (LDRRMPs), risk assessment and structural measures based on risk assessment have not been conducted fully. Capacity of national and local government officers on DRRM is not adequate, and detailed plans and guidelines for rehabilitation and reconstruction have not been formulated yet, etc. In addition, the existing system of DRFI is not functioning fully and it has not promoted the pre-disaster investment for DRRM. Challenges on flood disaster countermeasures are that coordination between flood control/management and river basin management is insufficient, risk assessment, structural measures and early warning systems have not been conducted fully, and manpower and technical capacity of officers of DPWH and LGUs are lacking. No DRRM system for coastal disaster has been established yet and coastal management has not been recognized fully as an academic field. Challenges on earthquake disaster countermeasures are that capacity on monitoring and analysis is not adequate, detailed risk assessment and DRRM planning have not been conducted except for Manila, building administration on seismic diagnosis is weak, and seismic retrofitting of important public structures and small to mid-sized general structures have not been promoted fully etc. Challenges on volcanic disaster countermeasures are that policy has not been formulated, targeted volcanoes have been limited in number, detailed countermeasures have not been fully conducted such as establishment of a wide area coordination mechanism among LGUs, evacuation planning, promotion of land use regulation etc.

Necessary Measures for DRRM Sector in the Philippines (draft): Necessary measures (draft) to solve the above challenges were proposed as follows.

Table Proposed Measures for DRRM Sector in the Philippines

	Overall DRRM	Flood/Sediment/Coastal Disaster	Earthquake/Volcanic Disaster
1. Science-based Disaster Risk Assessment	**Promotion of Implementing Risk Assessment**		
	• Collection and analysis of existing result of risk assessment • Standardization of risk assessment, and establishment and utilization of promotion system of risk assessment	• Risk assessment of priority rivers (considering the effect by climate change)	• Earthquake risk assessment of major cities • Risk assessment of priority volcanos (including risk assessment of ash fall)
2. Further Strengthening of Disaster Risk Governance **2-1 Policy/ Institutional Improvement**	**Preparation of National Level Plans (Clarification of Role Allocation / Setting Targets)**		
	• Preparation of National Disaster Prevention and Mitigation Plan • Preparation of National Disaster Recovery and Reconstruction Plan • Preparation of Emergency Response Plan at each level for each disaster	• Harmonization between Flood Control and other Related Plans in terms of River Basin Management • Enhancement of recognition of importance of coastal DRRM and protection	• Preparation of National Earthquake DRRM Basic Plan • Preparation of National Volcanic DRRM Basic Plan
	Promotion of Implementing DRRM Activities (Policy/Institutional Improvement)		
	• Establishment of system to promote the implementation of NDRRMP • Establishment of system to promote the preparation and implementation of LDRRMP • Establishment of system to promote the operation of DRRM TI • Strengthening of cooperation with industry-government-university • Strengthening of system of Disaster Risk Finance and Insurance (DRFI)	• Preparation of legal framework and technical standard on coastal DRRM and protection	• Strengthening of building administration on seismic diagnosis and retrofitting
2-2 Further Capacity Enhancement	**Administrative Capacity Enhancement**	**Technical Capacity Enhancement**	
	• Capacity enhancement to implement DRRMP (NGAs and LGUs) • Capacity enhancement for disaster response (human resources) (preparation of BCP, preparation of evacuation plan, implementation of drill etc.) • Capacity enhancement for disaster response (equipment) (equipment for BFP, special vehicles etc.) • Capacity enhancement to implement DRFI	• Technical capacity enhancement of DPWH LGUs on countermeasures for flood, sediment and coastal disaster. • Capacity enhancement of PAGASA for meteorology and flood forecasting • Improvement of monitoring system and its standardization (hydro-meteorology and wave height)	• Capacity enhancement for seismic retrofitting • Strengthening of capacity on seismic monitoring and analysis • Strengthening of capacity on volcanic monitoring, analysis and forecasting
3. Sustained DRRM Measures		**Implementation of DRRM Measures**	
		• Implementation of flood control measures for priority river basins (promotion of comprehensive flood control / mitigation measures) (prioritization, MP, FS implementation etc.) • Seismic retrofitting and asset management of river structures • Establishment of DRRM System for Tsunami	• Preparation and implementation of Earthquake DRRM plan of major cities (including emergency response plan) • Seismic retrofitting of structures (small-mid general structures, important public structures) • Preparation and implementation of plans for priority volcanos (evacuation plan, wide area DRRM plan, land use plan etc.)

JICA DRRM Sector Cooperation Strategy for the Philippines (draft): The partnership between Japan and the Philippines in DRRM is evolving to a more strategic nature encompassing both bilateral and multilateral fields. Embracing this evolved strategic partnership, and in formulating its "DRRM Sector Cooperation Strategy for the Philippines", JICA outlined the two principles to guide the process as described below.

1) The new "JICA DRRM Sector Cooperation Strategy for the Philippines" should contribute and/or support the implementation of DRRM efforts undertaken by the Government of the Philippines. JICA will fully utilize the advanced proven technologies of Japan, lessons learned and practices accumulated during the past cooperation programs/projects. Future DRRM programs/projects will be in line with measures described in Chapter 4.

2) The new "JICA DRRM Sector Cooperation Strategy for the Philippines" will be in accordance with the Philippines Development Plan, sectoral strategies, Ambisyon Natin 2040, 10-Point Socioeconomic Agenda and with global and regional DRRM frameworks. Based on this new strategy, the enhanced partnership between Japan and the Philippines should contribute in enabling both countries to undertake leadership in the field of DRRM at international and regional levels. Both countries will cooperate in formulating, accumulating and sharing good practices, to reduce the vulnerability to realize a safe and resilient society.

Upon extensive discussion internally and with the Philippine stakeholders, JICA formulated the following strategic framework guided by principles mentioned above. Such projects have to be appealed to the international community with the strategic vision to be achieved by JICA's DRRM Sector Cooperation.

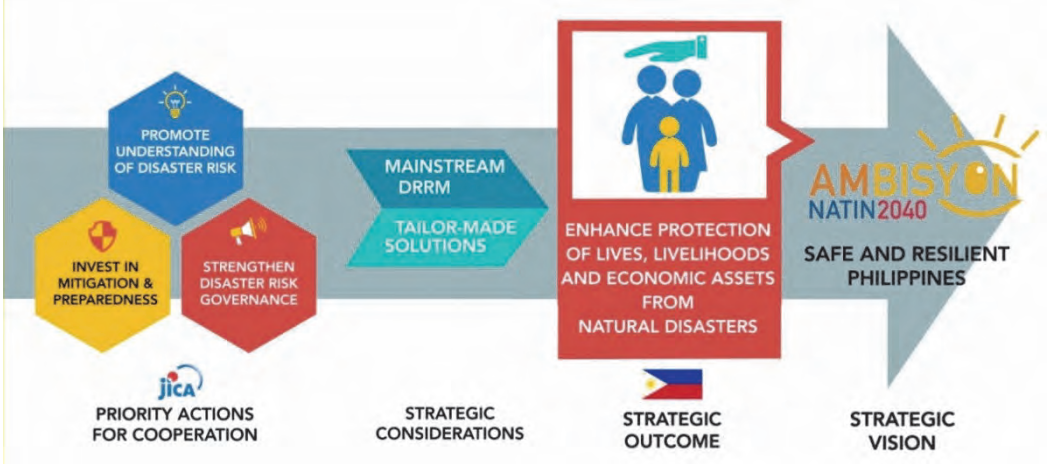

Figure New JICA DRRM Sector Cooperation Strategy (draft)

Strategic Vision: Safe and Resilient Philippines

JICA's cooperation aims to contribute to the establishment of a "resilient" society guided by the concept of "Build Back Better" that is not limited to recovering to the same status after disasters, but to pursue establishing a stronger society less vulnerable to disaster risks than before, and to support eradicating poverty so that sustainable development can be realized. On the other hand, considering that the pace of urbanization varies among areas in the Philippines, especially those areas where there is aggregation of population and economic assets, "resiliency" itself will not be sufficient to protect livelihoods. Highly urbanized areas need to be "safe" from the impacts of disasters, which require heavy investment in developing physical protection infrastructures to enhance the safety level of such areas that need to be protected. This is exactly why JICA is emphasizing the importance of investing in DRRM infrastructures in order to protect people's safety among various forms of cooperation, mindful that such initiatives are more challenging to implement. JICA's overall vision of the new cooperation strategy does not limit itself to the establishment of just a resilient society but a "safe and resilient Philippines".

Strategic Outcome: Enhanced protection of lives, livelihoods and economic assets from natural disasters

By supporting the Government of the Philippines to implement DRRM measures to reduce disaster risk and impacts, JICA will contribute to the realization of a "safe and resilient Philippines" and consequently the realization of sustainable development. Realization of "safe and resilient Philippines" is directly connected to economic growth and people's protection against instability, and will subsequently enable achieving "AmBisyon Natin 2040". Taking into account this close correlation between DRRM and sustainable development, JICA is setting its new strategic outcome

as “Enhanced protection of lives, livelihoods and economic assets from natural disasters”, which is supported by three priority actions and two strategic considerations.

JICA Priority Action 1: Promote understanding of disaster risk

The understanding of disaster risk is the starting point to consider all of the DRRM measures. The lack of evidence or adequate science-based disaster risk assessment will cause wasteful investment and also will provoke the increase of disaster impacts by misleading DRRM measures to be implemented. As such, objective understanding of disaster risk is fundamental to consider the optimal combination and sequence of DRRM measures and allocate adequate budget to DRRM measures from governmental national programs to community based DRRM activities.

JICA Priority Action 2: Strengthen disaster risk governance

Considering that strengthening of risk governance is Priority for Action 2 in the Sendai Framework for DRR 2015-2030, JICA is of the view that enhancing capacity of national government agencies is fundamental to realize a safe and resilient Philippines. Of course, empowerment of communities, private sectors and CSOs is also essential to establish an effective disaster governance system, but targeting national agencies for capacity development will directly contribute to the strengthening of DRRM governance.

JICA Priority Action 3: Invest in Mitigation and Preparedness

JICA is continuing to emphasize the importance of pre-disaster DRRM investment by presenting economic analysis results that quantitatively prove that such investment is correlated with the overall economic development of a country. Such continued effort facilitated a consensus that pre-disaster investment for disaster mitigation and preparedness is an essential element of DRRM activity, and was clearly positioned as one of the Priorities for Action of the Sendai Framework 2015-2030. JICA prioritizes pre-disaster DRRM investment especially in highly populated areas where economic assets are concentrated, such as Metro Manila and other emerging metropolitan areas, in order to ensure the continuity of economic activities.

Strategic Consideration 1: Mainstream DRRM within and across all sectors <Sectoral Expansion>

As a bilateral development agency, JICA has been stressing the importance of mainstreaming DRRM into all development sectors. In order to achieve sustained social and economic growth, it is paramount to incorporate DRRM considerations within and across all sectors that support development in order to set a path towards safe and resilient development. As such, DRRM is a sector that supports development by itself, and at the same time, a crosscutting theme that supports other development sectors. By incorporating DRRM considerations in all development sectors, development activities will be ensured not to result in increasing disaster risk, while unfortunately, too many development activities are reproducing vulnerability and risk exposure instead.

Strategic consideration 2: Tailor made solutions to fit specific regional context (No One-Size Fits All) <Regional Expansion>

In order to plan DRRM projects based on this new strategic framework, JICA will always look into regional context covering the locality of disaster risks and the stage of development in order to identify optimal set of measures that best suits the target area. In other words, JICA will not push a one-size-fits-all solution but will formulate plans and implement DRRM measures based on considerations with regional specificity.

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Abbreviation

Abbreviation	English
ABC	Approved Budget for the Contract
AADMER	ASEAN Agreement on Disaster Management and Emergency Response
ACDM	ASEAN Committee on Disaster Management
ADB	Asian Development Bank
AFD	Agence Française de Developpement
AHA centre	ASEAN Coordinating Centre for Humanitarian Assistance on disaster management
APEC	Asia-Pacific Economic Cooperation
APP	Annual Procurement Plan
ARMM	Autonomous Region in Muslim Mindanao
ASEAN	Association of South-East Nations
ASEP	Association of Structural Engineers of the Philippines
ASTI	Advanced Science and Technology Institute
AusAID	Australian Assistance for International Development
BAWP	Bicol Agri-Water Project
BBB	Build Back Better
BCM	Business Continuity Management
BCP	Business Continuity Plan
BFP	Bureau of Fire Protection
BOD	Bureau of Design
CAAP	Civil Aviation Authority of the Philippines
CAR	Cordillera Administrative Region
CAT DDO	Catastrophe Deferred Drawdown Option
CBEWS	Community-Based Early Warning System
CCA	Climate Change Act
CCC	Climate Change Commission
CCT	Conditional Cash Transfer
CHED	Commission on Higher Education
CLUP	Comprehensive Land Use Plan
COA	Commission on Audit
COP	Conference of the Parties
CSO	Civil Society Organization
DBM	Department of Budget and Management
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DEO	District Engineer’s Office
DepEd	Department of Education

Abbreviation	English
DGCS	Design Guidelines, Criteria and Standards
DILG	Department of the Interior and Local Government
DND	Department of National Defense
DO	Department Order
DOE	Department of Energy
DOF	Department of Finance
DOH	Department of Health
DOST	Department of Science and Technology
DPWH	Department of Public Works and Highways
DREAM	Disaster Risk and Exposure Assessment for Mitigation
DRF	Disaster. Risk Financing
DRFI	Disaster Risk Financing and Insurance
DROMIC	Disaster Response Operations Monitoring and Information Center
DRR	Disaster Risk Reduction
DRRM	Disaster Risk Reduction and Management
DRRM-CEP	DRRM- Capacity Enhancement Project
DRRM-TI	Disaster Risk Reduction and Management Training Institute
DSWD	Department of Social Welfare Development
EC	Electricity Company
EIRR	Economic Internal Rate of Return
EO	Executive Order
EPWG	Emergency Preparedness Working Group
EQ	Earthquake
EWS	Early Warning System
F/S	Feasibility Study
FCSEC	Flood Control and Sabo Engineering Center
FFWSDO	Flood Forecasting and Warning System for Dam Operation
FDI	Foreign Direct Investment
FRIMP	Flood Risk Management Project
FW	Floodway
GAA	General Appropriation Act
GGGI	Global Green Growth Institute
GIS	Geographic Information System
GIZ	Gesellschaft für Internationale Zusammenarbeit
GDP	Gross Domestic Product
GOP	Government of the Philippines
GMMA	Greater Metro Manila Area
GMMA-RAP	Greater Metro Manila Area Risk Assessment Project
GSIS	Government Service Insurance System

Abbreviation	English
HEC	Hydrologic Engineering Center
HFA	Hyogo Framework for Action
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
HLURB	Housing and Land Use Regulatory Board
IACCC	Inter-Agency Committee on Climate Change
IC	Insurance Commissioner
IDMC	Internal Displacement Monitoring Centre
IDNDR	International Decade for Natural Disaster Reduction
IFC	International Finance Corporation
IMS	Information Management System
IPCC	Intergovernmental Panel on Climate Change
IROW	Infrastructure Right-of-Way
IRR	Implementing Rules and Regulations
IWRM	Integrated Water Resources Management
IWRMCT	Integrated Water Resources Management Coordination Team
JA	Japan Agricultural Cooperatives
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JMC	Joint Memorandum Circular
JOCV	Japan Overseas Cooperation Volunteers
KOICA	Korea International Cooperation Agency
LDRRMC	Local Disaster Reduction and Management Council
LDRRMF	Local Disaster Risk Reduction and Management Fund
LDRRMFIP	Local Disaster Risk Reduction and Management Fund Implementation Plan
LDRRMO	Local Disaster Risk Reduction and Management Office
LDRRMP	Local Disaster Risk Reduction and Management Plan
LCCAP	Local Climate Change Action Plan
LCE	Local Chief Executive
LGC	Local Government Code
LCF	Local Calamity Fund
LGA	Local Government Academy
LGC	Local Government Code
LGU	Local Government Unit
LiDAR	Light Detection and Ranging、Laser Imaging Detection and Ranging
LWUA	Local Water Utilities Administration
M/P	Master Plan
MDGs	Millennium Development Goals
MGB	Mines and Geosciences Bureau
MMEIRS	Metro Manila Earthquake Impact Reduction Study

Abbreviation	English
NAMRIA	National Mapping and Resource Information Authority
NBCP	National Building Code of the Philippines
NCCAP	National Climate Change Action Plan
NCF	National Calamity Fund
NCR	National Capital Region
NDCC	National Disaster Coordinating Council
NDPP	National Disaster Prevention Plan
NDRP	National Disaster Response Plan
NDRRMC	National Disaster Risk Reduction and Management Council
NDRRMF	National Disaster Risk Reduction and Management Fund
NDRRMP	National Disaster Risk Reduction and Management Plan
NEA	National Electrification. Administration
NEDA	National Economic Development Authority
NFSCC	National Framework Strategy on Climate Change
NGA	National Government Agency
NGO	Non-Governmental Organizations
NHCS	Napindan Hydraulic Control Structure
NIA	National Irrigation Administration
NOAH	Nationwide Operational Assessment of Hazards
NORAD	North American Aerospace Defense Command
NPGA	Non-Project Grant Aid
NSCP	National Structural Code of the Philippines
NWRB	National Water Resources Board
O&M	Operations & Maintenance
OCD	Office of Civil Defense
OECF	Overseas Economic Cooperation Fund
OSSP	Organizational Structure and Staffing Pattern
OTCA	Overseas Technical Cooperation Agency
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAR	Philippine Area of Responsibility
PCRM	Philippines Catastrophe Risk Model
PD	Presidential Degree
PDNA	Post-Disaster Needs Assessment
PDP	Philippines Development Plan
PFZ	Philippine Fault Zone
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PIA	Project Impact Analysis
PIRA	Philippine Insurers and Reinsurers Association
POW	Program of Work

Abbreviation	English
PPA	Philippine Ports Authority
PPMP	Project Procurement Management Plans
PPP	Public Private Partnership
PRA	Philippine Reclamation Authority
PSF	People's Survival Fund
PSWS	Philippine Public Storm Warning Signal
PTFCC	Presidential Task Force on Climate Change
PWS	Public Storm Warning Signal
QRF	Quick Response Fund
RA	Republic Act
RAY	Reconstruction Assistance on Yolanda
RA10121	Republic Act No. 10121
RAP	Risk Assessment Project
RB	Retarding Basin
RBCO	River Basin Control Office
RC	Reinforced Concrete
RDRRMC	Regional Disaster Risk Reduction and Management Council
REDAS	Rapid Earthquake Damage Assessment System
REDD+	Reduction of Emission from Deforestation and forest Degradation+
RGDP	Regional Gross Domestic Product
RIMES	Regional Integrated Multi-Hazard Early Warning System
RRI model	Rainfall-Runoff-Inundation model
ROs	Regional Offices
SASOP	Standard Operating Procedure for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations
SATREP	Science and Technology Research Partnership for Sustainable Development
SDGs	Sustainable Development Goals
SDMOF	Senior Disaster Management Officials Forum
SFDRR	Sendai Framework for Disaster Risk Reduction
SMEs	Small and Medium Enterprises
SNAP	Strategic National Action Plan
SPEED	Surveilance in Post Extreme Emergencies and Disasters
TOR	Terms of Reference
UNDP	United Nations Development Program
UNDRO	United Nations Disaster Relief Organization
UNFCC	United Nations Framework Convention on Climate Change
UN/GA	UN/General Assembly
UN-ISDR	UN-International Strategy for Disaster Reduction
UNOCHA	UN Office for Coordination of Humanitarian Affairs

Abbreviation	English
UNWCDRR	UN World Conference on Disaster Risk Reduction
UP	University of the Philippines
UPMO-FCMC	Unified Project Management Office-Flood Control Management Cluster
USD	United States Dollar
VOM	Valenzuela-Obando-Meycauayan
WB	World Bank
WHO	World Health Organization
WRR	Water Resources Region

Chapter 1 Outline of Study

1.1 Background

The economy of the Philippines has been on track towards sustained growth, with an annual Gross Domestic Product (GDP) growth exceeding 6% in recent years. Foreign Direct Investment (FDI) has also sustainably increased and the amount in 2014 was six times as much as it was in 2010. Moreover, the Government of the Philippines is currently increasing the budget for infrastructure development as stated in the policies of the present Philippine Development Plan (PDP) 2011-2016 and demonstrated by the actual increase of the budget for the Department of Public Works and Highways (DPWH). In addition, through the enactment of the Disaster Risk Reduction and Management Act of 2010 (Republic Act No.10121, RA10121) enforcing the formulation of the National Disaster Risk Reduction and Management Plan (NDRRMP), the experience of recovery and reconstruction from Typhoon Yolanda, and the active contribution to establish international frameworks such as the Sendai Framework for DRR (SFDRR) and APEC agreements, the enhancement of the Government of the Philippines' capacity in terms of Disaster Risk Reduction and Management (DRRM) was revealed.

On the global level, 2015 was an important year for both the socio-economic development and DRRM and new landmarks, international frameworks and agreements were adopted. The Government of the Philippines was one of the most active countries during the 3rd United Nations World Conference on Disaster Risk Reduction (UNWCDRR) held in Sendai in March 2015 and contributed to the consensus building and adoption of SFDRR. The Government of the Philippines also played an important role in negotiating the Sustainable Development Goals (SDGs) and Paris Pledge for Action.

At the regional level, the Government of the Philippines has also taken the leadership to facilitate DRRM discussions during the ASEAN and APEC meetings. As a result of this strong leadership, regional frameworks such as the ASEAN Agreement for Disaster Management Emergency Response (AADMER) and APEC DRR Framework have been brought to consensus.

Aside from the global and regional level efforts, the Government of the Philippines has also undertaken significant efforts to strengthen the country's DRRM capacity, such as:

- Legal and institutional arrangements;
- Preparation of Plans related to DRRM;
- Improvement of the budgeting system;
- Capacity enhancement of government officials etc.

The increase of DRRM investments will ensure the implementation of future development programs. The economic sustainable growth and enhancement of the DRRM capacity are on the same track by supporting each other, and the "Inclusive Growth" envisioned in the present PDP can only be

achieved by managing and accelerating these two improvements. The Government of the Philippines and JICA established a strong partnership long ago in various sectors, especially in the DRRM sector. Regarding DRRM, the Government of the Philippines and JICA have developed a unique partnership by covering all the stages of the Disaster Management Cycle that include prevention/mitigation, preparedness, response, and rehabilitation/recovery. Based on this partnership, many kinds of schemes/projects such as Technical Cooperation Projects (including Grassroots Cooperation Projects conducted by Japanese NGOs, Local governments and other groups); Grant Aid Projects; Yen Loan Projects; Masterplan Study Projects; Volunteer Projects; various training programs; and Emergency Relief activities were conducted involving all levels of society including national government agencies, LGUs, academics, local communities and other sectors. JICA is proud to be a reliable partner of the Government of the Philippines and Filipino people and hopes to continue to be a "partner of choice" by improving strategies and tools.

The previous JICA cooperation strategy on DRRM was formulated in 2008. It included the promotion of non-structural measures such as the support to policy making and community enhancement that was one priority of the Hyogo Framework for Action of 2005 and cooperation projects mainly focusing on the implementation of structural measures. Since then, both Japan and the Philippines have experienced catastrophic disasters such as the Great East Japan Earthquake and Typhoon Yolanda, and both countries were compelled to respond and rebuild from unexpected and extraordinary disasters. With a recognition that natural disasters hamper economic growth, JICA set the cooperation strategy on Disaster Management called "Toward mainstreaming Disaster Risk Reduction ~Building Disaster Resilient Societies~", in March 2015, as one development strategic goal in order to contribute to the sustainable development of developing countries. On the other hand, many new trends such as Sustainable Development Goals (SDGs), SFDRR, and ASEAN/APEC agreements were adopted through recently conducted international dialogues. From those international trends, several well-known keywords arose such as "Mainstreaming DRR", "Build Back Better" and "New Normal" etc.

Based on the considerations regarding the Philippines' situation and international trends, JICA recognizes that 2016 is the year to review the cooperation strategy in the DRRM sector to strengthen the partnership with the Government of the Philippines.

1.2 Objectives

The objectives of the study are:

- to review and renew JICA's strategy in the DRRM sector;
- to strengthen the consistency between JICA's strategy and the Government of the Philippines' DRRM policy
- to set up a platform to facilitate dialogue between the Government of the Philippines and JICA on DRRM issues

1.3 Outputs

The expected outputs of the study are:

- Output 1: JICA's Cooperation Strategy for the Philippines in the DRRM sector
- Output 2: List of potential priority projects for the next five years from 2016 to 2021, including each proposed project's summary

1.4 Components

To achieve the objectives and formulate the expected outputs, the study is divided into three basic components.

(1) Study of the Philippines' situation

- Analysis on the Philippines' disaster risk
- Analysis on the impacts of natural disasters to the country's society, economy and sustainable development
- Study on existing DRRM strategies/policies and efforts/experiences of the Government of the Philippines
- Identification of the gaps existing in the DRRM sector

(2) Review of international trends/frameworks

- Study of the international trends/frameworks related to DRRM

(3) Review of Japan's experiences

- Study the past JICA cooperation projects in the DRRM sector
- Study on the Japanese experience (technology, know-how etc.) and applicability to the DRRM sector of the Philippines.

Chapter 2 Disaster Risk in the Philippines

2.1 Characteristics of Disasters Recently Occurred in the Philippines

Direct damage costs due to disasters which have occurred from the 1970's to 2009 have been estimated at USD 100~300 million annually, which corresponds to 0.5% of GDP of the Philippines. In addition to direct economic damage, natural disasters have severely affected communities and caused more than 1,000 deaths per year. According to World Risk Report 2014 formulated by UN-University, the Philippines is one of the most vulnerable countries to natural disasters in the World and ranked as the 2nd worst out of 171 countries following Banuatu.

In this Section 2.1, recent disaster risks trends in the Philippines have been analyzed based on the disaster damage from January 2005 to September 2014 recorded by the Office of Civil Defense (OCD). The extents per type of disaster and regional tendencies are summarized as the following four (4) items.

- The annual number of natural disasters has tended to increase during the last ten years and disasters are causing untold and extensive damages. Natural disasters are causing an average of more than 2,000 deaths and affecting approximately 7.5 million people every year;
- Out of the total numbers of deaths / missing persons and affected peoples, 39% of death/ missing and 22% of affected people has resulted from only one disaster, namely Typhoon Yolanda. The scale of the impacts of Typhoon Yolanda is particularly notable. On the other hand, excluding Typhoon Yolanda, 48% of the total number of deaths / missing has also resulted from other typhoons, floods and/or downpours. That means that the major causes of damage were hydro-meteorological disasters;
- The average of the number of affected peoples per disaster of the National Capital Region (NCR) is the highest that means that once NCR is affected by a disaster, extensive damage can occur. This illustrates the high exposure to natural disasters of NCR where the population density is high and socio-economic activities are concentrated.; and
- As another point of view of regional characteristics, the damages in Mindanao and the northern part of Luzon are important. Compared to the other regions where economic conditions have been already grown, such as in the central areas of Luzon and Visayas, the regions of Mindanao and the northern part of Luzon have been undeveloped. In this connection, it is supposed that Mindanao and the northern part of Luzon have further vulnerability to natural disasters.

The descriptions and data analyzes based on OCD's disaster database are outlined below as (1) ~ (9) in detail.[1]

[1] Refer to ANNEX-2.1 for the outlines of database of the OCD

(1) Damage caused by natural disasters, during the last ten years, is tremendous.

The summary of natural disasters during the last ten years (from January 2005 to September 2014) is shown in Table 2.1.1. Economic losses generated by natural disasters reached PhP 182.9 billion in total with more than 2,000 deaths or missing and approximately 7.5 million people affected a year.

Table 2.1.1 Natural Disasters from 2005 to 2014

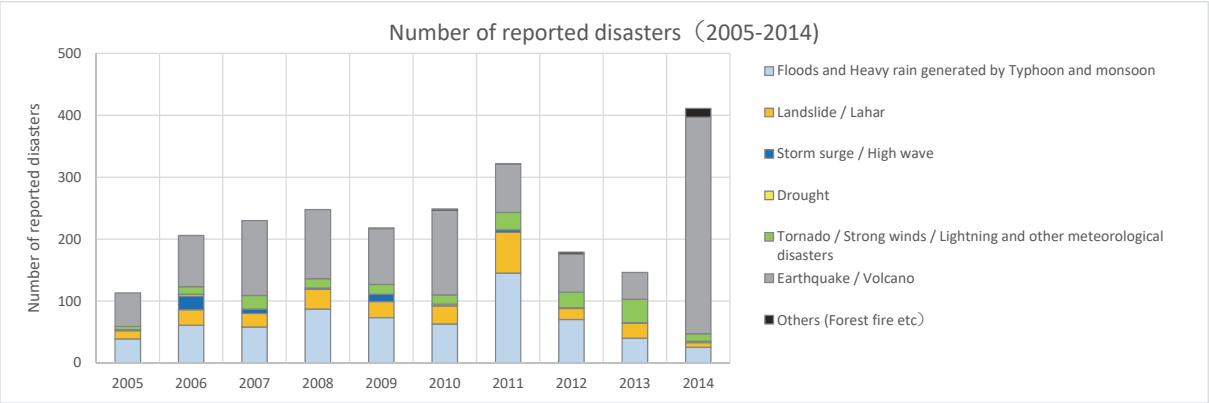
Natural Disaster	No. (*1)	Human losses (people)			Damaged House		Economic Loss (Mil PHP)*1
		Dead	Injured	Affected	Totally	Totally	Total
Forest Fire	14	1	0	9,416	0	0	0
Earthquake	1,098	355	1,198	3,651,055	22,448	74,379	26,093
Volcanic activity	34	2	0	77,774	100	4	33
Typhoon	115	9,489	10,166	38,915,637	305,660	1,000,200	95,300
Floods	529	443	209	4,795,763	5,013	69,962	5,792
Monsoon / Heavy Rainfall	32	351	227	7,519,633	6,570	23,223	4,813
Storm Surge / High Wave	52	7,808	27,030	16,127,626	552,652	590,268	35,554
Drought	7	0	0	2,532,465	0	0	13,022
Thunderstorm / Tornado / Strong Winds	190	84	191	650,003	26,299	46,422	2,063
Landslides	263	1,494	269	183,617	808	425	235
Other	7	1	0	100	8	34	5
Total	**2,341**	**20,028**	**39,290**	**74,463,089**	**919,558**	**1,804,917**	**182,909**

Note: *1: The Number of Disasters are quoted from the Number of Incidents recorded by NDRRMC

Source: JICA Study Team based on OCD Database

(2) The Number of Natural Disasters recorded has tended to increase.

2,341 incidents were recorded as natural disasters in the OCD Database (2005-2014). 49% of them were earthquakes or volcanoes and 29% were hydro-meteorological l disasters, such as typhoons and monsoons including downpours and/or floods. Although the number of disasters recorded in 2012 and 2013 were relatively low, the number of records is demonstrating an upward trend since 2005.



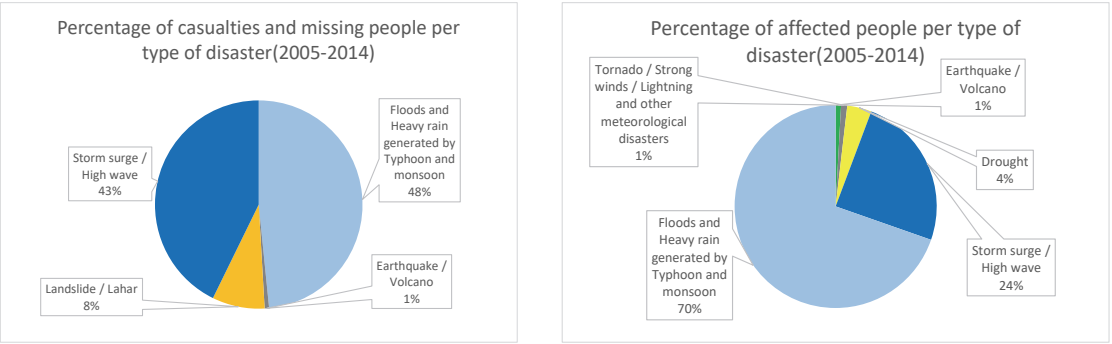
Source: JICA Study Team based on OCD Database (Jan.2005 – Sept. 2014)

Figure 2.1.1 Annual Number of Natural Disasters (2005-2014)

(3) Dominant Type of Disaster was Hydro-Meteorological Disaster in recent decade.

According to OCD Disaster Database, from January 2005 to September 2014, the total number of missing or dead by natural disasters was 20,028 persons and the total number of affected people was approximately 75 million.

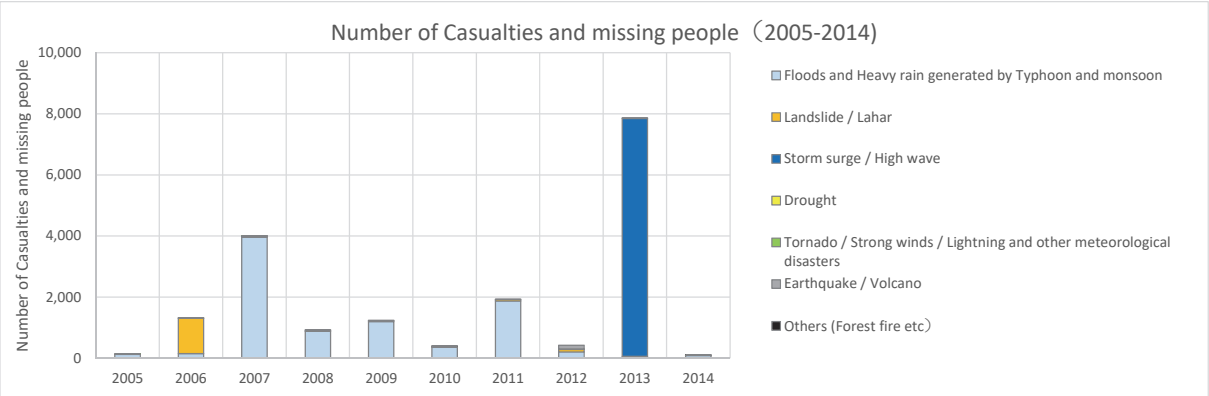
As for the causes for the missing or dead, downpours (heavy rainfalls) or floods accounted for 48%; on the other hand, storm surges or high waves accounted for 43%. As for the number of affected people, "typhoon or heavy rainfalls/floods" accounted for 70%, and "storm surges or high waves" accounted for 24% of the total number of affected people in the OCD Disaster Database. More than 99% of the total number of affected peoples by "storm surges or high waves" resulted from only one disaster, namely Typhoon Yolanda. In other words, 43% of the total number of missing or dead during the most recent ten years was caused by only one disaster.



Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

Figure 2.1.2 The Ratio of Human Suffering by Types of Disaster (Jan. 2005 ~ Sept. 2014)

Looking at the trends in human suffering by natural disasters, an annual average of more than 100 people are reported as missing or dead due to floods by monsoons or other hydro-meteorological disasters. In addition, the number of affected people has tended to increase since 2005 and an average of 5 million people are suffering because of flooding every year.



Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

Figure 2.1.3 Trend in the Number of Missing or Dead by Natural Disasters (Jan. 2005 ~ Sept. 2014)

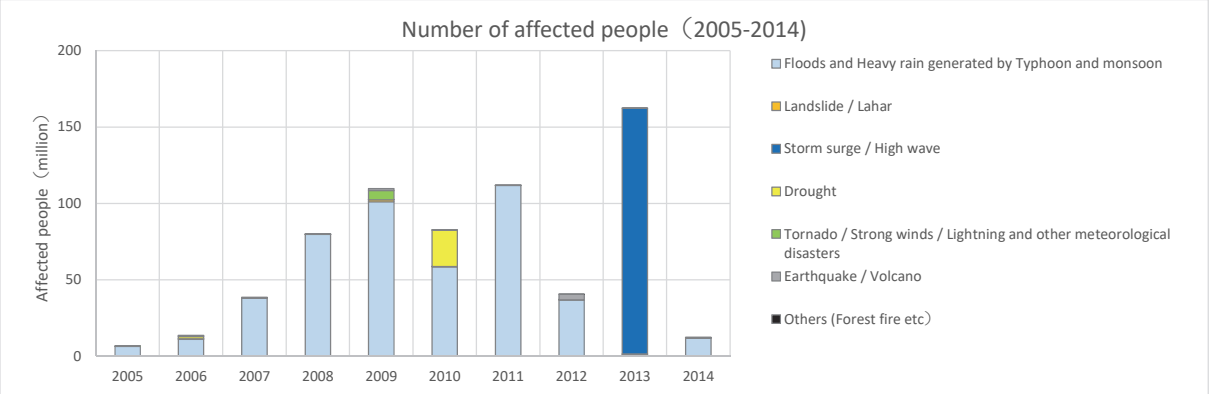


Figure 2.1.4 Trend in the Number of Affected Peoples by Natural Disasters (Jan. 2005 ~ Sept. 2014)

(4) Damage by Typhoon Yolanda was dominant among the disaster damages from 2005 to 2013

Due to the devastating damage caused by Typhoon Yolanda, the highest number of dead and/or missing people was recorded in the Regions VI, VII and VIII of Visayas during the last ten years. According to these records, regional characteristics of disaster damage from January 2005 to September 2014 can be summarized and itemized as described in Table 2.1.2:

- The largest number of dead/missing people was recorded in Region VIII;
- The biggest number of evacuated people in evacuation centers was recorded in Region VI; and
- The biggest numbers of damaged houses (totally or partially) were recorded in Regions VI and VIII.

From these facts, damage by Typhoon Yolanda was the most dominant disaster in ten years in the Philippines.

Table 2.1.2 Damage by Natural Disasters from January 2005 to September 2014 by Region

Region	Human Suffering		Affected People		Evacuation		House Damage	
	Dead / Missing	Injured	Family	People	Family	People	Totally	Partially
NCR	652	594	1,559,077	6,946,190	82,086	373,102	38,438	108,188
I	241	159	1,121,059	5,329,787	25,698	163,533	21,323	92,013
II	108	50	669,156	4,707,187	94,064	429,327	23,346	109,898
CAR	156	166	472,353	3,823,213	29,653	122,049	29,550	125,079
III	3,972	200	1,001,067	4,486,938	128,380	582,847	42,726	102,830
IV-A	228	177	822,960	5,208,515	99,054	451,686	44,257	135,877
IV-B	249	197	599,849	2,886,195	59,075	285,256	21,807	64,330
V	249	211	811,290	3,920,038	81,366	378,289	32,184	129,946
VI	515	781	1,303,797	6,121,032	540,826	2,517,002	240,430	299,238
VII	594	1,729	2,208,628	10,315,043	180,933	847,081	94,963	157,100
VIII	8,755	26,318	1,232,876	6,125,301	342,000	1,691,951	254,204	285,670
IX	128	232	242,436	1,237,938	27,269	133,592	8,004	31,220
X	1,439	5,574	389,371	2,368,519	55,773	266,410	22,490	70,212
XI	1,453	1,749	1,259,476	6,244,842	68,197	330,901	22,882	34,425
XII	401	105	245,636	1,210,107	53,934	266,994	1,137	2,318
XIII	99	571	233,023	1,147,468	41,110	203,067	18,081	36,796
ARMM	140	218	405,104	1,896,150	30,153	145,383	3,622	16,664
Unknown	138	63	237,623	777,495	58,762	252,428	274	3,451
Total	19,517	39,094	14,814,781	74,751,958	1,998,332	9,440,897	919,716	1,805,254

Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

(5) The exposure of Metro Manila and Highly Urbanized LGUs to disaster is high

As described above, damages caused by Typhoon Yolanda were the worst in the last ten years and the largest number occurred in Regions VI, VII and VIII because these regions were in the path of the Super Typhoon. On the other hand, the number of affected people in NCR is also relatively high because of typhoons Ondoy and Pepeng as shown in Table 2.1.2.

To demonstrate more clearly that NCR is highly exposed to disaster, the number of dead/missing people and the damage to infrastructure per region caused per disaster are shown in Table 2.1.3 below.

From Table 2.1.3, it is identified that damage per disaster in highly urbanized areas such as Metro Manila (NCR), where the concentrated population and properties are predisposed to greater aggregated damage compared to other regions. The highly urbanized areas like NCR have a huge exposure to disasters such as earthquakes, tsunamis and huge floods which may arise in the future due to climate change and growing urbanization.

Table 2.1.3 Number of Dead/Missing People per Region per disaster in the most recent ten years

Name of Region	Human Suffering		Affected People		Evacuation		Damage to infrastructures (Mil. PHP)
	Dead / Missing	Injured	Family	Person	Family	Person	
NCR	15	14	36,622	163,165	1,928	8,764	175
I	2	1	8,537	40,587	196	1,245	15
II	1	1	7,423	52,214	1,043	4,762	30
CAR	2	2	5,442	44,049	342	1,406	31
III	32	2	8,153	36,544	1,046	4,747	14
IV-A	2	2	7,428	47,012	894	4,077	25
IV-B	2	2	5,002	24,069	493	2,379	25
V	1	1	4,763	23,015	478	2,221	16
VI	4	6	10,647	49,983	4,416	20,553	77
VII	4	11	14,048	65,609	1,151	5,388	34
VIII	57	171	8,022	39,857	2,225	11,010	48
IX	2	4	3,742	19,105	421	2,062	9
X	10	37	2,584	15,721	370	1,768	14
XI	5	6	4,148	20,566	225	1,090	14
XII	2	0	956	4,709	210	1,039	1
XIII	1	3	1,367	6,734	241	1,192	3
ARMM	3	5	8,444	39,525	629	3,030	26
Unknown	2	1	4,169	13,640	1,031	4,429	21
Total	147	268	141,498	706,103	17,338	81,162	577

Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

(6) The ratio of affected families/people and houses damage per person is high in Region II and CAR, which are frequently passed by typhoons.

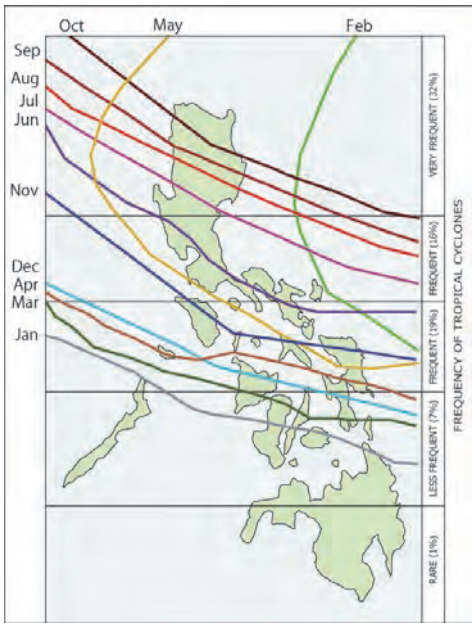
According to OCD's database, the number of affected people and other related damage amounts per person is high in Region II and CAR as well as Region VIII and VI as shown in Table 2.1.4. This has resulted from the fact that the frequency of passing typhoons in Northern Luzon including Region II and CAR is relatively higher than other regions (Figure 2.1.5).

Table 2.1.4 Damage Amount by Disaster per Population per Region (Jan. 2005 ~ Sept. 2014)

Region	Affected by Disaster		Evacuation		House Damage	
	Family	Persons	Family	Persons	Totally	Partially
NCR	0.132	0.586	0.007	0.031	0.003	0.009
I	0.236	1.122	0.005	0.034	0.004	0.019
II	0.207	1.458	0.029	0.133	0.007	0.034
CAR	0.292	2.365	0.018	0.075	0.018	0.077
III	0.099	0.443	0.013	0.057	0.004	0.010
IV-A	0.065	0.413	0.008	0.036	0.004	0.011
IV-B	0.219	1.052	0.022	0.104	0.008	0.023
V	0.150	0.723	0.015	0.070	0.006	0.024
VI	0.184	0.862	0.076	0.354	0.034	0.042
VII	0.325	1.517	0.027	0.125	0.014	0.023
VIII	0.301	1.493	0.083	0.413	0.062	0.070
IX	0.071	0.363	0.008	0.039	0.002	0.009
X	0.091	0.551	0.013	0.062	0.005	0.016
XI	0.282	1.398	0.015	0.074	0.005	0.008
XII	0.060	0.294	0.013	0.065	0.000	0.001
XIII	0.096	0.472	0.017	0.084	0.007	0.015
ARMM	0.124	0.582	0.009	0.045	0.001	0.005

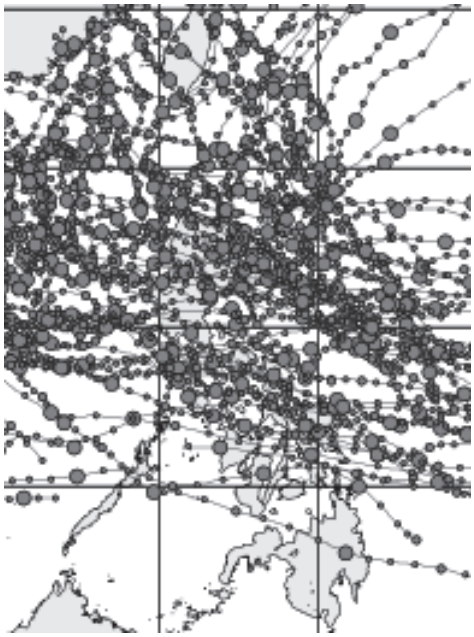
Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

The frequency of typhoons passing through Regions I, II and CAR is shown in Figure 2.1.5 as reference. The dominant disaster occurring in the Philippines is typhoons based on Table 2.1.4 above.



Monthly Typhoon Tracks passing through the Philippines

Source: The Study on Flood Control Project Implementation System for Principal Rivers in the Philippines undertaken by JICA, September 2004



Individual Typhoon Tracks passing the Philippines from 2006-2015

Source: Digital Typhoon: Typhoon Images and Information http://agora.ex.nii.ac.jp/digital-typhoon/index.html.en

Figure 2.1.5 Typhoon Tracks passing through the Philippines

(7) Strong typhoons have tended to cause devastating damage. The PSWS issued by PAGASA has a certain relationship with the extent of damage by typhoons

The analysis of the typhoon hazard is done in this section by analyzing the relationship between the disaster scales defined by winds velocity, pressure, issuance of PSWS and damage.

PAGASA issues a Typhoon Advisory / Warning to people in accordance with the Public Storm Warning Signal (PSWS) shown in the Table 2.1.5.

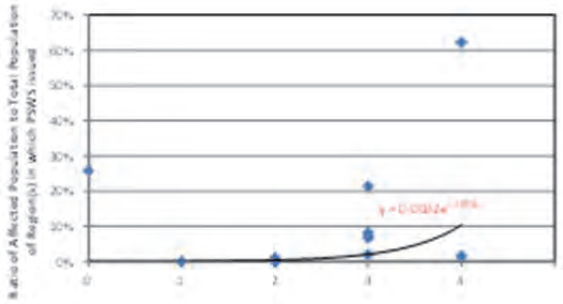
Table 2.1.5 Definition of PSWS

PSWS	Lead Time (Hrs)	Winds (Km/Hr)	Impacts of the Wind
#1	36	30-60	No Damage to very light damage
#2	24	61-121	Light to moderate damage
#3	18	121-170	Moderate to heavy damage
#4	12	171-220	Heavy to very heavy damage
#5	12	More than 220	Very heavy to widespread damage

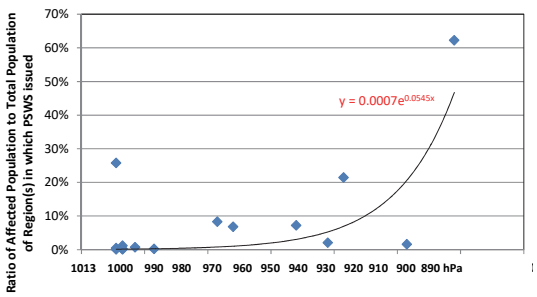
Source: PAGASA

The relation between PSWS mentioned above and actual scale of damage by typhoons are confirmed as follows.

Sixteen typhoons struck the PAR in 2012-2014 (three years). The relationship of these typhoons' strengths and damages is illustrated in Figure 2.1.6 and tabulated in Table 2.1.6.



Relation between PSWS and Ratio of Number of Affected People by Total Population in Regions in which PSWS was issued



Relation between pressure near the center(hPa) at landfall and Ratio of Number of Affected People by Total Population in Regions in which PSWS was issued

Figure 2.1.6 Relation between Typhoon Strength and Damage in 2012-2014

Table 2.1.6 Typhoon Strength and Damage in 2012-2014

Year	Typhoon	Signal No.	Signal Location (Region)	At Landfall		Total Affected Persons	Total Dead Persons
				Maximal Gustiness (km/h)	Maximal Pressure (hPa)		
2011 Dec	Sendong	2	XI, XIII, VII, VIII	80	998	441,022	1949
2012 Aug	Helen	2	I, II, CAR	90	990	13,234	14
2012 Oct	Ofel	2	VI, VII, VIII	80	996	116,406	39
2012 Dec	Pablo	3	VI, VII, VIII, X, XI, XIII	195	930	6,243,998	1,901
2012 Dec	Quinta	2	V, VI, VII, XIII	80	1,000	241,603	44
2013 Jan	Auring	2	IV-B	80	1,002	10,597	1
2013 June	Gorio	2	IV-A, V, VI, VII, VIII, VIII	80	1,000	3,592	7
2013 July	Isang	1	I, II	-	1,002	1	2
2013 Aug	Labuyo	3	I, II, III, CAR	200	935	395,723	14
2013 Sep	Odette	4	I	250	910	73,063	3
2013 Oct	Santi	3	II, III	185	965	900,421	20
2013 Oct	Vinta	3	II	160	970	265,769	6
2013 Nov	Yolanda	4	V, VI, VII, VIII, XIII	250	895	16,078,818	7,354
2014 Jan	Agaton	0			1002	1,148,621	79
2014 Feb	Basyang	2	VI, VII, VIII, X, XIII	100	1,000	47,740	6
2014 July	Glenda	3	III, IV-B, V, VIII	150	945	1,600,298	105

Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014) and PAGASA/ Japan Meteorological Agency.

As shown in Figure 2.1.6 above, the damage or number of affected people are related with the Public Storm Warning Signal (PSWS) issued by PAGASA in a certain degree in which damages have increased in the situation under the PSWS 3 or more. A quantitative warning system may be required since the actual damage from typhoons is caused by not only wind speed but also intensity/amount of rainfall, because there were some huge damages under the conditions in small PSWS.

(8) Based on the disaster data excluding Typhoon Yolanda, the damages caused by natural disasters are dispersed widely across the Nation.

The following Table 2.1.7 shows the regional disaster damage in which the damages by Typhoon Yolanda were excluded. (Please compare with Table 2.1.2.)

From Table 2.1.7, it is identified that the damages by disasters have been dispersed nationwide, such as regions NCR, I, III, IV-A in Luzon and Regions X, XI in Mindanao.

Table 2.1.7 Damage per region from January 2005 to September 2014 excluding Typhoon Yolanda

Region	Human Suffering		Affected People		Evacuation		House Damage	
	Dead / Missing	Injured	Family	People	Dead / Missing	Injured	Family	People
NCR	652	594	1,559,077	6,946,190	82,086	373,102	38,438	108,188
I	241	159	1,121,059	5,329,787	25,698	163,533	21,323	92,013
II	108	50	669,156	4,707,187	94,064	429,327	23,346	109,898
CAR	156	166	472,353	3,823,213	29,653	122,049	29,550	125,079
III	3,972	200	1,001,067	4,486,938	128,380	582,847	42,726	102,830
IV-A	225	173	817,025	5,181,489	99,054	451,686	44,223	135,071
IV-B	206	136	498,843	2,420,075	58,255	283,296	10,196	42,128
V	243	190	660,401	3,228,018	81,366	378,289	30,096	119,622
VI	244	317	464,332	2,251,793	48,180	272,762	11,116	46,272
VII	515	1,381	909,192	4,405,088	131,403	641,038	32,135	109,141
VIII	1,371	195	225,469	1,107,899	46,189	216,389	9,654	37,364
IX	127	231	242,436	1,237,938	27,269	133,592	8,004	31,220
X	1,439	5,574	385,118	2,348,927	55,773	266,410	22,488	70,194
XI	1,453	1,749	1,258,476	6,239,842	68,197	330,901	22,871	34,417
XII	401	105	245,636	1,210,107	53,934	266,994	1,137	2,318
XIII	98	571	218,224	1,077,512	41,106	203,045	17,615	30,558
ARMM	140	218	405,104	1,896,150	30,153	145,383	3,622	16,664
Unknown	138	63	237,623	777,495	58,762	252,428	274	3,451
Total	11,729	12,072	11,390,591	58,675,648	1,159,521	5,513,070	368,812	1,216,427

Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

(9) Regions where the economic development level is relatively low have been greatly affected by disasters even though the disaster scales are not so big.

After the removal of damage data by huge disasters as listed in Table 2.1.8 including the date of occurrence of the disasters and the reasons of removal from data, regional tendency of damages by disasters were confirmed.

Table 2.1.8 Natural Huge Disasters removed from Database for Additional Analysis

Type of Disaster	Name of Disaster	Date of Occurrence	Reason of Identification as Huge Disaster
Typhoon	Frank	2008/06/18~23	Retired Typhoon Name by PAGASA because of Magnitude of Damage Extents
	Ondoy	2009/09/24~27	
	Juan	2010/10/15~20	
	Bebeng	2011/05/06~10	
	Mina	2011/08/21~29	
	Pedring	2011/09/24~28	
	Sendong	2011/12/14~18	
	Pablo	2012/12/02~09	
	Labuyo	2013/08/09~13	
	Yolanda	2013/11/07~11	
Monsoon	2012-Habagat	2012/08/03~08	At Science Garden, 1,177mm of rainfall was recorded in seven days (2012/08/02~08)
Earthquake	Bohol EQ	2013/10/15	Mw7.2 Earthquake occurred directly beneath Bohol Island with huge damages

As a result, the amounts of human sufferings, number of affected people, etc. after removal of data of huge disasters have been enumerated and summarized as given in Table 2.1.9 and Table 2.1.10.

Table 2.1.9 Regional Damage by Natural Disasters from January 2005 to September 2014 except Huge Disasters

Region	Human Suffering		Affected People		Evacuation		House Damage		Amount
	Dead	Injured	Family	People	Family	People	Total	Partial	Infra.
NCR	97	47	151,204	819,746	8,910	41,538	24,685	34,543	425
I	166	72	884,035	4,197,177	7,699	92,461	8,509	37,742	1,189
II	87	32	480,754	3,831,426	55,870	270,098	16,759	75,864	2,163
CAR	83	72	239,280	2,709,450	13,000	57,228	16,741	70,660	1,667
III	3,850	101	375,497	1,840,212	21,845	99,486	25,536	32,904	511
IV-A	105	75	241,016	2,756,420	15,321	70,887	28,927	74,990	1,709
IV-B	118	50	304,383	1,476,368	28,949	142,002	974	4,458	878
V	134	95	400,084	1,944,045	45,286	236,469	20,842	74,867	424
VI	137	108	267,247	1,285,524	18,561	130,282	1,547	7,627	328
VII	176	193	117,189	570,706	9,518	47,131	6,785	9,900	637
VIII	1,294	117	95,619	456,845	21,267	101,347	1,347	3,989	465
IX	43	40	160,054	816,499	20,684	100,736	812	1,679	57
X	105	123	179,713	853,503	29,191	141,908	1,780	4,867	245
XI	314	191	217,355	1,028,612	34,303	166,387	1,137	2,250	242
XII	84	82	245,564	1,209,747	53,862	266,634	1,137	2,318	289
XIII	56	414	167,051	821,237	24,461	119,057	686	3,587	389
ARMM	112	97	402,599	1,872,776	30,040	144,854	3,324	15,913	1,208
Unknown	138	63	237,623	777,495	58,762	252,428	274	3,451	1,224
Total	7,099	1,970	5,166,267	29,267,785	497,528	2,480,932	161,802	461,608	14,049

Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

Table 2.1.10 Regional Number of Dead/Missing Persons per Disaster from January 2005 to September 2014 except Huge Disasters

Region	GRDP (2014) (Mil. PHP)	Human Suffering		Affected People		Evacuation		House Damage		Damage Amount (Mil. PHP)		
		Dead	Injured	Family	People	Family	People	Total	Partial	Infra-structure	Agri-culture	Private
NCR	4,680	2.6	1.3	4,092	22,185	241	1,124	668	935	12	11	0
I	391	1.4	0.6	7,495	35,586	65	784	72	320	10	29	0
II	234	1.0	0.4	5,472	43,608	636	3,074	191	863	25	61	0
CAR	231	1.0	0.9	3,013	34,116	164	721	211	890	21	39	0
III	1,148	34.7	0.9	3,384	16,586	197	897	230	297	5	6	0
IV-A	2,015	1.0	0.7	2,318	26,514	147	682	278	721	16	24	0
IV-B	212	1.0	0.4	2,612	12,668	248	1,218	8	38	8	7	1
V	264	0.8	0.6	2,498	12,136	283	1,476	130	467	3	3	0
VI	503	1.2	0.9	2,302	11,072	160	1,122	13	66	3	5	0
VII	832	1.2	1.3	766	3,730	62	308	44	65	4	0	0
VIII	259	8.6	0.8	636	3,040	142	674	9	27	3	2	0
IX	257	0.7	0.7	2,637	13,453	341	1,660	13	28	1	2	0
X	486	0.7	0.8	1,233	5,858	200	974	12	33	2	2	0
XI	519	1.0	0.6	721	3,411	114	552	4	7	1	1	0
XII	351	0.3	0.3	963	4,745	211	1,046	4	9	1	3	0
XIII	155	0.3	2.5	992	4,877	145	707	4	21	2	138	1
ARMM	106	2.3	2.0	8,396	39,054	626	3,021	69	332	25	24	1

Source: JICA Study Team based on OCD Disaster Database (Jan. 2005 ~ Sep. 2014)

Based on the above tables, particularly by Table 2.1.10, the Northern area of Luzon and Mindanao areas are among the most severely damaged areas by perennial natural disasters except huge natural disasters as well as Region NCR and III.

This tendency indicates that it is possible that frequent disasters which are not huge disasters have an impact on relatively-poor regions.

ARMM in the Mindanao Island is not frequently hit by typhoons but is one of the worst-hit areas in Table 2.1.10. It follows from this that people affected by human disasters such as “conflicts” are devastated again by the natural disaster(s). The cases of negative spiral are as described in the following examples.

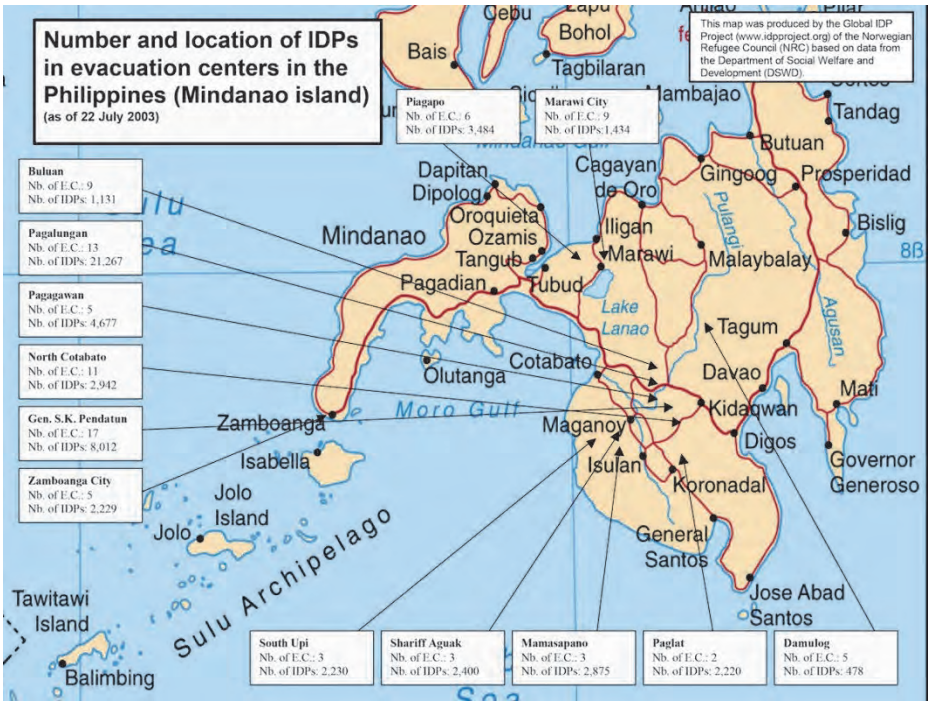
1) Damage Situation of Conflict-ravaged People by Further Flood Disaster in 2008

Several evacuation centers for conflict-induced internal displacement were constructed in the vulnerable areas against flood disaster, and the Datu Piang evacuation center in central Mindanao was, as anticipated, flooded in August 2008. Datu Piang with a normal population of 8,000 had to accommodate around 40,000 people displaced by conflicts or floods, or both. All public areas including mosques, schools and hospitals were filled with displaced people. Besides, the displaced people were forced to move on again.

2) Other Damage Situations of Conflict-ravaged People by Further Disaster(s)

According to disaster evaluation and situation documents produced by the United Nations High Commissioner for Refugees (UNHCR), namely the Emergency Operations – Supporting IDPs affected by Tropical Storm Washi- and by Typhoon Sendong in 2011, conflict-ravaged people around Iligan City were further distressed.

In addition, according to Situation Report No.7 as of 08/10/2013 produced by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) during Typhoon Ramil in 2013, some evacuation centers that were filled with conflict-ravaged people in Zamboanga were flooded. Notwithstanding, flood disaster victims also stampeded into damaged evacuation centers. Thus, confusion enveloped the centers and the quantity of relief goods fell short.



Source: Number and location of IDPs in evacuation centers in the Philippines (Mindanao island) (As of July 22, 2003), Reliefweb
http://www.internal-displacement.org//south-and-south-east-asia/philippines/2003/number-and-location-of-idps-in-evacuation-centers-in-the-philippines-mindanao-island

Figure 2.1.7 Conflict in Mindanao and Number/Location of IDPs

Consequently, the conflicts increased vulnerability to natural disasters and caused extended damage by the even relatively small-scale disasters.

2.2 Past studies and disaster risk analysis

The outlines of efforts for disaster risk knowledge and awareness in the past are summarized below.

2.2.1 Efforts of the Government of the Philippines

As one of the mandates of the NDRRMC, the following responsibilities are described in (d) of Sec.6 in RA10121:

> Section 6 (d): Ensure a multi-stakeholder participation in the development, updating, and sharing of a Disaster Risk Reduction and Management Information System and Geographic Information System-based national risk map as policy, planning and decision-making tools;

In line with this article, agencies and organizations related to the DRRM activities in the Philippines have conducted a wide variety of hazard and risk assessments. Those achievements are summarized in the table below.

Table 2.2.1 Outline of Efforts and Achievements on Hazard/Risk Assessment by the Government of the Philippines

Efforts and Achievements	Description*1
Collection and Publication of Hazard Maps	DENR-NAMRIA "One Nation, One Map Project" has been activated by NAMRIA. In the Project, hazard maps and related information are collected and shared with the public as well as the agencies concerned. These collections and sharing of information can be accessed from the Philippine Geoportal (http://www.geoportal.gov.ph/).* DOST-ASTI Flood Hazard Maps, Landslide Hazard Maps and Storm Surge Advisories have been prepared for certain cities/municipalities. (http://noah.dost.gov.ph/#/) * In the website, hazard maps can be checked per city/municipality.
Preparation of Hazard Maps for Floods and Sediment Disasters	DOST-PAGASA Flood Hazard Maps (1:10,000, 1:15,000 and 1:50,000) for high risk areas have been prepared. Tropical Cyclone Severe Winds Hazard Maps for Metro Manila have also been prepared. These maps can be viewed from the website of PAGASA. DENR-MGB Based on site inspection and interview survey, Landslide and Flood Susceptibility Maps (1:50,000) and a Detailed Landslide / Flood Susceptibility Map (1:10,000) have been prepared. These maps can be checked from http://www.mgb.gov.ph/lgmp.aspx. Project-NOAH As described above, DOST-ASTI is the main responsible agency for this activity. In addition, the University of the Philippines is the main technical advisory organization for the Project-NOAH. Furthermore, 29 agencies participated in order to prepare hazard maps in this national Project. Disaster Risk and Exposure Assessment for Mitigation (DREAM) Program The Program being executed by the University of the Philippines (UP) has prepared hazard maps based on flood simulation analysis for eighteen major river basins and the results are disclosed on the website in Project NOAH, such as Pasig-Marikina River Basin. In this program, detailed topographic data in eighteen major river basins were obtained by Light Detection and Ranging、Laser Imaging Detection and Ranging (LiDAR) survey. That information can be confirmed from https://dream.upd.edu.ph/ .
Preparation of Coastal Erosion and Sedimentation Maps	DENR-MGB Based on site inspection and interview surveys, Coastal Erosion, Sediment and Accretion Situation Maps nationwide. According to DENR-MGB, these activities will be completed by 2018.
Preparation of Volcano and Fault Maps	DOST-PHIVOLCS Philippine Fault Hazard Maps, Liquefaction Susceptibility Maps, Volcano Hazard Maps and Tsunami Hazard Maps have been prepared for certain high risk areas. (http://www.phivolcs.dost.gov.ph/)

* As of February 2016

* 1 See ANNEX-2.2 for detailed information

2.2.2 JICA's Cooperation

Cooperation activities related to disaster risk assessments by JICA are summarized in the table below.

Table 2.2.2 Summary of Cooperation related to Disaster Risk Assessment by JICA

Year	Name of Activities	Target Area	Outline of Cooperation
1998	Master Plan of Water Resources Management in the Philippines	Nationwide	The formulation of a nationwide master plan for water resources development and management towards the Year 2025 in which the contents included the evaluation of regional vulnerabilities to water resources in the whole Philippines. The evaluation of vulnerabilities was conducted in terms of the following three points of view: (1) Drought Risk in 2025 per 12 Water Resources Region (WRR) based on the relation between water resources capacity and water use demand: As a result, it was identified that the following four regions were the most vulnerable: • WRR II (Cagayan Valley) • WRR III (Central Luzon) • WRR IV (Southern Tagalog) • WRR VII (Central Visayas) (2) Drought Risk in 2025 per major and principal river basin: As a result, it was identified that the following seventeen river basins were vulnerable to drought disaster: • Laoag, Abra, Cagayan, Abulug, Agno, Pampanga, Amnay-Patric, Bicol, Panay, Jalaur, Ilog-Hilabangan, Tagoloan, Cagayan De Oro, Tagum Libugannon, Davao, Buayan-Malungon, and Mindanao (3) Drought Risk in 2025 per city (Target Cities: 55 cities): As a result, it was identified that the following nine cities were highly vulnerable to drought due to imbalance of demand versus supply: • Metro Manila, Cebu, Davao, Baguio, Angeles, Bacolod, Iloilo, Cagayan De Oro, and Zamboanga In the Plan, water development schemes were proposed for nine cities. In particular, the projects of which the EIRR was the highest were for Metro Manila, Cebu and Baguio.
2004	Earthquake Impact Reduction Study for Metropolitan Manila	Metro Manila	Earthquake damage analysis in Metro Manila was carried out based on the scenario of an earthquake. Urban vulnerability of Metropolitan Manila was also analyzed to indicate the regional characteristic of earthquake damage. Based on the results of these analyses, 105 recommendations in total for earthquake disaster mitigation for short, middle, and long term perspectives were prepared as a master plan of this study. Out of 150 recommendations, 40 projects were proposed as the most prioritized activities.
2008	The Study on Nationwide Flood Risk Assessment and Flood Mitigation Plan	Nationwide [947 flood-prone cities/ municipalities identified by the National Disaster Coordinating Council (NDCC)]	In the Study, prioritized areas based on the flood risk assessment were selected and the flood mitigation plans for these selected areas were also prepared. As first screening activities, based on the confirmed methodology, evaluation indexes of fourteen items, which represent flood damage potential from the viewpoints of socio-economic and natural conditions, a total of 120 river basins were selected. As second screening, the prioritization of river basins for project implementation was in principle given by ranking with the total score based on the economic efficiency in addition to the score obtained in the First Screening. In line with the procedures determined in the Study, finally 56 river basins were selected as the results of the Second Screening. For the selected 56 river basins, prioritization was examined and arranged in a manner of the implementation schedule dividing the river basins into two groups: (1) foreign-assisted projects; and (2) locally funded projects. Furthermore, flood mitigation plans for the model river basins were formulated. The model river basins were as follows: • Ilog-Hilabangan、Dungcaan、Meycauayan、Kinanliman、Tuganay、Dinanggasan

Year	Name of Activities	Target Area	Outline of Cooperation
2015	National Disaster Risk Assessment and Area Business Continuity Plan Formulation for Industrial Agglomerated Areas in the ASEAN Region	Industrial Agglomerated Areas in Cavite and Laguna Provinces and Metro Manila	Based on the data collection, analysis, and provision of information on natural hazards, such as earthquakes, tsunamis and floods as target disasters, the basic concept and procedures of implementation of Area BCM were formulated. The scale of disaster extents assumed in order to prepare the Area BCP were as follows: Earthquake: 50-year, 100-year, 200-year, and 500-year return period Tsunami: M 8.0~M 9.3 Flood: 50-year, 100-year and 200-year return period

2.2.3 Other Donors' Cooperation

The cooperation activities from other donors recently conducted are as summarized in the table below.

Table 2.2.3 Outline of Cooperation related to Disaster Risk Assessment by Other Donors

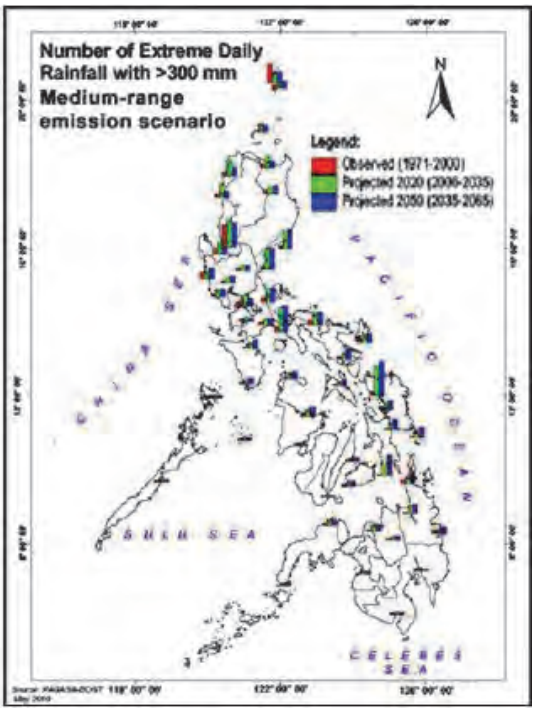
Name of Project	Organization	Outline of Cooperation
Ready Project	UNDP and AusAID	As a part of project outputs, multi-hazard maps for 27 target provinces (1:50,000 scale) and priority municipalities/cities/barangays (1:10,000 scale) were prepared. The Project's overall goal is "to contribute to the goal of strengthening the capacity of key stakeholders in localities vulnerable to natural hazards to protect/enhance the quality of the environment and sustainably manage their natural resources, as well as their capacities to prepare and respond appropriately to natural disasters.
Resilience Project	UNDP	The Resilience Project aimed to contribute to national efforts to build community resilience and reduce vulnerability to natural hazards by enhancing the capacity of LGUs and other stakeholders towards good governance in DRRM. As a part of the outputs, the Rapid Earthquake Damage Assessment System (REDAS) software was introduced to LGUs and the local exposure database was created.
Greater Metro Manila (GMMA) Risk Assessment Project GMMA-RAP (2010~2015)	AusAID, GeoScience Australia	GMMA-RAP conducted a Disaster Risk Assessment in Metro Manila. In the Project, topographic data including a detailed building and land use data base have been developed by LiDAR. In addition, GMMA-RAP also conducted a review and updating of the results of the Earthquake Impact Reduction Study for Metropolitan Manila, Republic of the Philippines by JICA (2002). As a result, it has been estimated that about 40 thousand deaths and PHP 2.5 trillion damage due to the collapse and damage of buildings and houses could be caused. That corresponds to 17.5% of the Philippines' GDP (Base Year 2015) if a Mw7.2 Earthquake occurs on the West Valley Fault.

2.3 Prediction or assumption of hazard increase in the future

The outlines of efforts for disaster risk knowledge and awareness in the past are summarized below.

(1) Frequency of daily rainfall over 300mm/day will increase

As shown in Section 2.1, currently, damages by typhoons and/or floods due to monsoons are dominant out of all damages caused by natural disasters in terms of human suffering. PAGASA has published its prediction of extreme rainfall events analysis. According to the analysis, heavy daily rainfall will continue to become more frequent, extreme rainfall is projected to increase in Luzon and Visayas, and slightly increased in Mindanao in 2020 and 2050. Figure 2.1.7 shows the projected increase in number of days with extreme rainfall (defined as daily rainfall exceeding 300 mm) compared with the observed (baseline) values.



Source: PAGASA (https://web.pagasa.dost.gov.ph/index.php/climate-change-in-the-philippines#extreme-rainfall-events (Accessed on 2016.03.18)

Figure 2.3.1 Current and Projected Extreme Rainfall in the Philippines in 2020 and 2050 under Mid-Range Scenario

(2) Hazards of floods, storm surges and land loss will increase due to the sea level rise.

The National Strategic Framework on Climate Change (NSFCC) notes that the sea level rise will increase the hazard of flooding and storm surges. One meter of sea level rise is projected to cause inundation in vast portions nationwide and affect lifestyles and livelihood activities of coastal inhabitants. The NSFCC also addressed that according to the estimations of the National Mapping and Resource Information Authority (NAMRIA), a one meter sea level rise would result in the loss of 129,114 hectares of the Philippines' territory.

(3) Expected huge earthquakes have the potential for tremendous impact and destructive damage on Filipino Lives

The Philippines are located on the edge between the Eurasian Plate (or South China Plate) which subducts eastward beneath Luzon Island along the Manila Trench, and the Philippine Sea Plate which subducts westward along the East Luzon Trench simultaneously. In addition, there are also a number of inland active faults. Because of this complex tectonic setting, the Philippine Islands show high seismic activities.

Recently, the following huge earthquakes have occurred in the Philippines:

- 1990: Luzon Earthquake: M7.8: 1,621 deaths
- 2012: Negros Earthquake: M6.9: more than 100 deaths caused by landslides and collapsed housing
- 2013: Bohol Earthquake: M7.2: more than 200 deaths and Damage Cost PhP 22 billion

Taking into account these situations, the most concerning issue about earthquake disasters is that a huge earthquake occurs in/around the Greater Metro Manila Area where the following potentials exist:

- Population Concentration: from 7.92 million in 1990 to 11.85 million in 2000;
- Densely Populated Area: 191.4 people/hectare in 2000; and
- Area of Concentration of Economic Activity: 13% of Total Population, 36% of GDP

According to the "Enhancing Risk Analysis Capacities for Flood, Tropical Cyclone Severe Wind and Earthquake for the Greater Metro Manila Area ~Component 5 – Earthquake Risk Analysis~" report formulated by the Greater Metro Manila Area Risk Assessment Project (GMMA-RAP)team, under the cooperation of the Australian Government, the following damages were estimated in case of a M7.2 Earthquake;

- 40,000 deaths; and
- PhP 2.5 trillion for direct structural damage cost corresponding to 17.5% of GDP

2.4 Summary

As a summary of disaster risk in the Philippines described in Sections 2.1~2.3, the following three conclusions have been obtained:

(1) According to disaster records in the most recent decade, the number of natural disasters and scale of damages have tended to increase since 2005. In this regard, the Government of the Philippines should further address the efforts for DRRM.

As described in Section 2.1, the natural disasters recorded and damages have tended to increase during the last ten years, and Typhoon Yolanda caused tremendous damage in 2013. However such large scale disasters occur periodically such it was the case in 1991 when Ormoc was heavily hit by Typhoon Uring. It can be said that the situation is the same as 1991, when such a large scale disaster still leaves deep scars in highly exposed areas.

On the other hand, the frequency and scales of hydro-meteorological hazards are supposed to increase in the future because of Climate Change.

Under such circumstances, the Government of the Philippines should further accelerate the implementation of DRRM measures to reduce disaster risk and realize the "Paradigm Shift to Adapt to the New Normal" as highlighted during the 9th Senior Disaster Management Officials Forum held in Iloilo City in September 2015.

(2) The recent disaster damage data and risk assessment studies are showing that NCR where the population and assets are concentrated is highly exposed and that the low-developed regions are highly vulnerable to disasters. Consequently consideration and implementation of DRRM measures are needed.

The recent disaster data and risk assessment studies demonstrate that if NCR representing 38% of the national GDP is affected by a large scale disaster, the damage would be tremendous. Such it was the case in 2009 when Typhoons Ondoy and Pepeng caused an economic loss equivalent to 1.8% of the RGDP (in the report of 'Typhoons Ondoy and Pepeng: Post-Disaster Needs Assessment', the amount of the damage caused by the two typhoons were evaluated to reach USD 4,383 million, that was equivalent to 2.7% of the national GDP). Regarding earthquakes, the Greater Metro Manila Area Risk Assessment Project supported by AusAID evaluated that more than 40,000 deaths with economic losses at PhP 2.5 trillion damages by structural collapse corresponding to 17.5% of national GDP would take place in case Mw 7.2 Earthquake occurs on the West-Valley Fault.

On the other hand, Regions where the level of economic development is relatively low, are suffering from frequent hazards even though the scales are not so big.

Consequently, the Government of the Philippines should promptly take actions to consider and implement measures addressed to reduce damages as much as possible.

(3) Risk assessment analysis need to be upgraded and standardized

National Government Agencies (NGAs), research institutes, universities and other groups have conducted disaster risk assessment and have prepared, diffused and accumulated risk/hazard maps. Through such efforts, the people's knowledge on disasters has been enhanced.

However, in some cases, users are confused because they were distributed different maps and the analysis conditions, accuracy and other parameters differed. Although such tools are contributing to enhance awareness, their contribution to actual risk reduction activities, such as revision of land use plans (reduction of hazard and/or exposure), formulation of flood control plans (reduction of hazard) and establishment of early warning systems (reduction of exposure) is little.

Those further disaster risk reduction activities based on the prepared maps have still been limited in the field of DRRM by several donors, such as AusAID, UN organizations and JICA. The updates and improvement of hazard maps with actual disaster risk reduction activities based on scientific and engineering approaches are imperative through the continuous and sustainable efforts and actions by NGAs.

Chapter 3 Study on Present Situation and Gaps on DRRM Sector

3.1 Global Trends

3.1.1 Global trends

(1) International Decade for Natural Disaster Reduction: to shift into a pre-disaster mitigation and prevention measures approach

One year after the cyclone causing more than 300 thousand casualties in Bangladesh, the United Nations Disaster Relief Office (UNDRO) was created to establish an international mechanism for the coordination of emergency humanitarian actions. During the 20 years after the creation of UNDRO, natural disasters caused more than three million casualties, USD 23 billion of direct damage in the world and more than 20 million lives still were threatened by drought in Africa. Considering such circumstances, the UN General Assembly (GA) decided to designate the 1990s as an International Decade for Natural Disaster Reduction (IDNDR) "in which the international community, under the auspices of the United Nations will pay attention to fostering international cooperation in the field of natural disaster reduction (Res. 42/169)"

(2) Yokohama Strategy : to build a strong society and reduce disaster damage with the implementation of pre-disaster measures and ensure the sustainable socio-economic growth

The first UN World Conference on Disaster Risk Reduction (UNWCDRR) was held in Yokohama in 1994 and the mid-term review of IDNDR was conducted. The Yokohama Strategy for a Safer World: Guidelines for Natural disaster Prevention, Preparedness and mitigation was formulated and adopted during the conference. Based on the recognition that "sustainable economic growth and sustainable development cannot be achieved in many countries without adequate measures to reduce disaster losses", eighteen activities to be promoted during the second half of IDNDR at community and national levels were identified. The activities identified included disaster reduction education and information programs, capacity building of communities, establishment of a disaster prevention network, the constructive role of media, public involvement incentives and risk assessment improvement.

To take over the achievements and failures of IDNDR, the UN International Strategy for Disaster Reduction (UNISDR) was established in 2000. UNISDR aimed to enhance disaster awareness which is a crucial element for sustainable growth, to reduce human and economic losses and disaster risk itself, and to facilitate the establishment of nations and communities resilient to disasters. An inter-agency task force and inter-agency secretariat for risk reduction was formed to serve as the focal point in the UN system for the coordination of disaster reduction activities.

(3) Hyogo Framework for Action（HFA）: to build the Resilience of Nations and Communities to disasters

In September 2000, representatives from 189 countries met at the Millennium Summit and adopted the Millennium Declaration which set out the goals to be reached in the 21st Century by the international society. The Declaration recognized the gaps in human rights and good governance and emphasized the role of the UN in the 21st Century.

The Millennium Development Goals (MDGs), which were formulated in 2001, emanated from the international conferences and summits of the 1990's, and were endorsed in the Millennium Declaration. MDGs were constituted of eight goals such as eradicate extreme poverty and hunger to be achieved by 2015.

One year after the MDGs' formulation, the Johannesburg Declaration on Sustainable Development was adopted during the World Summit on Sustainable Development, in September 2002. In the commitment to sustainable development, natural disasters were recognized to pose severe threats to sustainable development as well as chronic hunger, armed conflict and HIV/AIDS.

The second UNWCDRR "to formulate a Disaster Risk Reduction (DRR) guidance for the 21st Century to reduce disaster damage" was held in Kobe, in 2005; and the Hyogo Framework for Action (HFA), indicating the actions to prioritize by 2015, was adopted. Since goals in DRRM were not included in the MDGs and since no clear target value regarding DRRM was specified in the Johannesburg Plan of Implementation, concrete activities aiming to realize sustainable growth were considered.

HFA aimed to build the resilience of Nations and Communities to disasters, by achieving substantive reduction of disaster losses in lives, social, economic and environmental assets by 2015; and designated five Priorities for Action.

Priority 1: Ensure that DRR is a national and local priority with a strong institutional basis for implementation

Priority 2: Identify, assess, monitor disaster risks and enhance early warning

Priority 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels

Priority 4: Reduce the underlying risk factors

Priority 5: Strengthen disaster preparedness for effective response at all levels

(4) Sendai Framework for DRR (SFDRR): to accelerate and ensure the mainstreaming of DRR

The concept of "DRR mainstreaming" which emerged in the early 2000s, was officially incorporated in the UN's operations during the UN/GA on UNISDR in 2012. Because the DRRM mainstreaming was recognized as an important factor to reduce disaster risk, the concept was reflected to the following activities.

1. Strategy, policy, planning programs related to development issues
2. Activities related to poverty reduction and climate change adaptation issues
3. Regular activities of UN offices

The formulation of the post 2015 development agenda was agreed on during the Rio+20 Conference on Sustainable Development, and seventeen Sustainable Development Goals (SDGs) including 169 targets were proposed in 2014. Building upon the experiences and lessons learned from the previous MDGs, SDGs set a series of universal and applicable goals to balance the three dimensions of sustainable development that are economic, social and environmental aspects and goals aiming to enhance resiliency against climate change and disasters.

One year after the announcement of the SDGs, the third UNWCDRR was held in Sendai, in 2015. During the conference, initiatives to build resiliency against disasters and reduce disaster risk were considered under a sense of urgency, and commitments to establish a framework to integrate DRRM in policies, plans and budget at all levels of governance were made by world leaders.

According to the HFA National Progress Reports of each country, DRRM organizations and policies were established and enforced (HFA priority 1: Ensure that DRR is a national and local priority with a strong institutional basis for implementation), disaster response systems including early warning were performed (HFA priority 5: Strengthen disaster preparedness for effective response at all levels) in many countries including developing countries. However, activities related to the HFA priority 4: Reduce the underlying risk factors were estimated to be behind schedule.

During the second UNWCDRR, due to the influence of the 2004 Indian Ocean Earthquake and Tsunami, a Common Statement to establish an early warning system in the Indian Ocean was issued and priorities were still set on disaster response and early warnings even after the HFA adoption; and damage (especially economic losses) caused by recent large scale disasters were not radically reduced.

Under such circumstances, the fact that DRRM is not limited to humanitarian assistance and has to be considered as an issue for development, was emphasized during the third UNWCDRR and weight was put on pre-disaster DRRM and Build Back Better (BBB).

SFDRR 2015-2030 aims for “the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, cultural and environmental assets of persons, businesses, communities and countries” and the following four Priorities for Actions were agreed.

Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk

Priority 3: Investing in disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

Seven global targets and indicators were set to evaluate the progress that should be monitored by each country.

1. Reduction of disaster mortality: Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015
2. Reduction of the number of affected people: Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015; substantially reduce the number of affected people globally by 2030
3. Reduction of direct disaster economic loss: reduce direct disaster economic loss in relation to global Gross Domestic Product (GDP) by 2030
4. Reduction of damage to critical infrastructure and disruption of basic services: Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030
5. Increase of the number of countries with national and local disaster risk reduction strategies: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;
6. Enhancement of international cooperation with developing countries: Substantially enhance international cooperation with developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030
7. Improvement of early warning systems and access to disaster risk information and assessments: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

During the UN/GA held in autumn 2015, the integration of “DRR mainstreaming” into the post 2015 agenda was recognized to be a must. During the COP21 held in winter 2015, although a new framework to mitigate Climate Change was adopted, disaster risk was projected to increase continuously and affect especially small island states and coastal areas, and consequently, DRRM was recognized to be a crucial issue for Climate Change adaptation.

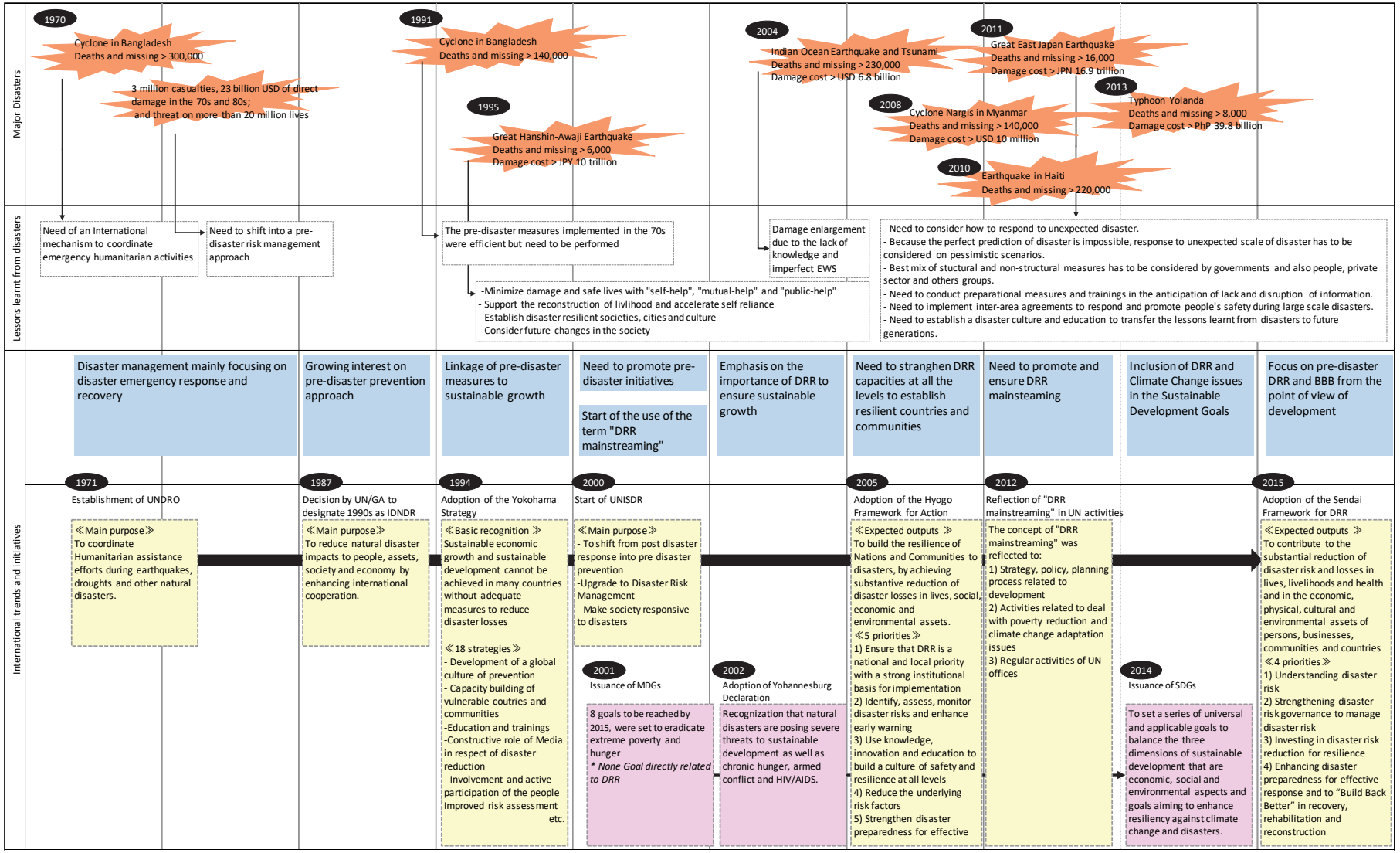


Figure 3.1.1 International trends in Disaster Risk Reduction Management

3.1.2 Cooperation at the Regional Level

(1) APEC

The Asia-Pacific Economic Cooperation (APEC) is a regional forum located in a disaster prone area.

The Emergency Preparedness Working Group (EPWG) was first established in 2005, as a task force[2] (TFEP: Task Force for Emergency Preparedness) to respond to the 2004 Indian Ocean Earthquake and Tsunami. EPWG aims to enhance DRRM capacities and facilitate disaster coordination in the Region and the members of the working group are convened once or twice a year.

During the 14th APEC Economic Leaders' meeting, held in Ha Noi, Vietnam, in November 2006, leaders recognized that natural disasters affect their economies and brainstormed about the role of APEC and coordination between member countries in order to better prepare the region for disasters and to facilitate emergency operations.

The 15th APEC Economic Leaders' meeting with the theme "Strengthening Our Community, Building a Sustainable Future" was held in Sydney, Australia, in September 2007. At the meeting Leaders agreed on the need to further strengthen APEC's efforts to build community resilience and preparedness for emergencies and natural disasters, and affirmed that human security is essential to economic growth and prosperity. The leaders' declaration including "Climate Change, Energy Security and Clean Development" and "Enhancing Human Security" was formulated and adopted during this meeting. One year after the 15th APEC Economic Leaders' meeting, the first APEC Senior Disaster Management Official Forum (SDMOF) was held in 2008. SDMOF is held every year to share information and discuss disaster experiences and DRRM initiatives.

The APEC DRR Framework was adopted during the 9th SDMOF held in the Philippines, in 2015. The APEC DRR Framework aims to contribute to adaptive and disaster-resilient Asia-Pacific economies that can support inclusive and sustainable development. The framework was adopted in the face of disasters and the "new normal", and cuts across all areas of the APEC AGENDA including agriculture, forestry, fisheries, trade and investment, energy, infrastructure development, critical infrastructure resiliency, food security, science and technology, and ecological integrity.

Apart from the SDMOF, brainstorming on Finance resiliency was conducted during the APEC Finance Ministerial Meeting chaired by the Department of Finance (DOF) of the Philippines. During the meeting, finance ministers of member countries submitted the Cebu Action Plan (CAP) in which the sharing of information related to Disaster Risk Finance and Insurance and other themes was emphasized.

[2] Recognizing the importance of its work to enhance human security and reduce the threat of disruptions to business and trade, the TFEP was elevated to an Emergency Preparedness Working Group (EPWG) in 2010.

(2) ASEAN

Asia is the most disaster prone region in the world and 90 percent of the world's natural disasters damage which occurred in the past 30 years was reported in Asian countries. Consequently, natural disasters are critical, proposing challenges for the members of the Association of South-East Asian Nations (ASEAN) both from the point of view of humanitarian issues and economic growth.

In 2003, the ASEAN Committee on Disaster Management (ACDM), consisting of the heads of national agencies responsible for disaster management of ASEAN Countries and ASEAN secretariat, was formed to intensify the regional cooperation in disaster management and response. ACDM's members are convened twice a year and the 28th ACDM meeting was held in Indonesia in April 2016. The comprehensive ASEAN Agreement on Disaster Management and Emergency Response (AADMER) to enhance the regional cooperation in disaster management and response was drafted during the first ACDM meeting and adopted in 2005.

AADMER mandated the establishment of the ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) which entered into operation in December 2008, the formulation of the Standard Operating Procedure for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations (SASOP), and set up of funds.

Under such circumstances, the government of Japan set a high priority on the ASEAN-Japan DRR cooperation and is providing various kinds of assistance. The "Disaster Management Network for the ASEAN Region" was proposed during the ASEAN Post Ministerial Conference +1 session with Japan, in July 2011. This initiative aims to fully use the DRRM knowledge acquired from the experiences of the 2011 Great East Japan Earthquake, the 1995 Great Hanshin-Awaji Earthquake, the 2004 Indian Ocean Earthquake and Tsunami and other disasters, as well as Japan's advanced approaches in the fields of DRRM and Environment in the ASEAN Region.

3.1.3 Summary

The key points are:

- In the 1990s, the importance to shift from a post disaster emergency response and recovery into a pre-disaster mitigation and prevention approach was advocated; and in the 2000s, the term "DRR mainstreaming" started to be used by the international society.
- Even with the adoption of HFA, priorities still were set on disaster response and early warnings; and the reduction of damage (especially economic losses) during recent large scale disasters was limited.
- Under such circumstances, the fact that DRRM is not limited to humanitarian assistance and has to be considered as an issue for development was emphasized during the third UNWCDRR and weight was put on pre-disaster DRRM and Build Back Better (BBB).
- Both the Philippines and Japan are countries exposed to a high disaster risk and are continuing to act actively with regard to the global and regional trends outlined above.

3.2 Legal Framework on DRRM Sector in the Philippines

3.2.1 DRRM and Development targets

The Philippines Development Plan (PDP) 2011-2016 was formulated by the National Economic Development Authority (NEDA), in May 2011. PDP adopted a framework of inclusive growth, which is sustainable high growth, generates mass employment, and reduces poverty. Good governance and anticorruption are the overarching themes of each intervention and PDP focuses on boosting the industries and creation of jobs, strengthening the financial sector and capital mobilization to answer to the various people's needs, facilitating infrastructure development, improving transparency and accountability in governance, and improving access to quality social services. DRRM and Climate Change issues are recognized as crucial issues to reach the MDGs and are positioned as crossing-issues in the PDP.

NEDA launched the AmBisyon Natin 2040 program, in March 2014. This program aims to formulate the collective long-term vision of the Filipino people for themselves and for the country for the next 25 years. The importance of people's participation was emphasized and 42 Focus Group Discussions were held, involving urban poor, disaster survivors, indigenous people, people with disabilities and other groups; and a national survey was conducted. The formulated Vision of Filipinos for Country is "The Philippines shall be a country where all citizens are free from hunger and poverty, have equal opportunities, enabled by a fair and just society that is governed with order and unity. A nation where families live together, thriving in vibrant, culturally diverse and resilient communities." To realize this vision, the protection against instability such as "factors impeding peace and security", "unexpected medical expenses" and "expenses due to natural disasters" has to be enhanced. Consequently, it can said that the importance of DRRM is also emphasized in the AmBisyon Natin 2040 which will serve as an anchor for development planning across at least four administrations.

3.2.2 Laws related to DRRM (PD No.1566、RA10121)

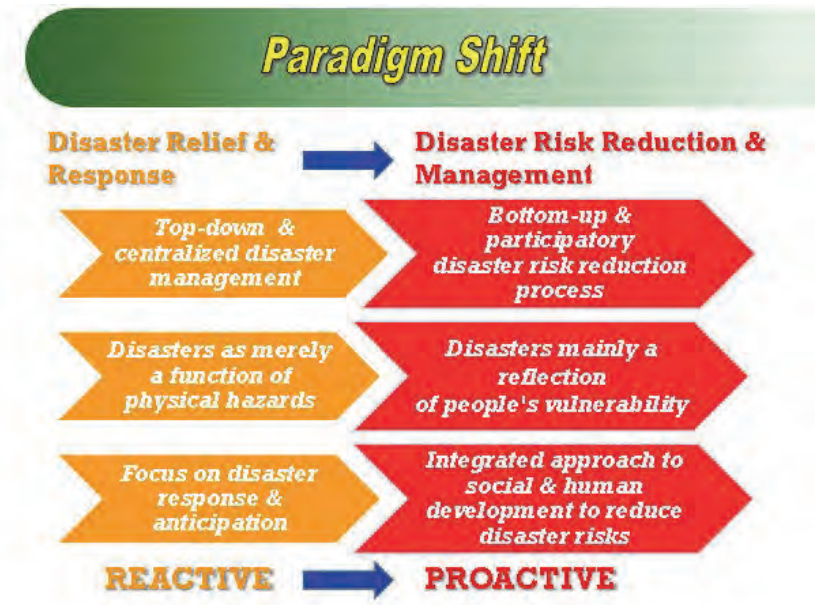
The Presidential Decree No. 1566 for "Strengthening the Philippine Disaster Control, Capability and Establishing the National Program on Community Disaster Preparedness" was enacted in 1978.

Since the 1990s, the Government of the Philippines is actively revising the DRRM system of the country to shift from a "post-disaster response and anticipation" into a "pre-disaster Disaster Risk Reduction and Management as an issue to eradicate poverty". After the adoption of the Hyogo Framework for Action (HFA), in January 2005, the Government of the Philippines adopted the Strategic National Action Plan (SNAP) for DRR 2009-2019 to implement the HFA in the country.

The Philippines Disaster Risk Reduction and Management Act (RA10121) was enacted in May 2010 and replaced the PD.1566. This law emphasizes the need for a coherent, comprehensive, integrated and proactive approach to DRRM across levels and sectors of government and among communities.

The section 27 of RA10121 states that “within five years after this Act goes into effect, or as the need arises, the Congressional Oversight Committee shall conduct a sunset review. For the purposes of this Act, the term "sunset review" shall mean a systematic evaluation by the Congressional Oversight Committee of the accomplishments and impact of this Act, as well as the performance and organizational structure of its implementing agencies, for purposes of determining remedial legislation”. The preparation of the review started in 2014 and gaps in disaster risk governance, risk assessment and monitoring, risk evaluation, risk management and other issues were identified. The proposal for the amendment of the law is planned to be presented to the new administration (no information on the target schedule yet).

Table 3.2.1 Comparison between PD No.1566 and RA10121

	PD No.1566	RA.10121
Enactment Date	June 11, 1978	May 27, 2010
Purposes	• Strengthens the Philippine Disaster Control Capability • Establishes the National Program on Community Disaster Preparedness	• Strengthens the National DRRM System • Introduces for the NDRRM Framework • Institutionalizes the NDRRM Plan • Appropriates Funds
Approach		
Composition of the National Council	National Disaster Coordinating Council (NDCC) Members: Nineteen organizations Chairman: Secretary, Department of National Defense(DND)	National Disaster Risk Reduction and Management Council (NDRRMC) Members: 44 Organizations including Civil Society Organizations (CSOs), private sector organizations Chairperson: Secretary, OCD (under DND) Vice-Chairpersons[3]: Sec, DOST – Prevention & Mitigation Sec, DILG –Preparedness Sec, DSWD – Disaster Response DG, NEDA – Rehab & Recovery

Source: JICA Study Team (Based on the Presentation of OCD during the DRRM National Summit2013)

[3] To improve the sharing of responsibilities in a non-serial but parallel or simultaneous way, proposal to re-focus on four risk factors as DOST for Hazard Management; DILG for Exposure Management; NEDA for Vulnerability; and DSWD for (Community) Capacity Management is suggested.

3.2.3 Other laws and circulars related to Local DRRM

(1) Roles and responsibilities of Local Government Units (LGUs) and Local Funds

1) Local Government Code (LGC)

The enactment of the Local Government Code of 1991 (LGC/RA7160) transferred some responsibilities from National Government Agencies (NGAs) to LGUs. According to the LGC, roles and responsibilities of the LGUs towards people's safety are:

1. Local Chief Executives (LCEs) are responsible of disaster response.
2. LGUs should consider how to respond to a disaster.
3. To consider such issues LGUs have to establish a Local Disaster Coordinating Council (LDCC) as mandated by DILG memorandum circular.

Since the amendment of the law in 1996, LGUs are also responsible to implement structural measures such as floods control works.

2) Circulars on Local DRRM Fund (LDRRMF)

After the adoption of RA10121, three circulars were issued in 2012 and 2013, to guide LGUs on the use of the Local Disaster Risk Reduction Management Fund (LDRRMF) and application process.

- Memorandum Circular No.2012-73: Utilization of Local Disaster Risk Reduction and Management Fund (LDRRMF)

  Issued by DILG on April 17th, 2012, this memorandum circular aims to guide LGUs on how to utilize their LDRRMF to ensure that basic "rescue and response equipment" are procured and to operationalize the provisions of the National DRRM Plan and National Climate Change Action Plan (NCCAP).

- Circular No.2012-002: Accounting and Reporting Guidelines for the Local Disaster Risk Reduction and Management Fund (LDRRMF) of Local Government Units (LGUs), National Disaster Risk Reduction and Management Fund (NDRRMF) given to LGUs and receipts from other sources

  Issued by the Commission on Audit (COA) on September 12th, 2012, this circular aims to promulgate LDRRMF accounting and auditing rules and regulations. Based on this circular, LGUs should submit a LDRRMF Investment Plan (LDRRMFIP) and Report on Sources and Utilization of LDRRMF to COA, DILG and OCD.

- Joint Memorandum Circular(JMC) No.2013-1 : Allocation and Utilization of the Local Disaster Risk Reduction and Management Fund (LDRRMF)

  Issued by the NDRRMC, Department of Budget and Management (DBM) and DILG on March 25th, 2013, this JMC aims to serve as a guide to LGUs in the allocation and use of

the LDRRMF and to enhance transparency and accountability in the use of LDRRM. According to this JMC, LGUs should submit to the Regional Disaster Risk Reduction Management Council (RDRRMC) through the regional office of OCD, a copy furnished to the regional offices of DILG and DBM, the monthly and annual report on the utilization of the LDRRMF and approved Annual Investment Plan (AIP) indicating the disaster risk reduction management projects and activities to be implemented.

(2) Initiatives on the Climate Change

1) Organizational structure

In 1991, before the ratification of the UN Framework Convention on Climate Change (UNFCC), the Inter-Agency Committee on Climate Change (IACCC) led by the Department of Environment and Natural Resources (DENR) was created, in order to respond to raising the awareness of the international society and Filipinos with regard to environment and sustainable development. IACCC aimed to harness and synergize all the activities undertaken by governments and civil society in response to climate change; and to formulate the country's recommendations and point of view in regard and support the UNFCC establishment.

In February 2007, as a response to the civil society's requests and growing awareness, and Intergovernmental Panel on Climate Change (IPCC) fourth Assessment Report, the Presidential Task Force on Climate Change (PTFCC) was created, and IACC was incorporated into PTFCC as a technical committee. PTFCC is mandated to address and mitigate the impact of climate change in the Philippines, paying special attention to adaptation, mitigation and technological solutions.

In 2009, with the enactment of the Climate Change Act (RA9729), the Climate Change Commission (CCC) was created as an independent and autonomous body with the status of a national-agency, tasked to co-ordinate, monitor and evaluate government programs and action plans on climate change. CCC formulated; i) the National Framework Strategy on Climate Change (2010-2022) which is committed towards ensuring and strengthening the adaptation of our natural ecosystems and human communities to climate change; ii) the Philippine National REDD+ Strategy to presents a broad range of strategies and corresponding activities over a 10-year horizon 2010-2020, and seeks to prepare forestland managers throughout the country to assume responsibility in implementing REDD-plus programs, research projects and activities; and iii) the National Climate Change Action Plan (NCCAP) to assess the current situation of the country with regard to climate change risk and outlines the NCCAP's strategic direction for 2011 to 2028 as a response to the current situation and projected impact.

2) Climate Change Act (RA9729)

The Climate Change Act, "an act mainstreaming climate change into government policy formulations, establishing the framework strategy and program on climate change, creating for

this purpose the climate change commission, and for other purposes", was enacted on July 27, 2009. This law mandated the framework, strategy and plan outlined above, and also the formulation of Local Climate Change Action Plan (LCCAP).

3) People's Survival Fund (PSF)

The People's Survival Fund (PSF) was created by RA10174, on July 27, 2011. PSF is an annual fund intended for local government units and accredited local/community organizations to implement climate change adaptation projects that will better equip vulnerable communities to deal with the impacts of climate change. It supplements the annual appropriations allocated by relevant government agencies and local government units for climate-change-related programs and projects.

The eligibility criteria of LGUs to access the PSF are i) Poverty incidence (>40%), ii) exposure to climate risk (>30%), and iii) presence of identified and delineated key biodiversity areas (>30%).

The PSF is managed and administered by the People's Survival Fund Board headed by the Secretary of the Department of Finance (DOF). To ensure commitment towards effective project implementation, project proponents are encouraged to provide counterpart contribution equivalent to at least 10% of the total project cost. CCC is responsible to submit to DBM and the Congress a semi-annual physical/narrative and financial report on the utilization of the PSF.

The "Proponent's handbook: a guide on how to access the People's Survival Fund" was formulated and PhP 1 billion, sourced from the 2015 national budget, was allocated to PSF, on October 28, 2015.

(3) Other laws, code and standards

1) Related to buildings

The two following Codes are related to buildings:

- National Building Code (PD1096): this code prescribes the minimum requirements against fire and natural disaster and design standards; was enacted in 1977 and its IRR was revised in 2004.
- Fire Code (RA 1185): identifies the roles and responsibilities of building owners and managers against fire.

2) Observation, forecast and warning

- PAGASA: The Presidential Decree No.78 of 1972 and PD No.1149 of 1977 established and empowered PAGASA. According to these laws, PAGASA is responsible to "observe and report the weather of the Philippines and specified adjacent areas, and issue forecasts and warnings of weather and flood conditions affecting national safety, welfare and economy". The Modernization Act of PAGASA was enacted in 2015 in

order: i) To upgrade Physical resources and operational techniques; ii) to enhance research and development capabilities; iii) to integrate DRRM, CCA and water resource management; iv) to strengthen linkages and cooperation at the national level; v) to establish and enhance field weather service centers; vi) to strengthen a technology-based data center consistent with International standards and vii) to enhance public information, education and advocacy.

- PHIVOLCS: The predecessor of PHIVOLCS, the Commission on Volcanology, was created by the RA No.766. The Executive Order No.984 of 1984 transferred the responsibility for Seismology, or the science that deals with earthquakes, which used to be a concern of PAGASA, to PHIVOLCS. Now, the mandates of PHIVOLCS are to i) predict the occurrence of volcanic eruptions and earthquakes and their related geotectonic phenomena, ii) determine how eruptions and earthquakes shall occur and also areas likely to be affected, iii) generate sufficient data for forecasting volcanic eruptions and earthquakes, iv) mitigate hazards of volcanic activities through appropriate detection, forecast and warning systems, and v) formulate appropriate disaster preparedness plans.

3) Implementation of structural measures at the local level

- Budget: The Presidential Decree No. 477 of 1947 mandates LGUs to ensure the "Infrastructure Fund" to repair, maintain, improve and construct sewerage and drainage systems. This law was replaced by the Local Government Code of 1991 that mandates LGUs to implement flood control projects.

4) Water management and flood control

- Basin management: The Executive Order No. 816 of 2009 of the President of the Philippines is mandating the River Basin Control Office (RBCO) to serve as the lead government agency for integrated planning, management, rehabilitation and development of the country's river basins; to serve as an oversight office in the implementation of IRBM/IWRM (Integrated Water Resources Management: IWRM) plans, projects and programs; to introduce national policy coordination for LGUs and NGOs in the development and sustainability of river basins, and to make recommendations on related approvals and funding; and to serve as the central fund administrator for the river basin appropriations introduced under the DENR budget.

  In 2011, to coordinate the programs, projects and activities of water-related agencies conducted by the Government and to achieve efficiency in developing and operating water-related infrastructure, the former President appointed the Secretary of DPWH as a "water czar". To fulfill this new task, DPWH established an Integrated Water Resources Management Coordination Team (IWRMCT) in 2014.

Regarding water management, NEDA drafted a policy study report analyzing the present institution, regulation and governance issues related to the water resources sector. In this draft, NEDA formulated recommendations such as the creation of a National Water Resources Management Council (NWRMC) which shall have the roles and responsibilities to integrate and coordinate an adequate national policy and plan to comprehensively manage water resources in the whole country.

- Implementation of flood control projects: The Water Code or Presidential Decree No.1067 was enacted in 1976, and its IRR in 2005. The IRR of 2005 designates DPWH as the responsible agency to formulate basic ideology on flood protection and construct/implement river structures. In addition to this, DPWH is mandated to designate the Flood Prone Areas, to arrange the establishment of Flood plain management committees, and to take leadership in implementing flood control projects and is responsible for the river works in the eighteen major river basins.

3.2.4 Summary

The key points are:

- In the 1990s, the Government of the Philippines started to consider the shift from a "post-disaster response and anticipation" into a "pre-disaster Disaster Risk Reduction Management as an issue to eradicate poverty".
- In 2010, RA10121 replacing PD.1566 was enacted. This new law emphasized the need for a coherent, integrated and proactive approach to DRRM across levels and sectors, governmental agencies and communities.
- In the Philippines Development Plan formulated in 2011, DRRM and Climate Change issues are crucial to reach the goals on sustainable growth and are positioned as issues crossing all sectors.
- During the formulation of the recent Ambisyon Natin 2040, natural disasters were identified as one of the three factors causing instability. In other words, natural disasters were recognized as an issue that has to be prioritized by the Government of the Philippines in order to ensure Filipinos' safety and prosperity.

3.3 DRRM Governance

3.3.1 Efforts of the Government of the Philippines

The policy and legal framework on DRRM are summarized in the previous section. In this section, the efforts undertaken by the Philippine government on the related plans, guidelines, institutional arrangement, role allocation, and budget allocation are summarized.

(1) Plans and Guidelines

As a national level plan on DRRM, there is the National Disaster Risk Reduction and Management Plan (NDRRMP, 2011) in the Philippines. As a long term plan for 2028, in the four phases of the DRRM cycle, fourteen objectives and 93 activities are described with their implementing agencies. Now, the related agencies are implementing the activities in the plan based on their responsibility. The National Disaster Response Plan (NDRP) for the hydro-meteorological disasters which defines a more detailed role and responsibility of related agencies for the disaster response phase, and National Disaster Preparedness Plan (NDPP) have also been formulated (the validation of the NDPP for earthquakes and tsunamis is in progress). It can be said that the capacity of the Philippine government from the disaster preparedness to the response phases has been remarkably increased in recent years by these plans.

As for the local level plans, there is the Local Disaster Risk Reduction and Management Plan (LDRRMP). LDRRMP has to be formulated by all LGUs based on RA10121 and LDRRMP is the basis to use the Local Disaster Risk Reduction and Management Fund (LDRRMF). The Office of Civil Defense (OCD) is supporting LGUs to formulate LDRRMP by the preparation of guidelines and implementation of awareness activities for LGUs. The Department of the Interior and Local Government (DILG) is also supporting LGUs to formulate LDRRMP together with the preparation of the Comprehensive Land Use Plan (CLUP) in cooperation with the Housing and Land Use Regulatory Board (HLURB). Through these efforts, almost all LGUs have formulated their own LDRRMPs. Regarding the contents of LDRRMP, OCD has formulated a checklist based on the guideline, and DILG is establishing the evaluation system of LGU's activities including the evaluation of LDRRMP. The national government tries to improve the contents of LDRRMP by these activities.

In order to support DRRM activities by related agencies and LGUs, OCD and DILG etc. have formulated several guidelines and memorandums on the preparation of LDRRMP, mainstreaming DRRM into CLUP, education and training on DRRM, promotion of CBDRRM activity and establishment of LDRRMO etc., and are instructing them directly how to use guidelines.

(2) Organization and Responsibility

The National Disaster Risk Reduction and Management Council (NDRRMC), chaired by the Minister of Department of National Defense and administrated by OCD for the national level, and

the Regional Disaster Risk Reduction and Management Council (RDRRMC), chaired by regional director of OCD for regional level, have been newly established under RA10121. The vice-chair agencies, such as DOST, DILG, DSWD and NEDA, have been also designated in the council and mandated to promote their responsible DRRM activities including activities described in NDRRMP. As for the local level, LGUs have been mandated to establish the Local Disaster Risk Reduction and Management Council (LDRRMC) and Local Disaster Risk Reduction and Management Office (LDRRMO).

National government agencies (NGAs) have their regional level offices (some agencies have officers in the LGU level) and regional offices coordinate with LGUs for DRRM activities. Generally, NGAs support LGUs technically when NGAs receive such requests from LGUs, and NGAs also monitor LGUs' activities if LGUs follows the national policy or not. For example, OCD and DILG etc. have formulated a guideline for LGUs to establish LDRRMO, and have formulated the monitoring system of LDRRMO to enhance the establishment of LDRRMOs.

To ensure the functionality of OCD as required by RA10121, an Organizational Structure and Staffing Pattern (OSSP) of OCD was drafted to enhance the organizational capacity and augment the personnel. As of May 2016, the OSSP was partially approved and the reorganization and upgrade of OCD were executed in July 2016, and the number of permanent officers was doubled.

(3) Prevention and Mitigation

1) Risk Assessment

Technical agencies such as PAGASA, PHIVOLCS, MGB, DPWH, DOST etc. have been preparing the hazard maps based on their specialty, and improving the accuracy and promoting nationwide in cooperation with donor agencies and universities, etc. Although most of the hazard maps were prepared based on 1/50,000 scale topographic maps, 1/10,000 scale maps have been utilized recently.

Technical agencies also support LGUs technically on risk assessment when LGUs formulates LDRRMP from the point to promote risk assessment and to enhance risk knowledge.

2) Structural and Non-Structural Countermeasures

The Philippine government has been conducting master planning and their implementation against floods, sediment and volcanic disasters for priority areas such as major cities, major river basins and heavily affected areas in the past, etc., by utilizing donor support. As for earthquake disasters, the design standard and building code are being revised, and the safety assessment and retrofitting of existing important public structures, such as bridges, government buildings, hospitals and schools etc., have been started mainly for Metro Manila with support by donors. Since the port facilities are also important in the Philippines, the DRRM activities, such as to secure the safety of port areas and to formulate Business Continuity Plans (BCPs), have been conducted mainly by the Philippines Ports Authority (PPA).

As for monitoring and early warning systems, the systems for floods, sediment disasters, volcano, earthquake and tsunami etc. have been established mainly by PAGASA and PHIVOLCS.

The land use planning from the point of DRRM has been also promoted mainly by HLURB.

(4) Preparedness

1) Human Resources Development

RA10121 puts importance on the capacity enhancement and human resources development of government officers including LGU officers, and defines to establish the DRRM Training Institute (DRRM-TI). Although the building of DRRM-TI has not been established and its operation rules have not been formulated, the policies and modules of human resources development have already been formulated, and some training programs such as Post Disaster Needs Assessment (PDNA) have been started.

The Local Government Academy (LGA) of DILG is conducting a training session for LGU officers, and recently LGA has been implementing training on DRRM.

The capacity enhancement of community people used to be conducted by various agencies in various ways. In order to standardize the activities, OCD has formulated guidelines to implement CBDRRM activities.

2) Inter-Organizational Cooperation

In the Philippines, there is an institutional framework to cooperate with each other for the preparation of plans and programs on DRRM, if there is an agency to take leadership. For example, DILG is promoting preparedness activities through the preparation of a National Disaster Preparedness Plan (NDPP) in cooperation with related agencies. The detailed roles and responsibilities of related agencies are described in NDPP. And the technical agencies such as PAGASA and PHIVOLCS as well as OCD and DILG support LGUs technically when LGUs formulates LDRRMP.

3) Establishment of Database

Each agency manages a database of their necessary data and information. OCD has established an Information Management System (IMS) which includes the disaster records, resources for response, and training records, etc.

The Department of Health (DOH) has established the “SPEED” (Surveillance in Post Extreme Emergencies and Disasters) system in order to instantaneously grasp the situation of the hospitals in affected areas. 21 key diseases that occur after a disaster are monitored.

The Department of Social Welfare Development (DSWD) has funded a Disaster Response Operations Monitoring and Information Center (DROMIC) in the Manila headquarters and assigned five staff members in each regional office to maintain the Information Management

System (IMS) and consolidate the database including the list of volunteer groups capable to support disaster relief and rescue activities and the list, location and capacity of all the evacuation centers designated by LGUs in the whole country.

The Department of Education (DepEd) formulated a "masterlist" of schools covering the whole nation in 2010 and is conducting a survey in the area affected by disasters that occurred between 2009 and 2014, and recording the number of schools affected by each kind of disaster.

The Department of Public Works and Highways (DPWH) established a database for the management and maintenance of roads and bridges, with the support of the World Bank (WB). Regarding DRRM, DPWH has initiated a discussion forum to consolidate the conceptual design of a database system for river management and flood control facilities. DPWH prepared a list (hard copy) for the river structures covering the whole country in 2005 and is reviewing it at least every five years. The pilot activity of the Cavite Industrial Area Flood Risk Management Project conducted by JICA aimed to digitize and convert printed data to electronic data of the river and flood control structures located in the river basins of Imus, San Juan and Canas by using a generic GIS and database software.

The National Mapping and Resource Information Authority (NAMRIA) launched the "One Nation One Map" program to manage the data of all the electronic maps prepared by various NGAs in one server, so that map data including hazard and risk maps can easily and promptly be shared and referred.

LGUs are starting to consider the formulation of DRRM database. Some advanced LGUs, mainly located in Metro-Manila, have established a Command Control Coordination (C3) Office to enforce disaster/crisis preparedness and response efforts and have established a real-time monitoring system to share and record information such as river level and rainfall. Through the ongoing "Verification Survey with the Private Sector for Disseminating Japanese Technologies for Integrated Geographic Information System (Integrated GIS) for Improvement of Regional Disaster Risk Reduction and Management" conducted by JICA, DRRM databases have been implemented in the Province of Pangasinan, in one city and two municipalities.

As described in the Section 2.2, the Advanced Science and Technology Institute of DOST (DOST-ASTI) has launched the "Project-NOAH" with the cooperation of other organizations in order to share and publish real-time hydro-logical data on the web.

Table 3.3.1 Summary of Activities for Creation of Database related to DRRM Activities

Organization	Database / Program / Activity	Description of Database
OCD	OCD-IMS	Historical Disaster Data Resources Data for Disaster Response
DOST-ASTI	Project NOAH	Hydrological and Meteorological Data
DOH	SPEED (Surveillance in Post Extreme Emergencies and Disasters)	Hospitals / Health Units Types of Diseases
DSWD	Disaster Response Operations Monitoring and Information Center (DROMIC)	Volunteer Groups Evacuation Centers
DepEd	Disaster Damage Survey (2009~2014)	Schools affected by Disasters
DPWH	Preparation of Nationwide River / Flood Control Facilities Data JICA Survey (Cavite Province)	Paper Data of list for River / Flood Control Facilities Data Electric River / Flood Control Facilities Data in Cavite Province
NAMRIA	One Nation One Map	Map Data / Information (Hazard / Risk Maps)
LGUs	Establishment of C3 Offices JICA Survey (Pangasinan Province)	Real-time Observation Monitoring System Structures / NGOs / Resources Data

(5) Response

DSWD has formulated NDRP for hydro-meteorological disasters in cooperation with OCD in order to define the roles and responsibilities of related agencies in the response activities. In an emergency, NDRRMC is convened and shares necessary information and data with related agencies and effective response operations were conducted in recent years.

(6) Rehabilitation and Recovery

Post Disaster Needs Assessment (PDNA) is conducted by OCD in cooperation with related agencies for prompt emergency recovery, whenever disasters occur. OCD conducts training sessions on PDNA during normal situations. The Philippines is one of the countries promoting the concept of Build Back Better (BBB). PPA and NEA have strengthened their facilities during the rehabilitation/recovery phases from the Typhoon Yolanda, which is a good example of the concept of BBB.

(7) Budget Allocation

The National Calamity Fund (NCF) and Local Calamity Fund (QCF) were used only when a disaster occurred. These funds are now called as NDRRMF and LDRRMF under RA10121. 30% of DRRMF is used after disasters and the remaining 70% is used for pre-disaster activities. More than five percent of the annual budget of LGUs have to be allocated for LDRRMF. Preparation of LDRRMP and its conformity with the usage of LDRRMF are necessary for using LDRRMF. The preparation of LDRRMP was accelerated by the policy to link LDRRMP and LDRRMF.

3.3.2 JICA's Cooperation

In Japanese Disaster Risk Management, the concept of Self-help, Mutual help and Government help are widely shared among DRRM officials and actors, which showed multi-layer roles from the central government, to the community and each individual to cope and be prepared for a disaster event. Meanwhile, the Philippines also has the tradition of "Bayanihan", which refers to mutual help among families and communities, and faces the needs in enhancing "Bayanihan" in the government from the central government's point of view towards communities. Therefore, JICA's cooperation on DRRM for the Philippines has also addressed the various needs in the central government as well as the communities.

The technical cooperation project mainly for OCD (2012-2015) and the dispatch of a Policy Adviser to OCD (since 2012) can be recognized as JICA's cooperation activities to enhance the overall DRRM governance. In the technical cooperation project, the preparation of LDRRMP with its checklist, NDRP, NDRRM Education and Training Program and guideline for CBDRRM activity etc. were supported, and the capacity enhancement of OCD was conducted through these activities. As for the cooperation for LGUs, LDRRMOs are supported by the Japan Overseas Cooperation Volunteers (JOCV) and also through the CBDRRM activities of the grass roots technical cooperation projects (since 2012).

Prevention/Mitigation, development studies, yen loan projects, grant aid projects, SATREPS etc., for floods, earthquakes and volcanic disasters have been conducted. (See more details in the following sections.)

In response to Typhoon Yolanda, rehabilitation and recovery plans have been formulated under the urgent development study and several priority projects have been implemented by grant aid projects (since 2013). Cooperation on the stand-by loan and on the insurance system etc. has also been conducted, which is outlined in the section regarding disaster risk finance and insurance.

In addition to the above projects, the preparation of an Area Business Continuity Plan (Area BCP) in the Philippines was also supported in the project targeting the ASEAN Region.

Furthermore, JICA is providing various training programs through Knowledge Co-Creation Programs (Group and Regional focus) related to DRRM governance to officers of OCD, DSWD, Local Government Units (LGUs) and other groups.

3.3.3 Other Donors' Cooperation

As for the cooperation to overall DRRM governance, preparation of NDRRMP, sunset review of RA10121, preparation of a guideline for LDRRMP etc., have been supported by UNDP.

AFD is supporting DILG to establish the evaluation system of DRRM activities by LGUs. GIZ also supports LGUs in several areas such as the establishment of an early warning system, preparation of CLUP and rehabilitation/recovery plans, etc.

As for Prevention/Mitigation, UNDP and AusAID have supported the READY project to produce hazard maps, and WB, ADB and WHO are supporting for the earthquake disasters. (See more details in the following sections.)

UNOCHA supports emergency operations. As for the risk finance, initially WB and ADB are supporting the Philippine government. (See more details in the section of risk finance.)

In addition, the Canadian government, ADB and GIZ support medium and small sized enterprises in formulating their BCPs.

3.3.4 Identification of Gaps

(1) Plans and Guidelines

Although DRRM activities described in NDRRMP are being implemented step by step, some activities are delayed depending on the awareness and capacity (human resources, equipment, budget etc.) of the responsible agencies. However, there is not yet an adequate system to support and promote the implementation of such activities.

As for the local level, although almost all LGUs have already formulated LDRRMP, most LDRRMPs are only a one page list of actions prepared for the use of LDRRMF except for some LDRRMPs which follow the items of the guideline formulated by LGUs in Metro Manila, vulnerable LGUs or LGUs supported by donor agencies, etc. The contents of the actions are also different depending on the LGU, and most of the actions, especially the actions of the one page LDRRMPs, are response activities or rehabilitation/reconstruction projects like the activities for previous LCF (QRF).

On the other hand, because of the small number of tangible guidelines to promote the considerations and implementation of efficient and concrete/realistic DRRM countermeasures, guidelines and strategies have to be formulated to enhance adequate planning of DRRM measures.

(2) Organization and Responsibility

OCD and four vice-chair agencies promote the implementation of DRRM activities on the national level. However, some activities are delayed depending on the awareness and capacity (human resources, equipment, budget etc.) of the responsible agencies.

As for the local level, there are few officers who have enough experience required in the guideline for LDRRMO. There are many cases that the assigned officers for LDRRMO have other assignments.

To ensure the functionality of OCD as required by RA10121, an Organizational Structure and Staffing Pattern (OSSP) of OCD was drafted to enhance the organizational capacity and augment the personnel, but the approval of this OSSP will take time (a part of the OSSP was already approved and implemented in July 2016).

(3) Prevention / Mitigation

1) Risk Assessment

Although the risk assessment is being implemented by the technical agencies, the covering of disasters and areas are still limited. There are lots of hazard maps prepared by many kinds of methodologies without detailed information, since there is not a standard methodology. In addition, there is not a system to monitor the changes of disaster risks together with various stakeholders.

RA10121 defines the rules that detail restriction areas or activities that have to be planned in the land use plan or LDRRMP of LGUs based on the risk assessment. However, the result of risk assessment has not been properly reflected to the said plans and effective DRRM activities so far, since LGUs cannot understand the meaning of the risk assessment prepared by the technical agencies.

2) Disaster Record Database

In Chapter 2, disaster risks and its trends etc. were analyzed based on the disaster records held by OCD. However, it was found that there are limitations regarding the analysis based on the type of data and information in the present OCD's disaster records. In the future, the re-classification of some parameters such as disaster types, level/force, and impact/affected areas should be considered in order to serve as tools to analyze the progress towards the SFDRR's global targets and also to serve as base-data to consider and implement DRRM countermeasures.

3) Structural Measures / Non-Structural Measures

As for Prevention/Mitigation, the countermeasures to mitigate damages have not been implemented effectively, since the national policies, targets, priorities, etc., for Prevention/Mitigation have not been defined yet. Especially for the structural measures, the awareness of related agencies are low except for DPWH and their capacity for planning, design and implementation of structural measures is also limited.

In addition, the effective structural and non-structural measures including the assessment of important buildings have not been planned and implemented based on the hazard maps. Especially for the land use planning from the point of DRRM has not been effectively conducted,

though there has already been a guideline. There have been few cases that the land use regulation was effectively implemented.

(4) Preparedness

There are some national government agencies (NGAs) and LGUs which cannot implement DRRM activities because of the lack of awareness for DRRM or the lack of capacity such as human resources, equipment, budget etc., even though they have awareness. As for the human resources development, which is one of the solutions for these issues, DRRM-TI is not in full operation and the expected training sessions have not been conducted so far. Although the databases on DRRM are important tools for DRRM activities, the utilization of data and sharing data among agencies have not been conducted well yet. In addition, although the human resources development tends to be highlighted as "Preparedness", "Preparedness" has to be conducted from the broader point of view.

(5) Response

Since the camp management and distribution of relief materials tend to be highlighted too much as "Response", the improvement of the overall response activities including budget allocation is necessary.

NDRP was formulated only for the national level hydro-meteorological disasters, and is necessary for other disasters and on the local level. It is also necessary to evaluate and improve NDRP when the actual disaster occurs or through the exercises (The NDRP for Earthquake is under consolidation).

During the response period, coordination with the donor agencies and private sectors has not been managed well. And, there are some agencies such as the Bureau of Fire Protection (BFP) which cannot fulfill their roles during the response period because of the lack of capacity such as human resources, equipment and budget, etc.

(6) Rehabilitation and Recovery

Rehabilitation and Recovery have not been conducted smoothly, in the time since the coordination with related agencies was conducted after the occurrence of the recent disasters, and the coordination with donor agencies, Civil Society Organizations (CSOs), private sectors etc. could not be conducted well. Therefore, there was duplication, or missed areas of support.

Additionally, the understanding on the locality, geographical and time distribution of disaster risk is not so high in the majority of the LGUs. To enhance the implementation of efficient recovery and reconstruction plans, disaster risks specific to the considered area have to be analyzed and shared.

(7) Budget Allocation

A major part of NDRRMF is used for the rehabilitation and recovery from major disasters such as the disaster caused by Typhoon Yolanda. As for LDRRMF, most of the vulnerable LGUs save the budget for emergency situations without using the budget for pre-disaster investment. After the disaster occurs, LDRRMF is mostly used for rehabilitation and recovery like NDRRMF.

3.3.5 Direction of Future Cooperation

The present situations and challenges on DRRM governance described above are shown in the matrix in section 3.9 in detail. The identified challenges are classified into the challenges on the policy/system and on the human resources/capacity enhancement. The directions of future cooperation on both challenges are described below.

(1) Policy / System

The clarification of role allocations of related agencies is one of the most important measures. It is indispensable to promote the implementation of NDRRMP. Especially for "Prevention/Mitigation" and "Rehabilitation/Recovery", it is necessary to formulate the policy and detailed activity plan for their implementation and promotion, and to define the roles of related agencies in detail. The lack of capacity of LGUs is also pointed out at various aspects, and it is necessary to define the role of NGAs how to support LGUs. As for risk assessment, which is the basis of all the DRRM measures, implementing risk assessment nationwide is the urgent issue and it is required to promote risk assessment by the agencies with the properly allocated roles.

Establishment of systems to promote the implementation of NDRRMP and LDRRMP is the high priority activity. This activity includes the establishment of a monitoring system for project implementation, preparation of a strategy for budget allocation, research of the effect by pre-disaster investment for DRRM, institutional arrangement for supporting LGUs etc. It is necessary to collect and analyze the existing hazard/risk maps, to establish the monitoring system for risk assessment, to formulate guidelines etc., in order to establish the system to promote risk assessment. In addition to the above systems, the system to promote the operation of DRRM-TI is necessary, such as the establishment of operation policy and institutional arrangement. The human resources development, research on the methodology of risk assessment, disaster analysis, and research on the effect by pre-disaster investment for DRRM etc. are recommended through the strengthening of cooperation among academic institutions such as the University of the Philippines (UP), Commission on Higher Education (CHED) and Manila Observatory.

(2) Human Resource Development / Capacity Enhancement

The capacity enhancement of LGUs is the most urgent issue. Especially the capacity for implementation and utilization of risk assessment, planning and implementation of LDRRMP, strengthening of LDRRMO and supporting communities, etc., has to be enhanced. As for the

national level human resources development, the capacity for the implementation and utilization of risk assessment enabling the consideration and implementation of concrete DRRM measures, preparation of BCPs, preparation of guidelines for supporting LGUs, etc., has to be enhanced.

Enhancement of the response capacity needs to be conducted continuously. Preparation of disaster response plans and evacuation plans, strengthening of information dissemination systems including the utilization of Digital Terrestrial Television Broadcasting, implementation of disaster management drills based on the response plan, etc., have to be conducted. It is also necessary to provide the equipment for disaster response activities to BFP, etc.

In particular, targets and activities on human resources development and capacity enhancement have to be identified and planned based on the defined roles and responsibilities of each agency in the revised RA10121 and outcomes of NDRRMP.

For example, the conduct of risk assessment is mandated by RA10121 but the method and reason to conduct risk assessment is not clear and consolidated. That is the reason why some technical standards and guidelines have to be formulated and periodically upgraded as is currently being done in Japan, and consequently the capacity enhancement of technical agencies is required.

In addition, risk maps have to be used as an educational tool by the communities to enhance risk understanding and self-protection measures, as a basic instrument for LGUs to formulate land-use plans and LDRRMP, and as a decision-making tool for the NGAs to formulate the National Strategy and Plan. That is why the capacity enhancement of all the levels of governance has to be promoted through a top-down strategy. Because OCD is the lead agency of the NDRRMP's outcome 1 which is "DRRM and CCA mainstreamed and integrated in national, sectoral, regional and local development policies, plans and budgets", and because DILG, DOST, DENR, HLURB and other agencies are designated as Implementing Partners, the capacities of OCD as coordinator and the other NGAs have to be enhanced.

3.4 Disaster Risk Finance and Insurance

3.4.1 Projects of disaster risk finance and insurance in Japan

Risk financing and risk control are closely connected together in Disaster Risk Finance and Insurance (DRFI). Disaster risk control is an activity to reduce damage associated from natural disasters. Typical examples of disaster risk control are seismic retrofit, emergency response plan and business continuity plan. These activities in both the physical and management aspects enhance to mitigate probable loss and increase the resiliency of the facilities. However, disaster risk control alone will not eliminate damage exposure completely. It is a role of disaster risk finance and insurance to cope with residual risks by a financial mechanism. In disaster risk finance and insurance, the residual risks may be retained or transferred. Typical approaches of risk retention are to set up contingent funds, special reserve account or contingent credit line. In risk transfer approach, disaster insurance and CAT Bond are typical financial mechanisms. Based on assessment of residual risks, disaster risk finance and insurance is to establish the most appropriate combination of risk retention and transfer.

The Japanese government has been developing its disaster prevention plans based on the damage anticipated in earthquake scenarios that may occur in the near future, such as earthquakes occurring directly beneath the Tokyo Metropolitan Area and Tonankai earthquakes. In the Cabinet Office's scenario of an earthquake occurring directly beneath the Tokyo Metropolitan Area (December 2013), the expenditures due to damages of assets, etc. are estimated to be about 47.4 trillion yen and those due to adverse effects on economic activities are estimated to be about 47.9 trillion yen. After the Great East Japan Earthquake, the Japanese government established a special account for the reconstruction[4] to secure a budget to cope with the damages. However, the occurrence of such huge damages may lead to a national crisis, such as an expansion of the financial deficit and a drastic increase in the interest rates of national bonds. To prevent such a crisis, it is important to decrease damages at the time of a disaster as much as possible. For that purpose, the government considered and formulated basic plans for national resilience during a Cabinet meeting in 2014.[5] In the national resilience action plans developed under these basic plans, measures to reduce the impact of disasters to equipment and facilities, such as construction of earthquake-resistant buildings and infrastructures, were included. At the same time, the action plans include many measures to decrease the effects on economic activities, such as the maintenance of supply chains during and after a disaster, including emergent cargo shipments, international container shipments, continuation of port businesses to import coal, and strengthening of earthquake-resistant structures of oil refineries for continuing the supply of oil products. These plans have been developed based on the lessons learned from past catastrophic events experienced by Japan, with the recognition that disaster-prevention plans only focusing on the improvement of infrastructures have limited effects.

[4] http://www.mizuho-ri.co.jp/publication/research/pdf/research/r120301keyword.pdf
[5] Outline of the Fundamental Plan for National Resilience
http://www.cas.go.jp/jp/seisaku/kokudo_kyoujinka/pdf/kk-gaiyou-h240603.pdf

Importance has been placed on the peacetime establishment of national-land, economic, and social systems with "strength and flexibility" in order to protect human lives, prevent fatal damage to the economic society, and promote early reconstruction.[6] Thus, the basic plans for national resilience constitute the basis for disaster risk management of the government.

In order to support local government units for their response and recovery from a natural disaster, a special financing scheme has been adopted based by the Act concerning Special Financial Aid to Deal with Major Disaster, The scheme aims to mitigate financial impact on local government units and private sectors. When a disaster is declared as major one by the central government based on the recommendation of the central committee, the subsidy from the central government to the local government units to fulfill monetary needs for response and recovery work will be increased. A special aid treatment concerning to public guarantee system for Small and Medium Enterprises (SMEs) will be allowed under this Act. Disaster risk finance and insurance systems that can be used by the Japanese people and private companies include residence earthquake insurance to cover earthquake damages of houses (1. reinsurance scheme introduced by private insurance companies and the Japanese government; 2. mutual aid associations and 3. funding systems for natural disaster victims relief). System 1 "Reinsurance scheme" is a government-sponsored reinsurance program and has been successfully operated since majority of catastrophe insurance risks is ceded to the sole reinsurer from the private insurers. System 3 is also backed up by government funding, and the government bears the risks for these systems. System 2 "mutual aid associations" (e.g. National Mutual Insurance Federation of Agricultural Cooperatives) is a system to transfer risks to reinsurance and bond markets through reinsurance and CAT bonds. Because of the Great East Japan Earthquake, which led to the highest expenditures in history, reviews have been made on earthquake insurance and reinsurance schemes to prepare for big earthquakes anticipated to occur in the future. System 3 is a public support system through a special funding scheme established by local governments in order to provide monetary assistance to the people who suffered extensive damage due to a disaster, This scheme is intended to enhance the recovery process of the affected region through the prompt recovery of individuals. [7]

Private facilities other than residences are covered mostly by private fire insurance, but some financial organizations have established BCP loan systems for decreasing damages, ranked BCM loan systems to set preferential loan conditions depending on BCM endeavors, and loan allocation systems. At the same time, there are a wide variety of fund raising systems to meet various needs, such as catastrophe bonds and insurance derivatives.

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[6] What is "National Resilience"? National Resilience Promotion Office, Cabinet Secretariat http://www.cas.go.jp/jp/seisaku/kokudo_kyoujinka/pdf/kokudo_pamphlet.pdf

[7] Cabinet Office, General Information on Rehabilitation Aid Scheme on Victims http://www.bousai.go.jp/taisaku/seikatsusaiken/pdf/140612gaiyou.pdf

3.4.2 Efforts of the Government of the Philippines

Because of the tremendous damage caused by the Typhoons Ondoy and Pepeng (2009), the Government of the Philippines shifted its focus from measures for disaster recovery after damage occurs to preventive measures to reduce impacts from disasters. The government enacted the NDRRM Plan and established the NDRRMC. The responsibilities of NDRRMC included the development of the external transfer of contingent liabilities occurring due to a disaster and the increasing use of disaster reserve funds for advance investment.[8]

By establishing a scheme by which local governments and organizations can directly access overseas insurance and financial markets, the government aims to prevent excessive effects of the manifestation of contingent liabilities due to a disaster on the governmental budget. The effects of a natural disaster will differ, depending on whether the agency is the central government or a local government, on family finance, and on whether the subjects belong to the underclass. Therefore, the government has been establishing a comprehensive DRFI system, by combining optimal risk finance methods for respective classes. To establish an efficient DRFI system, it is necessary not only to develop a natural disaster scenario of the maximum amount of damage but also to evaluate the amount of damage quantitatively and estimate the anticipated annual amount of damage. While many countries were trying to establish a DRFI system based on a maximum damage scenario, the government developed a model to estimate damages from earthquakes and typhoons called "Philippines Catastrophe Risk Assessment and Modeling" (2014), with the support of the World Bank. The government has been using this model for its DRFI strategies. Because of that, the government's endeavors for DRFI are ahead of those of other countries. Unlike physical measures for disaster recovery and disaster prevention, the DOF can play a leadership role in taking disaster-prevention measures for DRFI, and is promoting DRFI in collaboration with the World Bank.

Figure 3.4.1 shows the history of disaster prevention strategies in the world after the Hyogo Framework for Action 2005, topics related to DRFI during that time, and endeavors by the government and respective donors in the Philippines.

[8] Disaster Risk Finance – A Global Survey of Practices and Challenges, OECD 2015

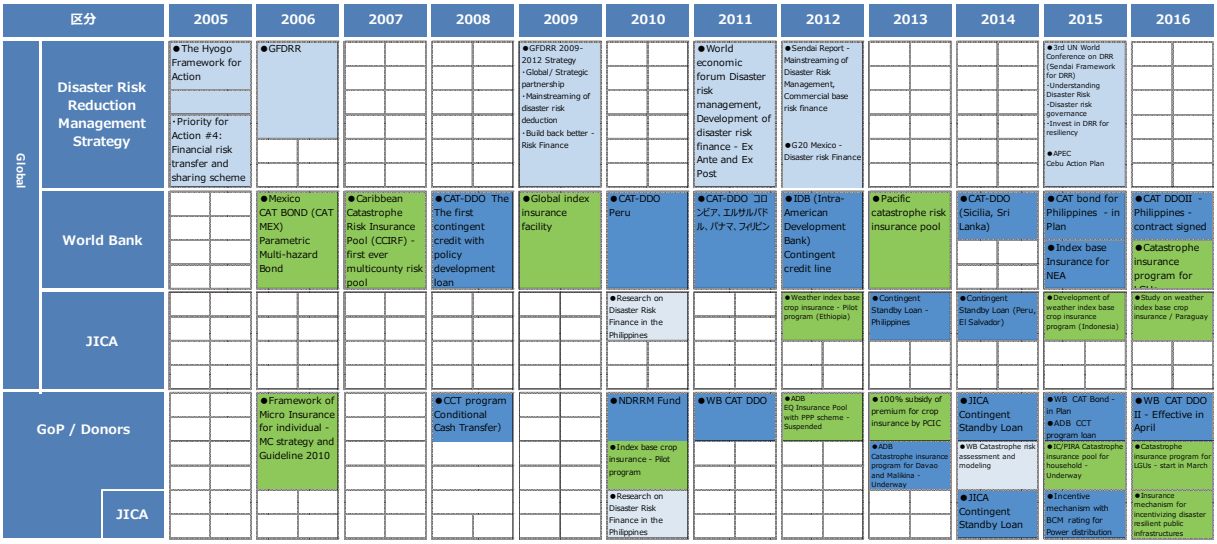


Figure 3.4.1 Historical Major Topics in Disaster Risk Finance and Insurance and Activities in the Philippines since 2005

3.4.3 JICA's Cooperation

In 2010, JICA conducted a "study on disaster risk finance" to determine the present status of DRFI in the Philippines and identify areas in which the implementation of DRFI policies can be promoted and in which JICA can provide support. In this study, areas in which JICA can provide support, such as standby loans, CAT bonds, and insurance derivatives, were identified.

Thereafter, as one of the cooperative projects of JICA in the area of DRFI, a loan agreement on standby yen loan for disaster recovery (50 billion yen) was concluded in March 2014. Like the undermentioned CAT DDO of the World Bank, this standby yen loan agreement has an attachment describing policy actions related to disaster risk reduction and management and goals of these actions. There is also a stipulation about monitoring the achievement status of the policy actions by the DOF. Also, an index to evaluate the operation and effects of policy actions quantitatively was introduced. Specifically, a numeric index of baseline values in 2012 and target values in 2016 were shown for the number of local disaster prevention plans, the number of rivers for which a comprehensive water resource management plan was established, and the number of main rivers for which an early warning system was established. Under this standby yen loan agreement, the full amount stated in the agreement was loaned in February 2015 to cover the costs of recovery and reconstruction in the areas affected by Typhoon Yolanda.

According to RAY Report[9] issued by NEDA, the costs necessary for the recovery and reconstruction of infrastructure sectors damaged by Typhoon Yolanda amount to 28.3 billion PhP. The damages in the electrical field amount to 6.8 billion PhP, out of which 5.2 billion PhP is to cover the damages in the electrical distribution area. Electrical distribution networks are important infrastructures to cover a large national land. However, they are outdoor facilities, which are infrastructures vulnerable to natural disasters, such as typhoons and earthquakes, as well as

[9] http://reliefweb.int/sites/reliefweb.int/files/resources/RAY.pdf

secondary disasters, such as the falling of trees caused by those primary disasters. To decrease the vulnerability of electrical distribution networks to natural disasters, advance investment for strengthening the networks and plans for early recovery are necessary. In Japan, ranked BCM loans, which link business continuation management (BCM) and loan conditions, are commercially available. To apply this concept in the framework to promote disaster-prevention investment, JICA conducted a "data collection and confirmation study on the review of the introduction of an incentive system for improving disaster resiliency of electrical distribution networks" (2015). With regard to public infrastructures, JICA has been taking disaster prevention measures which correspond to Japanese measures in order to support the endeavors by the Philippine government for risk reduction and management. Thus, it has been promoting projects, such as a "data collection and confirmation study on disaster-resilient local ports and distribution plans" (2015) and a "data collection and confirmation study on the use of damage insurances for strengthening public infrastructures to prepare for disasters in the Manila Metropolitan Area" (2016). These studies aim to design systems to specifically promote the construction of disaster-resilient facilities and advance investment for disaster prevention.

In line with NDRRMP, the Government of the Philippines has been strengthening disaster risk prevention and reduction. The Government of the Philippines, led by DOF, is also developing and implementing a multi-layered DRFI program. The program aims to effectively and immediately cope with funding needs when a disaster occurs by introducing risk financing schemes such as a contingent commitment line program and insurance program based on the assessment of loss exposure. In particular, CAT DDO I/II has a distinct scheme to enhance a disaster risk reduction approach by the Government of the Philippines with a linkage between disaster finance and disaster risk control activities. JICA also provided a stand-by loan as disaster risk finance and insurance in 2014. Result indicators and target levels were embedded with the loan.

JICA's cooperation in the areas of DRFI and relevant concepts are evaluated as follows:

- Cooperation in the field of disaster risk finance and insurance meets with the strategy of the Government of the Philippines and their needs as a disaster risk reduction mechanism.
- The stand-by loan by JICA in 2014 has well responded to the monetary needs by the Government of the Philippines after Typhoon Yolanda. Since the loan facility was exhausted entirely in 2014, the result indicators linked to disaster prevention and reduction activities may not work as originally intended. The similar loan facilities to be provided by JICA in the future may need a contractual linkage to the target DRRM action by the Government of the Philippines so that the action should continue even after the loan facility has been exhausted.
- Incentive mechanism to induce an investment on disaster prevention and reduction by means of application of BCM rating is a unique concept by JICA. In order to implement the concept effectively, a further study including scheme development of a feasible financing mechanism and identification of challenges to materialize the concept are needed.

3.4.4 Other Donors' Cooperation

(1) World Bank

The World Bank supported the implementation of "Ondoy-Pepeng post-disaster needs assessment (PDNA)" by the Philippine government. In 2011, it also established the Catastrophe Deferred Drawdown Option (CAT DDO), to be triggered by a government's declaration of a large-scale disaster. Under the CAT DDO, the full amount (500 million US dollars) was loaned based on a national disaster declaration after Typhoon Sendong in December 2011. Thereafter, in response to the request from the Philippine government in 2015, preparation was made for the establishment of the second option "CAT DDO II" (500 million US dollars). In January 2016, a contract was concluded on the CAT DDO II, which will be effected in April of the same year.

The CAT DDO II, as a disaster risk management policy development loan, encourages governments to continue their efforts to decrease disaster vulnerability, and sets forth matters concerning technical support by the World Bank Group to promote their efforts. Its management targets can be classified into two pillars, i.e., "development and regulation for decreasing damages" and "disaster finance capability." Each pillar consists of five areas, and the monitoring times and standards are stipulated in respective areas. The DOF oversees management targets, but actual duties are performed by various organizations, such as ministries and agencies, public organizations, local governments, and business groups. (Table 3.4.1)

Table 3.4.1 CAT DDO II Program Development Objectives

Pillar A: Strengthen risk reduction investment planning and regulations		Pillar B: Enhancing the financial capacity to manage natural disaster risk	
A1	Development of a methodology for national-level risk-informed planning	B1	Development of a joint catastrophe risk insurance program for Local Government Units
A2	Disaster risk reduction measures are integrated in revisions to the National Building Code of the Philippines	B2	Development of disaster risk financing and insurance strategy by number of line agencies
A3	Development of provincial commodity investment plans (PCIP) using expanded vulnerability and suitability assessment (eVSA)	B3	Design of property catastrophe risk insurance pool for homeowners by DOF, IC and PIRA
A4	Policy framework development for post-disaster shelter assistance through recovery and reconstruction phases	B4	Program development and commencement for post-disaster emergency income support
A5	Multi-hazard vulnerability assessment of priority cultural heritage site	B5	Catastrophe risk insurance database template updated and adopted by IC

DRFI policies currently taken by the government, such as the development of a natural disaster damage evaluation model as a basis of DRFI, index-type local government insurance by GSIS, and natural disaster insurance for family finances by the insurance committee, are included.

Figure 3.4.2 shows the present status of the endeavors by the Government of the Philippines to establish DRFI and how JICA and the World Bank are related to them. Figure 3.4.3 shows the present status of disaster risk finance and insurance by classified levels.

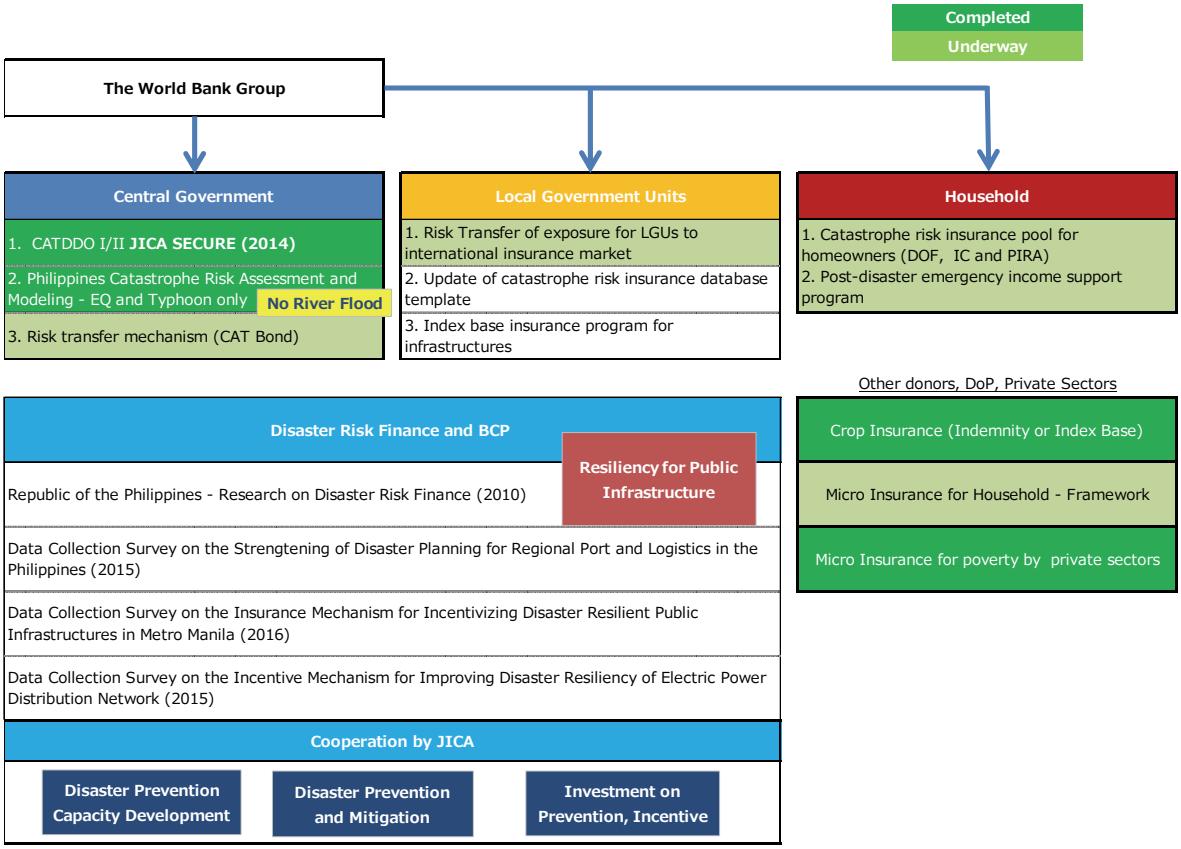


Figure 3.4.2 Multi-layer approach in Disaster Risk Finance and Insurance Development in the Philippines and involvement of the World Bank and JICA

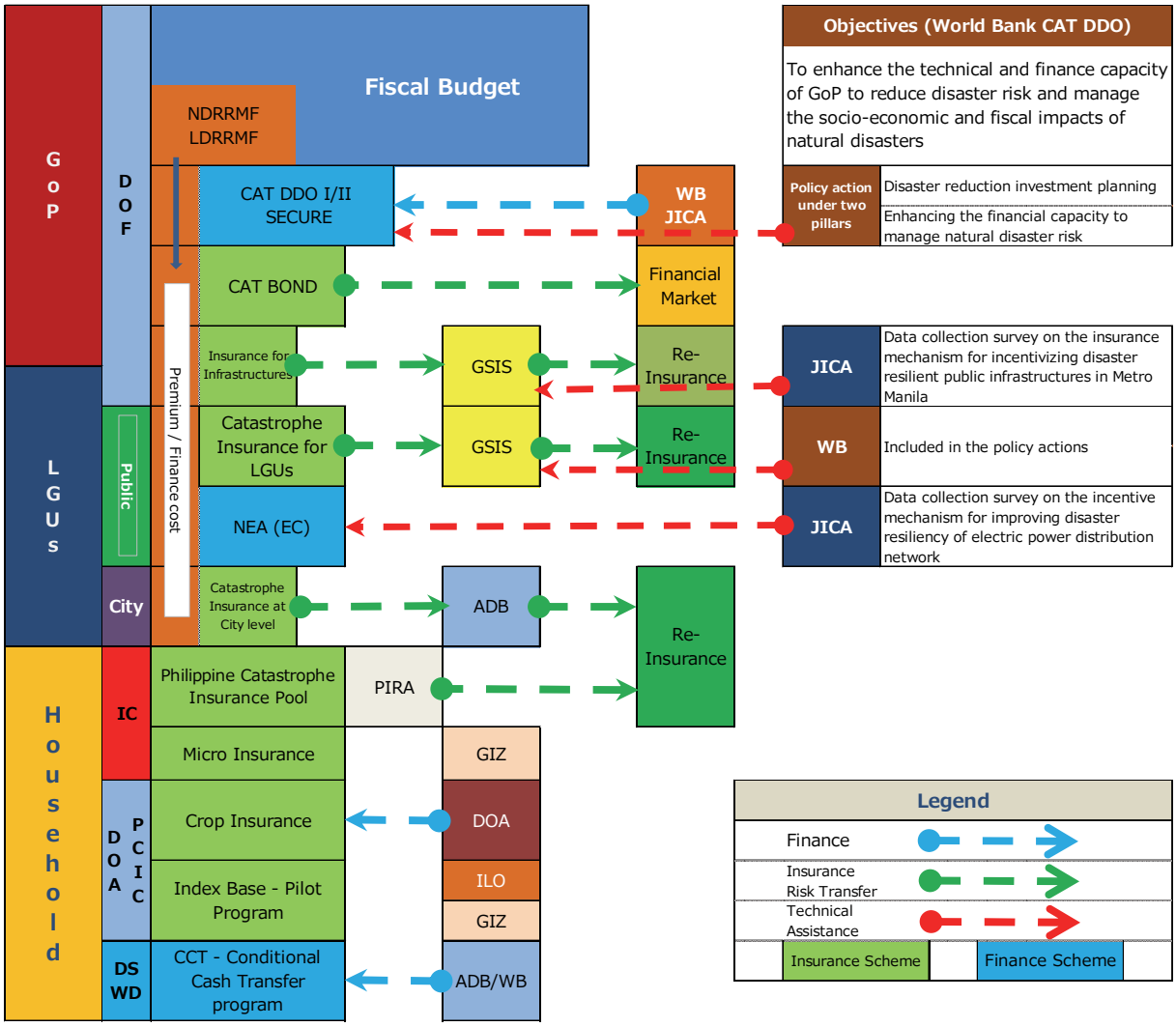


Figure 3.4.3 Schematic view of Disaster Risk Finance and Insurance in the Philippines

(2) ADB

The Asian Development Bank (ADB) has been primarily making the following attempts in the field of disaster risk finance and insurance:

A natural disaster insurance pool for local cities (Davao and Marikina) is being introduced. This is an attempt to transfer the exposure of the local cities to the overseas insurance market.

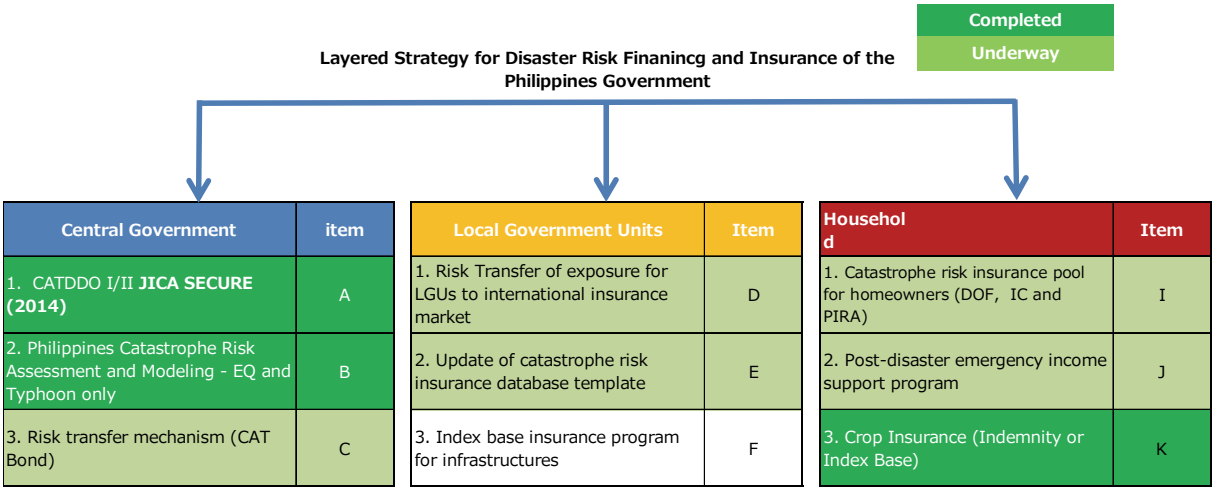
An attempt was made to establish a natural disaster insurance company (index-type) for small and medium-sized companies and family finances based on PPP. However, the DOF was not supportive of this attempt because the coverage was only for earthquake damage and the government's funding was necessary. Therefore, this plan has been discontinued. A damage evaluation model has been created.

Although the advance endeavors for disaster risk finance and insurance have been limited, a review is being made on the future provision of standby loans for disaster recovery.

3.4.5 Identification of Gaps

The following table summarizes the DRFI projects by the Philippine government, related issues, and points to be considered:

Table 3.4.2 Status of DRFI projects by the Philippine government and related issues



Central Government	item
1. CATDDO I/II **JICA SECURE (2014)**	A
2. Philippines Catastrophe Risk Assessment and Modeling - EQ and Typhoon only	B
3. Risk transfer mechanism (CAT Bond)	C

Local Government Units	Item
1. Risk Transfer of exposure for LGUs to international insurance market	D
2. Update of catastrophe risk insurance database template	E
3. Index base insurance program for infrastructures	F

Household	Item
1. Catastrophe risk insurance pool for homeowners (DOF, IC and PIRA)	I
2. Post-disaster emergency income support program	J
3. Crop Insurance (Indemnity or Index Base)	K

Central Government and LGUs	Item
1. NDRRM Fund and LDRRM Fund The application range is being expanded to include advance measures	G
2. Mandatory insurance scheme for public assets	H

Item	Projects by the Philippines gov.	Evaluation	Issues
A	World Bank and the Philippine government signed the agreement in January 2016 on a disaster recovery fund (CAT DDOII).（USD500Mil）	Although the CAT DDO I and JICA standby fund were already spent, CAT DDO II was newly enacted in April 2016. Thus, an emergency fund up to USD 500M can be used.	• Because of typhoon disasters which have been frequently occurring recently, CAT DDO II may be used up and will be insufficient to cope with disasters.
B	A model to predict damages from earthquakes and typhoons (Philippines Catastrophe Risk Model / PCRM) was developed and used for DRFI.	PCRM is a quantitative risk evaluation model necessary for establishing DRFI, and is essential for an effective DRFI plan.	• In the present PCRM, the subject hazards only include earthquakes, typhoons, and floods caused by a typhoon. The amount of damages from flood, tidal waves, and landslide is substantial, too. To evaluate them, the range of the subject hazards needs to be expanded. • An internal model covering various organizations within the Philippines government will be necessary for updating and refining the disaster prediction model (hazards and vulnerability)
C	Disaster risk transfer with CAT bond	DOF and WB have worked towards issuing its USD100M –300M CAT bond in 2015 but not enacted yet. WB says discussions on it ground to a halt.	• The reason for the halt is unclear Issuing CAT bond which enables to transfer risks to bond markets seems possible
D	A plan is being developed to create disaster index insurance programs for LGUs to introduce a direct access to insurance market for immediate funding needed after disasters.	The objective of the program is to introduce LGUs to a direct access to the insurance market and not to rely on the central government for immediate funding needed after disasters. The current pilot program is likely to start in six LGUs.	• The current pilot program is likely to start but needs to increase the number of LGUs for more stable operations. • This is for prompt payment and insufficient for post-disaster restoration on facilities. Therefore, a combination with a conventional insurance scheme is necessary for complete recovery from disasters (Item H).

Item	Projects by the Philippines gov.	Evaluation	Issues
E	Update of natural disaster database to enhance the natural disaster insurance market. The update includes revision of a reporting format for natural disasters from insurance companies to IC.	This item is specified at Result Indicator CAT DDOII B5. IC is currently revising the natural disaster reporting format.	• None
F	Index-base insurance for infrastructures	IFC is ready to finalize an index-base insurance program for electrical distribution networks retained by ECs. A proposed insurance scheme is already in place, but has been halted due to the transition of the government.	• As evidenced by Typhoon Yolanda, the distribution network is the most vulnerable facility in the power sector as it is located outside. Power disruption causes a delay in recovery from disasters.EC is currently increasing emergency stocks for faster repair, hardening of the facility against natural disasters is necessary to mitigate the damage.
G	NDRRM fund and LDRRM fund The application range is being expanded to include advance measures, such as the creation of a QRF fund and disaster insurance.	System has been established to utilize funds such as an increase in disaster reserve funds and advance investment for disaster prevention.	• It is necessary to check if payment for advance investment, such as fund savings and insurance premiums, is made as planned.
H	An existing law stipulates that the GSIS should cover insurance for public infrastructure.	Risks for the expenditures of disaster recovery of public facilities have been transferred through insurance (GSIS)	• Although this insurance policy is mandatory, the enrollment rate is less than 80%, which needs to be increased. • Compensation will be made on a basis of current replacement cost, but actually some accounts are partially covered by insurance. There is a possibility that sufficient insurance benefits may not be paid.
I	Mandatory catastrophe insurance scheme for houses led by a private sector (PIRA) through mortgage housing loans.	Insurance scheme for typhoon and EQ mandatory for mortgage loan for housing (only apply to small RC made houses). Stable increase of insurance penetration due to mandatory mortgage loan. Loss payment is indemnity based featuring an emergency partial payment triggered by a pre-agreed index.	• Overall program scheme has been completed. DOF requested the office of the President to issue an executive order in 2014. No progress has been made since then. • It is planned by DOF to request an executive order after the transition of the government.
J	Emergency cash transfer program	DSWD, together with DOF and DBM plans to establish an emergency cash transfer program for impoverished people affected by disasters utilizing the existing CCT (Conditional Cash Transfer) framework. This is one of the result indicators of CAT DDOII (B4)	• None
K	A pilot project for farmers has been conducted.	This project is limited to a pilot endeavor in particular areas while all of the current projects are “pilot projects”.	• As this is a weather index-based insurance for the trigger of the insurance payment, extension of the coverage of automatic weather monitoring station is necessary in order to increase the area. • Difference between actual damage and trigger of the weather index may be an issue. i.e. heavy rain which occurred upstream of the river causes damage to crops downstream due to a river flood, not by heavy rain.

3.4.6 Directions of Future Cooperation

For future cooperation in the DRFI areas, the following projects are considered necessary:

Table 3.4.3 Directions of future cooperation (draft)

Possible directions for solution	
1) Secure of emergency cash (Item A, C, D, G)	Because of natural disasters which have been frequently occurring recently, CAT DDO II may be used up and will be insufficient to cope with disasters. Introduction of JICA SECURE II and CAT Bond are options available. It is suggested to have a risk financing scheme linked to the implementation of prevention and mitigation measures. A plan is being developed to create disaster index insurance programs for LGUs to introduce a direct access to insurance market for immediate funding needed after disasters. The current pilot program is likely to start with several LGUs but needs to increase the number of LGUs for more stable operations. The pilot program should be changed to a permanent program to make the program comprehensive and effective.
2) Enhancement of the Philippines Catastrophe Risk Model / PCRM (Item B)	A damage prediction model constitutes basic data for DRFI strategies. For the continual maintenance and update of a model system, including the update of facility data, it is necessary to develop a model unique to the Philippines rather than using an existing model developed overseas. The range of subject hazards should be expanded to include hazards other than typhoons and earthquakes, such as floods. In order to maintain, renew and upgrade, development locally in the Philippines is appropriate. It is considered that related organizations within the Philippines are able to develop such models.
3) Enhancement of investment on disaster prevention and mitigation for public infrastructures (Item F, H)	Improving resiliency of infrastructures contributes to faster recovery from a disaster. Hardening of facilities outside such as power transmission and distribution, water and waste water, and ports are necessary. A mechanism which enhances investment on disaster prevention and mitigation is necessary. A preferred allocation of the funds for investment for improving resiliency programs and arrangement of an insurance program with an incentive mechanism for restoration of the facilities should be reviewed. GSIS insurance scheme for the public assets plays a critical role in DRFI for restoration of the insured properties. Enhancement of the existing program, i.e. increase of penetration, appropriate setting of insured value should be made. Awareness of acknowledgment of the role and effect of the insurance program for the public assets should be enhanced with closer involvement of NDRRMC.
4) Catastrophe insurance scheme for houses	This insurance scheme lead by PIRA was not implemented. With very high exposure of houses in the Philippines against natural disasters, it is appropriate to have a catastrophe insurance program protecting houses. DOF, IC and PIRA should continue to work to implement the program with the new government.

3.5 Flood and Sediment Disaster, Meteorological Phenomenon

3.5.1 Efforts of the Government of the Philippines

(1) Standards and Guidelines

As described with other related laws and acts in Section 3.2, based on Presidential Degree (PD) No.1067 or Water Code enacted in 1976 and Executive Order (EO) No.816-2009 for establishing the River Basin Control Office (RBCO) under the Department of Environment and Natural Resources (DENR) mandated as the oversight agency for all government efforts and initiatives within the country's river basins, the standards, guidelines and plans related to flood and sediment disaster control/mitigation measures have been formulated. As of March 2016, the legislation of the River Act on the basis of the Japanese River Act is discussed by the environment committees of the Senate of the Philippines and House of Representatives of the Philippines.

In addition, those guidelines related to flood and sediment control/mitigation have been updated and improved based on amendment of related regulations and results of discussions about international trends of disaster risk management and river basin management. The latest information of plans and guidelines for flood and sediment disaster are shown below.

Table 3.5.1 Standards and Guidelines for Flood and Sediment Disaster in the Philippines

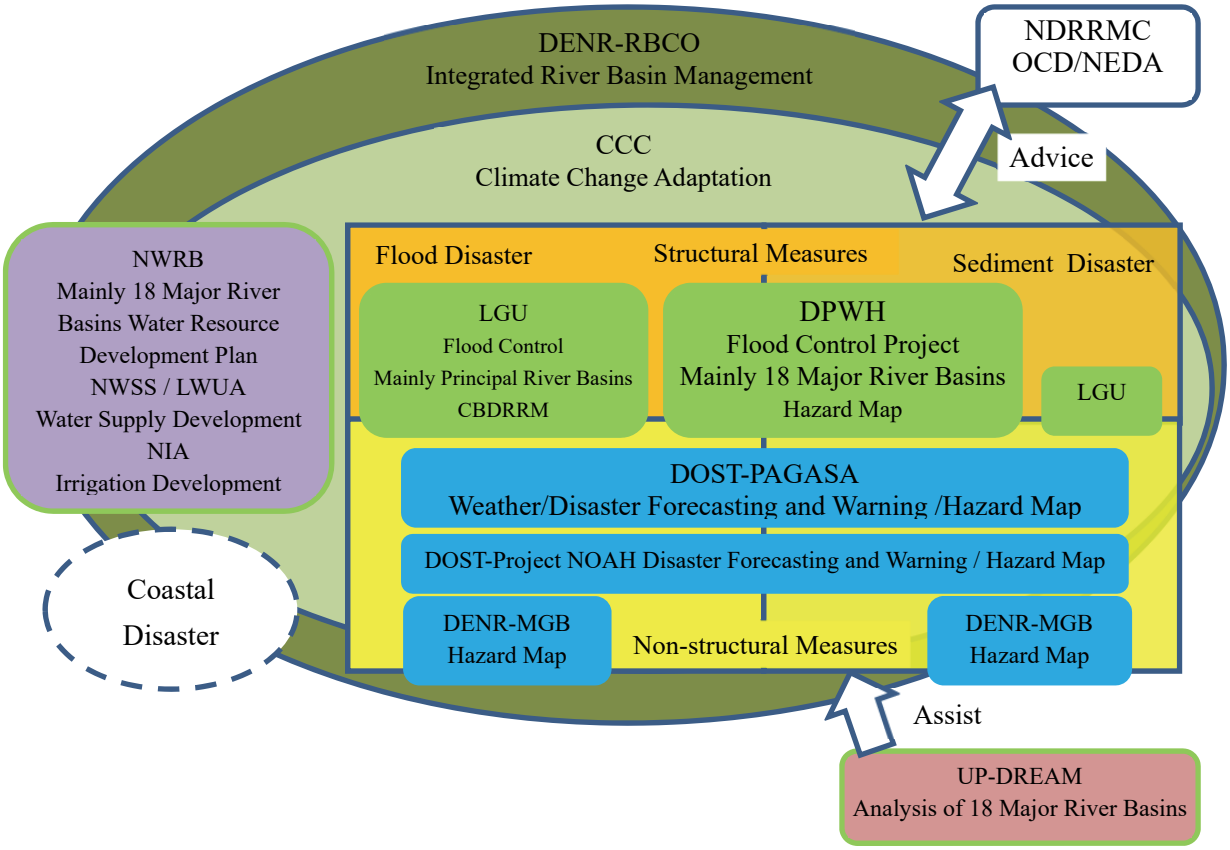
Year of Effect / Issue	Standards and Guidelines	Appellative, Main Contents
1980's	Design Guidelines, Criteria and Standards (DGCS)	The DPWH design guidelines, criteria and standards include the facilities of flood control and drainage.
2015	New DGCS 2015	Modification of flood design scale, such as a 100-year return period in a Major River Basin. Climate change and adaptation are included in the new DGCS (Incorporate a 10% increase in rainfall intensity in the design. Allow for a 0.3 m sea level rise in the design.)
2002 ~ 2010	Technical Standards and Guidelines by FCSEC	Manuals of plan/design for flood control project formulated by DPWH-FCSEC (Flood Control & Sabo Engineering Center) to supplement the DGCS. (Refer to ANNEX-3.1)
2003	IROW Procedural Manual	Manual for land acquisition and compensation formulated by DPWH. Infrastructure Right-of-Way (IROW) Procedural Manual formulated by DPWH (01 April 2003)
2011	Philippines Medium-Term Development Plan (2011-2016)	Watershed protection for flood risk mitigation and efficient/adequate development of infrastructure are mentioned as one of the major policies. Besides, the prioritized construction of river structures at high flood risk areas, and disaster risk reduction and management from both structural measures and non-structural measures are mentioned as the strategy.

Source: JICA Study Team based on Information provided by the DPWH

(2) Organization / Responsibility

1) Roles and Responsibility of Related Agencies on the Implementation of Flood and Sediment Control Projects

The related agencies implement the flood and sediment control project on the basis of the above Policy/Legal Framework. The activities of related agencies such as DPWH, DOST-PAGASA, DENR and LGUs, to mitigate flood and sediment disaster are as illustrated in the following Figure 3.5.1 .



Source: JICA Study Team based on Information provided by the DPWH

Figure 3.5.1 Organizational Structure for Measures against Flood/Sediment Disaster

2) Plan for the Establishment of New River Management Organization by NWRB and NEDA

In terms of the above Figure 3.5.1 , NEDA formulated "policy recommendation about current status and issue of water resource development plan, and establishment of National Water Resources Management Council (NWRMC)" in 2011. The recommendation aims at the establishment of NWRMC in lieu of enhancement of the organizationally vulnerable National Water Resources Board (NWRB), and mentions that the administrative function for all water sectors shall be strengthened. The report of the advisory commission on the recommendation was submitted to the President in 2013, but has not been discussed in detail so far.

3) Reorganization of DPWH related to Flood Control

(a) Amendment of Project Implementing Policies for Flood Control and Drainage/Slope Protection

The guidelines and procedures for the implementation of flood control and drainage/slope protection projects were amended through the issuance of DO. No.87-2016. According to the DO, Foreign-Assisted Projects have been undertaken by UPMO-FCMC including planning, designs, bidding, and construction. On the other hand, Locally-Funded Projects have been managed by the UPMO-FCMC for planning and design and Regional Operations for ROs or DEOs for remaining activities as shown in Table 3.5.2 .

Table 3.5.2 Oversight Functions of UPMO-FCMC and Regional Operations for Flood Control

Activities	Regional Operations	UPMO Operations
A. Foreign-Assisted Projects		
Planning and Design	UPMO-FCMC Coordination with concerned DEOs and ROs	UPMO-FCMC undertakes F/S, Conducts Pre-Engineering and DED.
Pre-Procurement		Formulated Plans, Estimated, Program of Works (POW) and Approved. Budget for the Contract (ABC)
Procurement		Formulates Project Procurement Management Plans (PPMP), Annual Procurement Plan (APP), Terms of Reference (TOR) and Bid Documents
Implementation	UPMO-FCMC Coordination with concerned DEOs and ROs	Implementation of Projects and related activities.
B. Locally-Funded Projects		
Planning and Design	Preparation of Document by UPMO-FCMC based on the Checklist as require under DO23-2015	
Pre-Procurement	DEO: PhP 1M – PhP 50M RO: PhP 50M above	UPMO-FCMC to provide technical support and monitoring of various Locally-funded projects implemented by Regional Operations.
Procurement		
Implementation		
C. Locally-Funded Projects under Component of Foreign-Assisted Projects		
Planning and Design	UPMO Coordination with concerned DEOs and ROs	UPMO undertakes F/S, Conducts Pre-Engineering and DED.
Pre-Procurement		Formulated Plans, Estimated, Program of Works (POW) and ABC
Procurement		Formulates PPMP, APP, TOR and Bid Documents
Implementation	UPMO Coordination with concerned DEOs and ROs	Implementation of Projects and related activities.

Source: JICA Study Team based on DPWH DO-No.87-2016

In addition to DO94-2016 mentioned above, basic procedures of the project implementation are described in DO-No.23-2015. In the DO-No.23-2015, Project Impact Analysis (PIA) has been introduced for project management of DPWH.

In addition, DPWH increased its manpower in 2015 and newly hired 1,396 staff. As for flood control, the Flood Control Management Cluster (FCMC) has transferred to be under the

supervision of the office of the Undersecretary for Regional Operations (DO-94-2015). In line with this transfer of management of flood control, all Regional Offices (ROs) and its DEOs have undertaken the designation of two Flood Control Coordinators per RO and one Flood Control Coordinator per DEO since June 17, 2015.

(b) Creation of DPWH Integrated Water Resources Management Coordination Team (IWRMCT)

The DPWH's mandates include carrying out the planning, design, construction and maintenance of infrastructure facilities for water resources development systems as well as for flood control together with other related agencies in accordance with E.O. No.124-1987 and other related acts and/or executive orders. However, it was imperative to urgently coordinate efficient planning and monitoring mechanisms among all the agencies related to water management including information sharing since the number of agencies related to water resources and water & sewerage systems are more than 30, such as Local Water Utilities Administrations (LWUA) and etc. To solve these issues, in 2011 the President designated the DPWH Secretary as the "Water Czar" who will coordinate the programs, projects and activities of water-related agencies of the Government to achieve efficiency in developing and operating water-related infrastructure.

In line with this condition, to carry out the above mentioned mandate, an Integrated Water Resources Management Coordination Team (IWRMCT) was created in the DPWH based on DO No.71-2014 in July 2014. The IWRM has basically performed the following functions, but are not limited to:

- To initiate, coordinate, and provide technical guidance in the establishment and operation of an integrated database, using applicable Information Technology (IT) and a Geographic Information System (GIS). The database covers (i) inventories of existing flood control infrastructure including their respective conditions and service coverage, (ii) inventories of needs for these structures, (iii) hydrologic data from stream gauging stations, and (iv) relevant water infrastructure costs and benefit data. To initiate and work on the development of an integrated Asset Management System (AMS) in DPWH for flood control;
- To coordinate the planning and implementation of flood control projects funded by DPWH and executed by its implementing offices including those projects operated and maintained by concerned agencies such as LGUs and community-based organizations; and
- To initiate and work on the development of a Monitoring and Evaluation System (MES) for water infrastructure projects.

In addition, as of April 2016, the IWRMCT has also formulated a guideline for IWRM of the Philippines under the support by the Government of Netherlands.

(3) Budget for Flood and Sediment Control Measures

As mentioned above under Organization/Responsibility, the main agencies for flood and sediment measures are the LGUs and three central government agencies, which are DPWH (mainly structural measures), PAGASA (mainly non-structural measures, such as the formulation of Flood Forecasting and Warning System (FFWS) and preparation of hazard maps), and MGB/RBCO/NWRB under DENR (mainly non-structural measures, such as the preparation of hazard maps and river management). The recent budgets for these three central government agencies are as given in Table 3.5.3 .

Table 3.5.3 Recent Budget for Related Agencies of Flood and Sediment Control Measures

(Unit: Million PHP)

Year	DPWH	DENR	DENR-EMB	DENR-MGB	DENR-NAMRIA	DENR-NWRB	DOST	DOST-PAGASA
2009	158,795	12,478	614	653	971	0	5,441	767
2010	141,779	11,324	641	573	715	0	4,862	614
2011	122,005	12,276	699	682	668	42	5,990	1,055
2012	157,291	16,991	778	709	910	51	9,139	1,261
2013	168,930	23,080	1,037	999	2,958	62	9,915	1,435
2014	206,634	19,834	1,254	1,126	1,011	65	12,023	1,229
2015	287,826	20,849	747	763	1,138	87	19,173	3,438

Note: The amount of budget is Obligation approved by DBM

Source: DBM http://www.dbm.gov.ph/

1) DENR

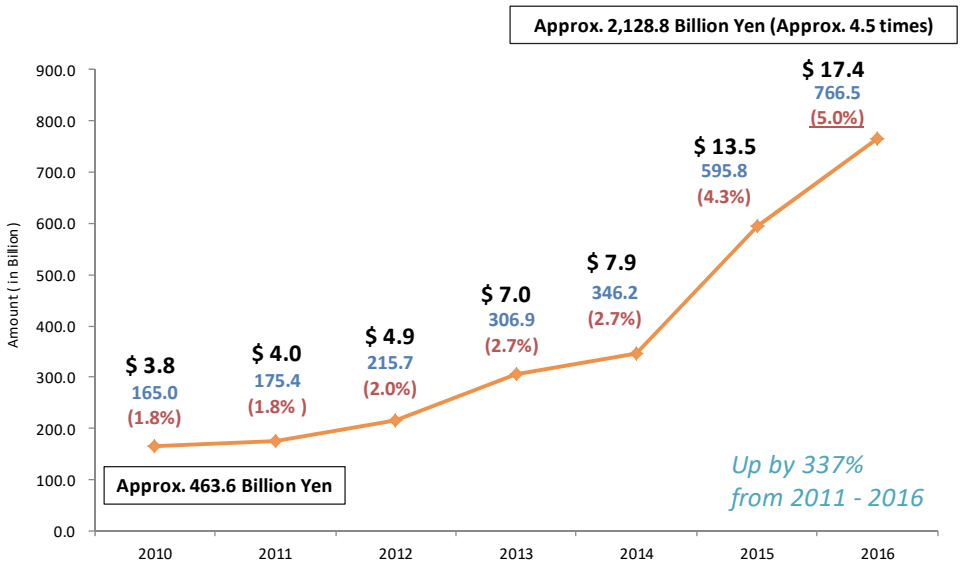
The budget of DENR is increased and decreased every year but the budget of NWRB has been gently increasing as indicated in Table 3.5.3 . There is no substantial progress of preparation of the Integrated Water Resource Management (IWRM) and hazard map by RBCO for flood and sediment control measures on the basis of the hearing survey of this study. DENR does not arrange the budget of flood and sediment control projects.

2) PAGASA

The budget of PAGASA has sharply increased since 2015 as indicated in Table 3.5.3 since PAGASA has promoted modernization in accordance with RA 10692 of the PAGASA Modernization Act. The amount of Allotment in 2016 is approximately 1.2 billion pesos and the amount is comparable with the budget in 2014. Based on the PAGASA Modernization Act, the annual budget will be approximately 1.5 billion PHP from 2018.

3) DPWH

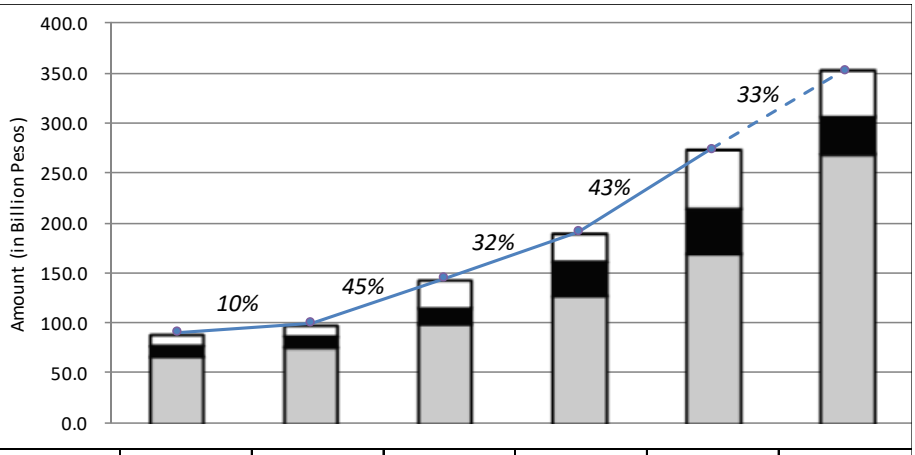
The budget of DPWH has sharply increased since 2012 as indicated in Table 3.5.3 . The budget in 2016 is increased by about 3.4 times of the budget in 2011.



Source: DPWH and JICA Expert Mr. Muronaga

Figure 3.5.2 Rapid Increase in Budget of DPWH of Recent Years

The budget of DPWH is divided into those of Highways, Flood Control and Others. The budget for Flood Control is about 10 to 20% of the total budget of DPWH as shown in Figure 3.5.3 .



	2011	2012	2013	2014	2015	2016
Highways	68.0	78.1	100.9	129.4	170.4	269.8
Flood Control	**11.3**	**10.8**	**15.9**	**33.6**	**45.9**	**38.0**
Others	11.3	10.6	27.6	27.9	57.7	45.0
Total Php'B	P **90.7**	P **99.5**	P **144.3**	P **190.9**	P **273.9**	P **352.8**

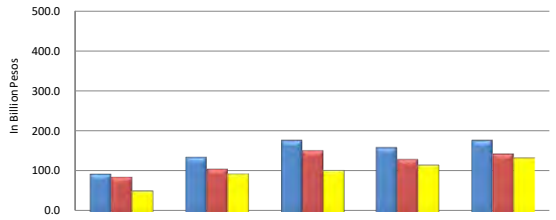
Approx. JPY 20.3 B. **Approx. JPY 117.9 (5 times)**

Source: DPWH and JICA Expert, Mr. Muronaga

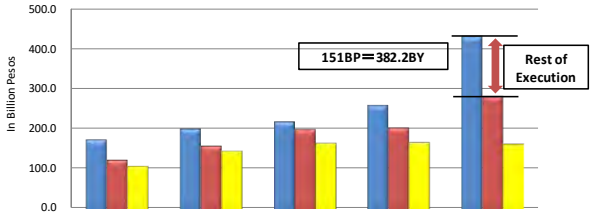
Figure 3.5.3 Budget for Flood Control Projects of DPWH (2011-2016)

Even though the budget is increasing, DPWH could not fully disburse the approved budget due to a shortfall of human resources in DPWH to formulate and implement flood/sediment control projects, and the lack of a dependable local consultant. The budgeting system in the Philippines has four steps, such as Appropriation approved by the Congress through GAA (General Appropriation Act), Allotment approved by DBM, and Obligation which is included as Contract

Amount and Disbursement. Recently, the differences have become larger. The average rate between Allotment and Obligation from 2006 to 2010 is 84% and the one from 2011 to 2015 has fallen to 77%.



	2006	2007	2008	2009	2010
Allotment	91.6	133.8	174.3	157.2	174.0
Obligation	85.2	103.4	149.0	127.0	141.8
Disbursement	51.0	91.7	99.6	114.5	132.4
Obiligations vs. Allotments	94%	77%	85%	81%	81%



	2011	2012	2013	2014	2015 (as of Sep)
Allotment	172.2	200.0	218.0	258.1	431.5
Obligation	121.6	157.9	198.1	201.4	280.0
Disbursement	105.5	142.9	163.3	164.7	161.2
Obiligations vs. Allotments	71%	79%	91%	78%	65%

Source: DPWH and JICA Expert, Mr. Muronaga

Figure 3.5.4 DPWH's Budget and Execution Amount (2001-2015)

The DPWH's regional investment amount for flood control projects completed from 2012 to 2015 is as presented in Table 3.5.4 . The regions with the lowest investments are Region IX and Region X in Mindanao.

Table 3.5.4 Number of DPWH's Flood Control Projects and Amount of Investments by Region (Jan. 2012 to Sep. 2015 Completion)

Region	Investment (Thousand PHP)	Number of FC Projects
I	1,278,744	173
CAR	275,485	36
II	257,005	12
III	5,979,524	57
NCR	17,377,197	92
IV-A	3,122,829	100
IV-B	30,408	3
V	346,941	11
VI	84,917	2
VII	33,961	1
VIII	34,490	1
IX		
X	500	1
XI	31,708	1
XII	99,241	3
XIII	366,439	1

Note: No ARMM data

Source: JICA Study Team based on DPWH DO-No.87-2016

The above investment amount by DPWH is for three years, from 2012 to 2015. Hereafter, the amount will change due to recovery projects from Yolanda in the Visayas, river improvement projects along Cagayan de Oro River and Tagoloan River in Mindanao, and so on.

(4) Priority Activities for Flood and Sediment Control Measures

The past and future priority activities for flood and sediment control measures mainly by DPWH (Structural Measures) and PAGASA (Non-Structural Measures) were confirmed through the interview and hearing survey. The results are given below.

1) DPWH

(a) Past Activities/Project by DPWH

DPWH have been formulating flood and sediment control plans and implementing the projects since the 1970's in the eighteen major river basins and the other river basins. The progress of the main plan and implementation of flood and sediment control projects by DPWH is given in Table 3.5.5.

Table 3.5.5 Flood and Sediment Control Projects by DPWH

Name of River (Catchment Area (km^2))	Planning[*1]	Detailed Design and Implementation[*1]	Design Flood Scale: Year Return Period (YRP)
Major River Basins (18)			
Cagayan (25,694)	F/P, M/P: 1987 [*3] F/S: 2002 [*3]	FRIMP-CTI: 2014~ [*3]	F/P: 100 YRP M/P, F/S: 25 YRP
Mindanao (23,169)	M/P, F/S: 2012 [*4]	D/D: 2016~ [*4]	M/P, F/S, D/D: 25 YRP
Agusan (10,921)	M/P: 1980~1984 [*5]	Lower Agusan D/D: 1983 [*5] Phase I & II: [*3]	M/P, F/S: Lower: 100 YRP Upper: 25 YRP D/D, Phase I & II: 30 YRP
Pampanga (9,759)	M/P: 1982 [*5] M/P: 2011 [*3]	Angat Dam: 1968 [*7] Pantabangan Dam: 1976 [*6] D/D, Phase I~III: 1991~2010 [*3]	New M/P: 5~20 YRP F/S, D/D, PhaseI~III: 20 YRP
Agno (5,952)	M/P: 1991 [*3] F/S: 1991 [*3]	Ambuklao Dam: 1968 [*7] Binga Dam: 1960 D/D, Phase I~IIB: 1995~2005 [*3]	F/P: 50~100 YRP M/P: 25 YRP F/S, D/D, Phase I~II: 10 YRP
Abra (5,125)			
Pasig-Laguna (4,678) *2	M/P: 2012 [*6] M/P: 2014 [*3] F/S: 2016~ [*6]	NHCS: 1985 [*7] Mangahan FW: 1986 [*5] D/D (Phase-I): 2002 [*3] Phase II~III [*3]	M/P: 100 YRP with Dam 30 YRP without Dam F/S: 30 YRP D/D, Phase II~III: 30 YRP
Bicol (3,771)	M/P: 2003 [*6]		M/P: 50 YRP
Abulug (3,372)			
Tagum-Libuganon (3,064)			
Ilog-Hilabangan (1,945)	M/P: 1991 [*3] F/S: 1991/2010 [*3]		M/P: 100 YRP (Long-term) F/S: 25 YRP
Panay (1,843)	M/P: 1985 [*3] F/S: 2002 (JETRO)		M/P: 100 YRP (Long-term) F/S: 10~25 YRP
Tagoloan (1,704)	M/P: 1982 [*5] F/S: 2010 [*3]	Left Bank: 2000 [*4] D/D, FRIMP-CTI: 2014~ [*3]	M/P, F/S, D/D, FRIMP: 25 YRP
Agus (1,645)			

Name of River (Catchment Area (km^2))	Planning[*1]	Detailed Design and Implementation[*1]	Design Flood Scale: Year Return Period (YRP)
Davao (1,623)			
Cagayan de Oro (1,521)	M/P, F/S: 2014 [*3]	D/D: 2016~ [*3]	M/P, F/S, D/D: 50 YRP with Dam 25 YRP without Dam
Jalaur (1,503)	M/P: 1982 [*5]		M/P: 25 YRP
Buayan-Malungun (1,434)			
Principal Rivers (421)			
Amnay-Patric	M/P: 1982 [*5]		M/P: 25 YRP
Laoag	M/P, F/S: 1997 [*3]	D/D, Construction: 2001~2009 [*3]	M/P, F/S, D/D, Construction: 25 YRP
Iloilo / Jaro	M/P, F/S: 1995 [*3]	Stage-I: 2012 [*3]	M/P, F/S, D/D: 50 YRP Stage-I: 20 YRP
Cavite (3 Rivers)	M/P: 2016 [*3] F/S: 2009 / 2016 [*3]	FRIMP-CTI [*3]	M/P: Long-term: 50 YRP, Short-term: 25 YRP FRIMP-CTI: 25 YRP (Retarding Basin)
Ormoc	M/P: 1995 [*3] F/S: 1995 [*3]	Phase I~II: 2001 [*3] Rehabilitation: 2007 [*3]	M/P, F/S, Phase I~II: 50 YRP
KAMANAVA	M/P, F/S:1990	D/D, Construction: 2008 [*3]	M/P, F/S, D/D, Construction: River: 30 YRP, Drainage: 10 YRP
VOM	M/P, F/S:1990	D/D, Construction: 2015 [*4]	M/P, F/S, D/D, Construction: River: 30 YRP, Drainage: 10 YRP
Drainage / Others			
Metro Manila	M/P: 1980's F/S: 1980's	10 Pumping Stations: 1980's [*3] Rehabilitation of P/Ss: 2016~ [*6]	M/P, F/S, Construction: 10 YRP
West Mangahan	M/P: 1991 F/S: 1991	D/D: 1993 [*3] Construction: 2007 [*3]	M/P, F/S, D/D, Construction: Lake: 40 YRP; Drainage: 5 YRP
Cebu	M/P, F/S: 1995		M/P, F/S: 50 YRP
Camguin	B/D: 2008	Sabo Dam: 2012 [*3]	Countermeasures against Debris Flow: 100 YRP

Note: *1: Latest Plan only mentions F/P: Framework Plan; M/P: Master Plan; F/S: Feasibility Study; B/D: Basic Design;
D/D: Detailed Design; FW: Floodway; NHCS: Napindan Hydraulic Control Structure
FRIMP-CTI: Flood Risk Management Project – Cagayan, Tagoloan and Imus
*2: Total area of Pasig-Marikina River Basin and Laguna Lake Basin;
*3: Conducted/Funded by JICA/JBIC
*4: Conducted by GOP Fund
*5: Conducted by OECF
*6: Funded by WB
*7: Funded by ADB

Detailed information is shown in ANNEX-3.2 and formulation/implementation chronicles are shown in ANNEX-3.3.

Source: JICA Study Team

The above table indicates the major projects. Other than the above major projects, rehabilitation of revetment/dikes and minor river improvement projects are carried out by DPWH when flood and sediment disasters occur.

(b) Study on Nationwide Flood Risk Assessment

DPWH and JICA conducted "The Study on the Nationwide Flood Risk Assessment and the Flood Mitigation Plan for the Selected Areas" and the report was prepared in 2008. The study targeted the priority areas for flood and sediment control projects selected from 947 cities/municipalities in flood prone areas recognized by the National Disaster Coordinating Council (NDCC, predecessor of NDRRMC) and supported by the World Bank. As a result, the study selected 120 priority river basins by the first screening and eventually 56 priority river basins by the second screening. The total project cost of 56 river basins was estimated at 236 billion pesos without price escalation. The result of the study is summarized in Table 3.5.6 .

Table 3.5.6 Priority River Basins and Evaluation Results of the JICA Study on the Nationwide Flood Risk Assessment in 2008

Rank	Name of River	Catchment Area (km^2)	Total Score (*1)	Project Cost in 2008 (Million PHP)
1	UPPER MARIKINA	515	221	13,469
2	EAST MANGAHAN	84	219	3,161
3	SAN JUAN	90	214	2,260
4	CEBU/MANDAWE	241	211	2,368
5	PATALAN/CAYANGA/ANGALACAN	656	202	2,318
6	YAWA/BASUD/QUIRANGAY (LEGAZPI CITY)	126	182	475
7	MEYCAUAYAN	154	166	7,180
8	SANTA RITA/KALAKLAN (OLONGAPO CITY)	102	158	479
9	MANDALAGAN (BACOLOD CITY)	187	157	214
10	MINDANAO	20,673	154	15,870
11	IMUS	112	153	2,377
12	TUMAGA	255	152	483
13	UPSTREAM of PAMPANGA (include RIO CHICO)	8,122	125	21,856
14	NANGALISAN/BAGGAO-PARED (CAGAYAN)	27,743	115	52,826
15	AKLAN	1,010	107	366
16	DINANGGASAN (CATARMAN-1S)	25	106	117
17	DAVAO	1,992	103	1,369
18	IPONAN	412	98	357
19	LIPADAS	163	91	198
20	MALUPA-DIAN (AGUANG)	666	90	540
21	UPSTREAM of AGNO (include AMBAYAWAN, BANILA)	5,722	88	11,850
22	GUINABASAN	131	88	433
23	SINOCALAN/MAROSOY (DAGUPAN)	1,023	83	3,890
24	KABILUGAN/VELASCO/BATO LAKE (BICOL)	2,999	74	12,095
25	KINANLIMAN (REAL-1)	10	73	32
26	ABULUG	2,766	71	2,989
27	UPPER AGUSAN	1,745	71	2,013
28	DONSOL/MANLATO	413	65	82
29	PANAY/MAMBUSAO	2,311	64	6,068
30	ILOG-HILABANGAN	2,162	64	1,638
31	TALOMO	279	64	359
32	TUGANAY	747	63	2,563

Rank	Name of River	Catchment Area (km^2)	Total Score (*1)	Project Cost in 2008 (Million PHP)
33	AGOS	483	59	680
34	GUAGUA	1,605	58	31,715
35	BAGO	868	58	595
36	AMBURAYAN	1,307	57	676
37	BALETE	132	57	259
38	TAGUM-LIBUGANON	2,434	55	3,517
39	ABRA	4,951	54	2,984
40	ANGAT	917	53	9,014
41	ARINGAY	421	53	822
42	JALAUR	1,534	52	3,249
43	BAUANG	510	51	358
44	TAGOLOAN	1,762	50	980
45	AGUS/BUAYAN	1,898	50	681
46	SILWAY-POPONG-SINAUAL (POLOMOLOK)	577	49	406
47	DUNGCAAN (PAGBANGANAN)	176	49	89
48	CAGURAY	361	47	794
49	PAMPLONA	698	39	280
50	DAGUITAN-MARABONG	292	38	308
51	CAGAYAN DE ORO	1,365	37	728
52	TAGO	1,370	36	2,169
53	BUAYAN-MALUNGUN	1,400	36	527
54	LAKE MAINIT-TUBAY	473	36	214
55	SIBUGUEY	994	31	2,493
56	MATALING	420	31	109
Total				235,946

Note*1: Scores calculated based on the indices of natural and social conditions as well as flood risks determined in the Study

Source: The Study on the Nationwide Flood Risk Assessment and the Flood Mitigation Plan for the Selected Areas in the Republic of the Philippines by JICA (2008)

Population and asset values have increased in several flood prone areas since 2008. As of April 2016, DPWH acknowledges the necessity of revising the priority river basins.

(c) Future Activities/Project by DPWH-UPMO/FCSEC

DPWH has issued a Department Order, namely DO 202-2016 in October, 2016 for a more effective and expeditious implementation of urgent flood control projects. In the DO 202-2016, seven flood control projects have been designated as “Identified High-Impact Projects”. The Feasibility Studies, Formulation of Master Plans and Preparation of Project Proposals/Packaging will be undertaken by UPMO for possible financing under Overseas Development Assistant (ODA). A list of the seven projects is given in the table.

Table 3.5.7 Identified High-Impact Projects in DO 202-2016 of DPWH

Identified High-Impact Projects	Remarks (Current Status)
Flood Mitigation Project in the East Manggahan Floodway Area (Stage-1)	Preliminary FS completed in 2007
Aklan River Flood Control Project	MP & FS Completed
Construction and Rehabilitation of Iloilo City Drainage System	MP & FS Completed
Panay River Basin Flood Control Project	For Updating of MP & FS
Upper Agusan Dev. Project	MP completed undertaken by DENR
Davao River Basin Flood Control Project	-
Pampanga Delta Flood Control Project, Phase II	-

Source: DO 202-2016, DPWH

2) PAGASA

(a) Past Activities/Projects of PAGASA

PAGASA has established a weather/flood forecasting and warning system, and releases announcements to the public through the NDRRMC when a hydro-meteorological disaster is predicted to occur.

The improvement of numerical prediction, installation of ten Doppler radars and a hydrological observation station has been carried out by PAGASA to improve the accuracy of weather forecasting.

PAGASA established the River Center for Eighteen Major River Basins, formulated FFWS and prepared the flood inundation analysis model. As of April 2016, PAGASA operates the River Center and FFWS in the five river basins. Besides, Flood Forecasting and Warning System for Dam Operation (FFWSDO) is being formulated at points downstream of each dam and FFWSDO operates at five dams.

As mentioned in Subsection 3.5.1, the PAGASA Modernization Act was enacted in 2015, and PAGASA is enhancing the activities to improve the weather/flood forecasting and warning system.

(b) Future Activities/Project by PAGASA

The future priority activities/project for flood and sediment control measures was confirmed from the Weather Division and the Hydro-Meteorology Division of PAGASA through the interview and hearing survey. The results are given in Table 3.5.8.

Table 3.5.8 Future Priority Activities/Project by PAGASA

Priority	Activities / Projects
Priority-1	Improvement of Numerical Prediction
Priority-1	Establishment of River Center in each Major River Basin
Priority-2	Preparation of Flood Analysis Model for each Major River Basin to Improve Flood Forecasting and Early Warning System (EWS)
Priority-2	Improvement of New Flood Control Projects for Major River Basins
Priority-3	Establishment of EWS in Principal River Basins

Source: JICA Study Team based on the Information provided by PAGASA

Besides, the status of the establishment of the River Centers by PAGASA is as summarized in Table 3.5.9.

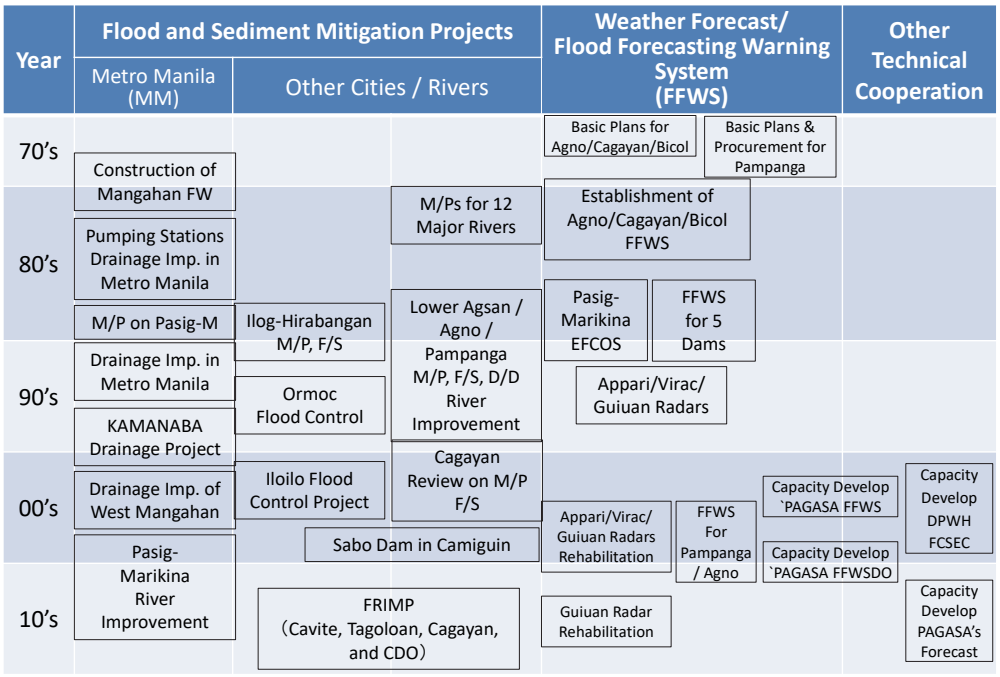
Table 3.5.9 Status of Establishment of River-Center by PAGASA

River Basin		City/ Municipality	River Center (PHP)	Status (River Center)	Monitoring Stations	Status (Monitoring Stations)	Remarks
Luzon							
1	Abulog	Tuguegarao City	4,822,887.62	Construction ongoing	-	-	Proposed for the NPGA
2	Abra	Vigan City	4,700,386.55	Construction done	Around 14.0M PhP	Project awarded to winning bidder	
Visayas							
3	Panay	Roxas City	4,822,887.62	Negotiation with Civil Aviation Authority of the Philippines (CAAP)	Around 14.0M PhP	Project awarded to winning bidder	
4	Jalaur	Iloilo City	-	Co-located with Iloilo Radar	-	Under Regional Integrated Multi-Hazard Early Warning System (RIMES Project)	
5	Ilog-Hilabangan	Kabankalan City	4,700,386.55	Construction ongoing	Around 14.0M PhP	Project awarded to winning bidder	
Mindanao							
6	Agusan	Prosperidad	4,700,386.55	Construction ongoing	-	-	Proposed for the NPGA
7	Tagum-Libuganon	Tagum City	7,335,455.09	Construction ongoing	Around 14.0M PhP	Installation done	
8	Davao	Davao City	4,700,386.55	Construction done	-	Under NPGA 2012	
9	Buayan-Malungon	Gen. Santos City	7,335,455.09	Construction ongoing	-	Under NPGA 2012	
10	Mindanao	M'lang	7,335,455.09	Negotiation with CAAP	-	-	Proposed for the NPGA
11	Agus	Iligan City	7,335,455.09	Negotiation with LGUs	-	-	Proposed for the NPGA
12	Cagayan de Oro	El Salvador	4,700,386.55	Bidding Failed (For Reposting)	(Multi-funding Source)	Installation done	
13	Tagoloan				–	Under NPGA 2012	

Source: PAGASA

3.5.2 JICA's Cooperation

JICA's Cooperation with the Philippines for flood and sediment disasters control/mitigation has been ongoing since the 1970's including the efforts of/by the OTCA (Overseas Technical Cooperation Agency), the OECF (Overseas Economic Cooperation Fund) and the JBIC (Japan Bank for International Cooperation). The main achieved projects or cooperation activities implemented are summarized in Figure 3.5.5 below;



Source: JICA Study Team

Figure 3.5.5 Projects/Cooperation Activities Implemented by JICA in the Past

JICA's cooperation for flood and disaster control measures including meteorological forecast improvement after 2008 is as presented in Table 3.5.10 in detail.

Table 3.5.10 JICA's Cooperation for Flood/Sediment Control Measures

Duration	Cooperation Scheme	Name of Project
2008 ~ 2011	Grant Aid	The Project for Improvement of Flood Forecasting and Warning System in the Pampanga and Agno River Basins
2009 ~ 2011	Development Study	Study on Integrated Water Resources Management for Poverty Alleviation and Economic Development in the Pampanga River Basin
2009 ~ 2011	Grant Aid	Detailed Design of the Project for the Improvement of the Meteorological Radar System
2009 ~ 2012	Grant Aid	The Project for Flood Disaster Mitigation in Camiguin Island
2009 ~ 2012	Technical Cooperation Project	Strengthening of Flood Forecasting and Warning System for Dam Operation
2009 ~ 2014	Grant Aid	The Project for the Improvement of the Meteorological Radar System
2010 ~ 2011	ODA Loans	The Project on Urgency Rehabilitation of Infrastructure from Typhoon Ondoy and Pepeng
2010 ~ 2011	Preparatory Survey	The Preparatory Study for Pasig-Marikina River Channel Improvement Project (Phase III)
2010 ~ 2012	Grant Aid	The Programme for the Improvement of Capabilities to cope with Natural Disasters Caused by Climate Change

Duration	Cooperation Scheme	Name of Project
2012 ~ 2016	ODA Loans	Pasig-Marikina River Channel Improvement Project Phase-III
2012 ~ 2017	ODA Loans	Flood Risk Management Project (FRIMP) for Cagayan River, Tagoloan River and Imus River
2012 ~ 2012	Promotion of ODA Loan Project- Detailed Design	The Detailed Design of Pasig-Marikina River Channel Improvement Project Phase-III
2012 ~ 2013	Grant Aid	Non-Project Grant Aid to Utilize Small and Medium-Sized Companies
2013 ~ 2013	Data Collection Survey	Data Collection Survey on Situation of Nationwide Flood Forecasting and Warning System
2013 ~ 2014	Data Collection Survey	Data Collection Survey on Flood Management Plan in Metro Manila
2014 ~ 2017	Development Study Type Technical Cooperation	The Project on Rehabilitation and Recovery from Typhoon Yolanda
2014 ~ 2017	Grant Aid	The Programme for Rehabilitation and Recovery from Typhoon Yolanda
2014 ~ 2017	Technical Cooperation Project	Project for Enhancing Capacity on Weather Observation, Forecasting and Warning
2015 ~ 2016	Preparatory Survey	The Preparatory Survey for Cavite Industrial Area Flood Risk Management Project
2015 ~ 2016	Promotion of ODA Loan Project	Project for the Improvement/Restoration of Telemetry Equipment of Effective Flood Control Operation System (EFCOS)
2015	Data Collection Survey	Data Collection Survey on Drainage System in Metro Manila
2015 ~ 2021	ODA Loans	Flood Risk Management Project (FRIMP) for Cagayan de Oro River

Source: JICA Study Team

3.5.3 Other Donors' Cooperation

Other donors' cooperation for flood and disaster control measures in the field of meteorological phenomenon after 2008 is summarized in Table 3.5.11.

Table 3.5.11 Other Donor's Cooperation for Flood/Sediment Control Measures

Name of Donor	Year	Name of Project / Implementation Agency	Contents
WB	2010 - 2016	Climate Change Adaptation Program / CCC	Strengthening of the information service system for meteorological disasters risk management (Mainly, technical cooperation of climate change adaptation for agriculture and water resource development)
WB	2011 - 2012	Master Plan for Flood Management in Metro Manila and Surrounding Areas / DPWH	Formulation of M/P for flood management in Metro Manila
WB	2013	Post Typhoon Recovery Loan / DOF and NEDA	Assistance for recovery from Typhoon Yolanda
WB	2016 - 2017	Consultancy Services for the Feasibility Study and Preparation of Detailed Design of the Proposed Upper Marikina Dam, Greater Metro Manila Area Flood Management Project	F/S and D/D of Marikina Dam and river improvement of Upper Marikina River
ADB	2009	Typhoon Ketsana (Ondoy) Project under Asia Pacific Disaster Response Fund / DOF	Assistance for recovery from Typhoon Ondoy (Grant)
ADB	2012 – 2014	Climate Resilience and Green Growth in the Upper Marikina River Basin Protected Landscape - Demonstrating the Eco-town Framework / CCC	Capacity enhancement for LGUs and Stakeholder for climate change mitigation and adaptation in the Upper Marikina River Basin.

Name of Donor	Year	Name of Project / Implementation Agency	Contents
ADB	2013 – 2014	Support for Post Typhoon Yolanda Disaster Needs Assessment and Response / NDRRMC	Needs assessment survey and support for disaster response to Typhoon Yolanda
ADB	2013 - 2014	Typhoon Haiyan (Yolanda) Project / DOF	Emergency assistance of recovery from Typhoon Yolanda (Grant)
ADB	2013 – 2014	Emergency Assistance and Early Recovery for Poor Municipalities Affected by Typhoon Yolanda / DOF	Emergency assistance of recovery from Typhoon Yolanda (Grant-Japan Fund)
ADB	2013 – 2014	Emergency Assistance for Relief and Recovery from Typhoon Yolanda / DOF	Emergency assistance of recovery from Typhoon Yolanda (Loan USD 500million)
ADB	2014 - 2016	Climate Resilience and Green Growth in Critical Watersheds / CCC	Capacity enhancement for LGUs for climate change mitigation and adaptation in the river basins of Lower Marikina River, Camarines Sur and Davao Oriental
GGGI	2014	Demonstration of Eco-town Framework in the Philippines / CCC	Study of climate change adaptation and risk assessment in the Municipality of San Vicente of Palawan
UNDP (Aus-AID)	2006 – 2011	READY Project / OCD, PHIVOLCS, DENR-MGB, DOST-PAGASA	Preparation of hazard maps for each disaster in the vulnerable 28 provinces.
	2010 – 2014	GMMA Ready Project / MMDA, etc.	The study of disaster risk increase by climate change and supporting preparation of the mitigation plan in metro Manila
UNDP	2012 - 2014	Project Climate Twin Phoenix / CCC, MGB, NAMRIA, etc.	The study of water-related disaster risks and supporting preparation of the risk reduction plan in the major areas in Region 10 and 11.
NORAD *1	2010 - 2015	Flood Forecasting and Warning System for Magat Dam and Downstream Communities / PAGASA	Capacity enhancement of forecasting and warning downstream of Magat Dam
US-AID	2012 - 2017	Bicol Agri-Water Project (BAWP) / DA, NIA, etc.	Supporting the enlightenment program and implementation of climate change adaptation for farmers in the Bicol River Basin in Region 5
Australia	~ 2016	Design Guidelines, Criteria and Standards (DGCS) 2016 Edition / DPWH	DGCS has been prepared with support from an Australian consultant
ADB	Under consideration	CCC, etc.	ADB has prepared 6 billion USD for a climate change mitigation and adaptation project (4 billion USD for mitigation, 2 billion USD for adaptation). The Philippines is selected as one of the supported countries. ADB will support the formulation of water policy.
KOICA	Ongoing	PAGASA	Project of KOICA 1 and 2 have been completed. Project of KOICA 3 is still ongoing. The equipment, facilities and systems are procured to enhance the capacity of flood forecasting and warning in Metro Manila by KOICA 3 which targets Marikina River, Tullahan River, etc.
	Ongoing (2014~)	NWRB	Name of Project: "Establishment of an Integrated 3D GIS-Based Water Resources Management Information System in the Provinces of Pampanga and Bulacan"

Name of Donor	Year	Name of Project / Implementation Agency	Contents
GIZ	Ongoing	OCD, etc.	GIZ supports the formulation of Community-Based Early Warning System (CBEWS) for floods mainly in the Mindanao and Visayas areas.
Government of the Netherlands	On-going (2015~)	PRA	Name of Project: "Coastal Defense Master Planning for Tacloban City and Palo, Leyte"
	Under consideration	PRA, DPWH, etc.	Flood control and reclamation plan for Manila Bay
NPGA	Under consideration	PAGASA	Provision of AWS (Automatic Weather Station), water level gauge, etc.

Note: *1: NORAD: North American Aerospace Defense Command

Source: JICA Study Team

DPWH conducted a study to update the Master Plan (M/P) for flood control and drainage improvement in Metro Manila and a Feasibility Study (F/S) on the channel improvement of Pasig-Marikina River from 1988 to 1990 under technical assistance from JICA called "The Study on Flood Control and Drainage Project in Metro Manila".

The Pasig-Marikina River Improvement Project is being carried out under Japanese ODA Loan with counterpart funds from the Government of the Philippines.

On the other hand, as mentioned above, the "Master Plan for Flood Management in Metro Manila and Surrounding Areas (2011~2012)" was conducted with WB funds.

Source: http://www.gov.ph/2015/07/31/dpwh-project-briefer-flood-management-master-plan/

Figure 3.5.6 Scope of Master Plan for Flood Management in Metro Manila and Surrounding Areas by the World Bank

The scope of the master plan study is as shown in Figure 3.5.6 . This master plan study included the review of the design discharges of the Pasig-Marikina River and so on.

Based on the master plan by WB, a consultant is to be procured to conduct Consultancy Services for the Feasibility Study and Preparation of Detailed Design of the Proposed Upper Marikina Dam, Greater Metro Manila Area Flood Management Project (2016~2017) including feasibility studies for the Marikina Dam and retarding basins along the Upper Marikina River Stretch.

3.5.4 Identification of Gaps

(1) Preparation of Matrix

Based on the above-mentioned disaster risk evaluation, the past activities, interviews, hearing survey results, lessons learned from JICA cooperation activities in the past, etc., the challenges for gaps are clarified by the item of "Legal Framework and Plan/Guideline", "Organization/Responsibility", "Structural Measures (Planning, Implementation and O&M)" and "Non-Structural Measures (FFWS, Hydro-Met Observation)".

The matrix for flood and sediment disaster, meteorological phenomenon is as presented in Section 3.9.

(2) Extracted Challenges for Gaps

The Challenges for Gaps are arranged in a matrix as shown in Table 3.5.13 . The keywords are summarized in three main subjects, each with two sub-titles, as shown in Table 3.5.12 .

Table 3.5.12 Keyword to Summarize Challenges for Gaps (Flood/Sediment Control Measures)

Items of Matrix	Relationship	Subjects	Sub-Titles
Legal Framework and Plan/Guideline		✓	Implementation of Flood and Sediment Disaster Projects ensuring consistency with Related Plans ■ Harmonization between Flood Control and Other Related Plans in terms of River Basin Management ■ Prompt and Repetitive Hazard/Risk Assessment
Organization / Responsibility		✓	Prompt Implementation of Flood Control Projects Ensuring Sustainability of Effects of Flood Mitigation Facilities ■ Prompt Implementation of Prioritized Flood Control Projects ■ Promotion of Comprehensive Flood Control/Mitigation Measures Approach encouraging Prompt Project Implementation considering flood control as 2-dimensional issues of target river basin ■ Promotion of the construction for more stable Flood and Sediment Control Structures based on lessons learned from the Philippines and Japan ■ Enhancement of Engineering Level of RO/DEO of DPWH and LGUs in terms of Flood Control
Structural Measures		✓	Much Further Sophisticated, Rapid and Unified Weather Forecast and Flood/Sediment Disaster Warning ■ Rapid Capacity Development of River Centers and LGUs ■ Capacity Enhancement for Weather Prediction of PAGASA ■ Standardization and Unification of Hydro-Meteorological Observation and Monitoring Facilities
Non-Structural Measures			

Source: JICA Study Team

Table 3.5.13 Summary of Challenges for Gaps (Flood/Sediment Control Measures)

Gaps in Matrix	Vector / Challenges for Gaps
Keyword ➢ Implementation of Flood and Sediment Disaster Projects ensuring consistency with Related Plans ■ Harmonization between Flood Control and Other Related Plans in terms of River Basin Management ■ Prompt and Repetitive Hazard/Risk Assessment	
• River management agency is not specified by law (Legal Framework and Plan/Guideline) • Data and/or plan of flood/sediment disaster is not shared among NWRB, CCC, DPWH, LGU, DOST-ASTI/NOAH, DENR-RBCO/EMB/MGB, etc. (Organization/ Responsibility) • Implementation agency for sediment disaster is not clear. (Legal Framework and Plan/Guideline) • DPWH's flood control plan is not clearly specified by DENR-RBCO in the integrated river basin management and development plan (Legal Framework and Plan/Guideline) • Transfer of all information on flood/sediment disaster to PAGASA is not assured and no law/act has been developed. (Legal Framework and Plan/Guideline)	• New Guideline to clarify Roles and Responsibilities of River Basin Management related to Agencies • Harmonization between Flood Control Plan and River Basin Development Plan • Place-making for Discussion and Presentation of Plans for Flood and Sediment Disaster Control
• The preparation of hazard maps in principal river basins is not progressing. (Non-Structural Measures) • Future utilization of hazard maps is not discussed. (Non-Structural Measures) • There are some hazard maps whose information is not accurate. On the other hand, preparation of an accurate hazard map needs a great deal of money and time. (Non-Structural Measures)	• Standardization of preparation of hazard maps. • Utilization of hazard maps for development of CBEWS and CLUP by LGU as well as its harmonization with flood mitigation projects conducted by DPWH/LGU. • Update of topographic map with high-accuracy
Keyword ➢ Prompt Implementation of Flood Control Projects Ensuring the Sustainability of the Effects of Flood Mitigation Facilities ■ Prompt Implementation of Prioritized Flood Control Projects ■ Promotion of Comprehensive Flood Control/Mitigation Measures Approach encouraging Prompt Project Implementation considering flood control as 2-dimensional issues of target river basin ■ Promotion of the construction for more stable Flood and Sediment Control Structures based on lessons learned from the Philippines and Japan ■ Enhancement of the Engineering Level of RO/DEO of DPWH and LGUs in terms of Flood Control	
• Flood/sediment disasters frequently occur along each river due to long stretches of unimproved river and recent large-scale typhoons even though the flood control project is promoted. (Structural Measures) • Some of the Eighteen Major River Basins have no flood control plan formulated. • There is a great difference in the design flood scale between the Memorandum of DPWH Secretary/DGCS 2016 Edition and the under-planning flood control projects. (Structural Measures) • Explanation on the prioritization of flood control projects to stakeholders is difficult because the evaluation of a project's priority is not clear. (Structural Measures) • Few local consultants formulate flood control plans. (Structural Measures) • Hydro/Met observation facilities have not been fully developed to appropriately conduct a flood control project (Structural Measures) • There are some cases that benefits and effectiveness by Projects have been reduced due to the delay of house relocation and land acquisition which resulted in the delay and budget shortage of Project Implementations (Structural Measures) • The improvement and updates of Design Criteria taking into account huge earthquakes and flood exceeding design level has not been executed. (Structural Measures) • Although the Project Impact Analysis (PIA) for flood control projects has been introduced, its procedures have not been defined	• Review of Prioritization of Flood Control appropriate for Risk (Review of JICA-DPWH Study in 2008) • Review of Flood Control Scale according to Guidelines and Actual Conditions • Further Promotion of Comprehensive Flood Control/Mitigation Approach utilizing Dams, Retarding Basins, Regulation Ponds and Underground Structures taking into consideration prompt project implementation and flood risk reduction function in case of floods exceeding Design Discharge • Necessity of Strengthening Flood and Sediment Control Facilities and Structures in terms of seismic and seepage resistance and other considerations based on lessons learned from the Philippines, Japan and other countries. • Utilization of advanced technologies which contribute to more effective and expeditious implementation of projects (Satellite rain data, laser profiler, Rainfall-Runoff-. Inundation Model (RRI) model, HEC-RAS, etc.) • Establishment of procedures for PIA

Gaps in Matrix	Vector / Challenges for Gaps
• Regional/District offices have no technical capacity to formulate flood control plans even though they are upgrading their skills to implement flood control projects. (Organization/Responsibility) • DPWH Head Office has no capacity to formulate flood control plans for all small/medium sized rivers simultaneously. (Organization/Responsibility) • There are few dependable local consultants. (Organization/ Responsibility) • Status/plan of a flood control project is not accurately grasped and shared within DPWH. (Structural Measures) • Individual agencies, particularly DPWH, could not expend the increased/approved budget (Structural Measures) • LGUs have no technical and financial capacity to implement flood control projects even though they are required to work on DRRM including flood control. (Organization/Responsibility) • LGU does not appropriately conduct O&M for river structures, or refuse handover from DPWH (Structural Measures)	• Enhancement of DPWH Regional/District offices • Appropriate O&M Activities for Flood Control Facilities mainly by DPWH • Establishment of a Support System of Flood Mitigation to LGU by DPWH • Preparation of Guidelines for Flood and Sediment Disaster Prevention/Mitigation Projects geared toward LGUs which can formulate the plan and implement the projects. • Supporting System for LGUs in terms of Flood and Sediment Control Measures
Keyword ➢ Much Further Sophisticated and Rapid and Unified Weather Forecast and Flood/Sediment Disaster Warning ■ Rapid Capacity Development of River Centers and LGUs ■ Capacity Enhancement for Weather Prediction of PAGASA ■ Standardization and Unification of Hydro-Meteorological Observation and Monitoring Facilities	
• There is no law/act to regulate observation facilities for forecasting and warning (Legal Framework and Plan/Guideline) • Capacity development for the personnel of the River Center is needed but it takes time. (Organization/Responsibility) • The number of water level gauges is not sufficient to conduct hydraulic study, flood management planning and flood observation. (Non-Structural Measures) • Equipment and system are not unified and are different according to agencies' projects. (Non-Structural Measures) • Capacity development plans for PAGASA's Regional River Centers have not been discussed in detail although the Centers are being established. (Non-Structural Measures) • Development of flood analysis models to be taken by each River Center takes a long time. (Non-Structural Measures) • Development of flood forecasting and warning system in principal river basins is not progressing. (CBEWS is hardly developed except a few river basins established by foreign donors.) (Non-Structural Measures)	• Installation of additional hydrological observation facilities to contribute to proper issuance of flood/sediment disaster forecasts and warnings • Utilization of satellite data for areas where the installation of a ground observation network is difficult like Mindanao • Capacity enhancement of PAGASA River Centers to contribute the proper issuance of flood/sediment disaster forecasting and warning • Preparation of guidelines regarding weather observation, prediction, warning and verification of instrument.
• The accuracy of numerical prediction is low. (Non-Structural Measures) • The capacity development activities are not progressing except PAGASA Central and Southern Luzon regions. (Non-Structural Measures) • PAGASA's current weather information is sometimes criticized for its difficulty. (Non-Structural Measures)	• Enhancement of staff of PAGASA • Improvement of accuracy of weather prediction to contribute to the issuance of weather forecasting and warning which are quantitative and reflect variation by area.

Source: JICA Study Team

3.5.5 Direction of Solutions for Gaps and Issues

The disaster risks and analysis in the Philippines in Chapter 2 and the effort of the Government of the Philippines and lessons learned from activities in the past including the international donors' support in Subsections 3.5.1 to 3.5.3 are described as premises (current status). Based on these premises, the challenges for gaps of hydro-meteorological disasters including flood and sediment disasters are extracted and elaborated in Subsection 3.5.4.

The recommended directions of solutions for gaps and issues mentioned in previous sections are as discussed below.

(1) Premise (Recognition of Current Status)

As mentioned in Chapter 2 related agencies in the Philippines are undertaking efforts to improve the DRRM including flood and sediment disaster activities. As to non-structural measures, hazard maps have been prepared and climate change adaptation actions have also been tackled by the departments/agencies concerned. The institutions and organizations for flood control are also being developed in line with the international trend. In relation to this, new organizations in NGAs related to flood and sediment disaster risk reduction have been established, such as the NDRRMC, RBCO in DENR and IWRM section in DPWH. The budgets of DPWH and PAGASA have rapidly increased recently. International donors' assistance is being activated to fully support the acceleration of the DRRM system. A number of measures have been conducted by international donors and national agencies to mitigate flood and sediment disasters.

On the other hand, damages due to hydro-meteorological disasters are unfortunately increasing as mentioned in section 2.1, in spite of the efforts mentioned above. There is also another concern that the increasing precipitation may cause frequent flood/sediment disasters by global warming due to climate change in the future as mentioned in section 2.3.

(2) Direction of Solutions for Gaps and Issues

The directions of future solutions on the basis of the extracted challenges for gaps in Subsection 3.5.4 are recommended as follows:

1) Harmonization between Structural and Non-Structural Measures of Flood and Sediment Disaster Projects ensuring consistency with Related Plans

(a) Harmonization between Flood Control and Other Related Plans in terms of River Basin Management

Although the roles of river basin management and water resource management which form the basis of the flood control projects are deconcentrated into several agencies, the related agencies do not closely cooperate and work well together. The related plans formulated by the agencies and LGUs are not always shared with each other. The forecasting and warning data is occasionally not shared with the related agencies. Some hydrological data are not absolutely transmitted to PAGASA in real time even though the process of transmitting data has been improved by projects implemented with JICA and other donors' support. To further improve the harmonization among the related agencies, the occasion to discuss, share information and outline their plans among related agencies should be periodically provided and related laws and/or regulations should be crafted. For instance, the Flood and Sediment Disaster Control/Mitigation Technical Group should be established under the Prevention/Mitigation TMG of NDRRMC. It is likewise essential to discuss and outline their flood/sediment control plans in every regular meeting of the Technical Group with the related agencies.

For example, the Government of Japan has established a Conference for Concerned Government Agencies to Promote National Resilience in order to strengthen collaboration among agencies concerned, to exchange opinions and discuss issues, and to promote holistic and comprehensive measures and policies on national resiliencies against mega-disasters with information sharing.

(b) Prompt and Repetitive Hazard/Risk Assessment

As mentioned in subsection 2.2.1, the related agencies have prepared hazard maps and conducted risk assessments for the flood and sediment disaster projects. The preparation of hazard maps for the eighteen major river basins in Project-NOAH is, particularly, remarkable.

However, flood disasters occur not only in the eighteen major river basins but also in the principal and the small to medium-size river basins and funds and time are also needed to carry out flood control projects in these river basins. Moreover, further efforts and cooperation among the related agencies are absolutely necessary not only for the continuous implementation of flood control projects by DPWH/LGUs but also for the establishment of the Community-Based Early Warning System (CBEWS) and updating of land use plans (CLUPs) based on the hazard maps. In this connection, as mentioned in item (a) above, the information sharing among related agencies and discussions in the Prevention/Mitigation TMG of NDRRMC including utilization of hazard maps are effective. Specific and comprehensive measures to solve the issues mentioned above have already been considered in the projects by JICA and other Donors. It is essential to conduct continuous approaches and implementation for the prevention and mitigation against not only flood and sediment disasters but also all types of disasters nationwide. As a first specific step, the discussions, including the standardization of the preparation of hazard maps with effective utilization in the Technical Monitoring Group under the "Prevention and Mitigation" Sector in the NDRRMC among related agencies shall be initiated

PAGASA has established a system to advise LGUs about CBEWS. However, PAGASA's advice is dependent on the request from LGUs in the existing system. PAGASA needs a supporting mechanism to advise the LGUs about CBEWS without a request from an LGU.

2) Acceleration of the Implementation of Flood Control Projects Ensuring Sustainability of the Effects of Flood Mitigation Facilities

(a) Prompt Implementation of Prioritized Flood Control Projects

As mentioned in Subsection 3.5.1 and Annex 3.2, no flood control project has been conducted in most of the river basins due to the enormous expense required and the long time to carry them out. Flood control projects also require appropriate technical approaches, and effective economic benefits should also be confirmed.

Floods have occurred in river basins in which some flood mitigation projects were unimplemented because river water overflows from unimproved river sections. According to

the latest DPWH Design Guidelines, Criteria and Standards (DGCS) 2015, the design against flood scales of 50-year return period is recommended for river basin areas of less than 40 km^2 and 100-year return period for 40 km^2 and above. However, the implemented or on-going flood control projects have targeted only 10 to 25-year return periods due to economic viability and social consideration along the river courses.

Under the circumstances mentioned above, the DPWH Head Office should undertake flood control projects in high risk and priority river basins as "National Projects" taking into account both technical and budgetary capacities. Appropriate flood control plans for flood prone areas shall also be formulated or updated and the inconsistencies of flood protection scale between the recommendations in the DPWH DGCS and the actually planned/conducted projects shall be clarified and appropriately discussed.

(b) Promotion of Comprehensive Flood Control/Mitigation Measures Approach encouraging Prompt Project Implementation considering flood control as 2-dimensional issues of target river basin

Under the initiative of the DPWH, the formulation of flood control/mitigation plans based on the approach by comprehensive flood control/mitigation measures has been initiated. This approach is a paradigm shift of flood control from only river training to consideration of all available measures to mitigate flood damage, such as construction of dams, retarding basins, on-site/off-site regulation ponds including underground structures (river tunnel and/or underground floodwater regulation facilities). In particular, flood damage mitigation plans for rivers passing through urbanized areas where land acquisitions and house relocations for the widening of river course and construction of dikes need plenty of time for negotiation shall be formulated through the comprehensive approach mentioned above. On the other hand, a massive investment budget is required for the construction of large-scaled floodwater regulation facilities in exchange for high benefits of flood risk reduction. The introduction of the said large-scaled facilities, such as flood control dams and underground regulation ponds, is one of the realistic alternatives to dramatically improve the flood situation since recently DPWH's budget has rapidly increased as shown in sub-section 3.5.1.

It is also imperative for prompt project implementation to utilize advanced technologies which contribute to more effective and expeditious implementation of projects (Satellite rain data, laser profiler (LIDAR), RRI model, HEC-RAS, etc.) based on experiences in Japan and the Philippines. These advanced technologies could encourage labor-saving for the formulation of M/P, conduct of F/S and Project Impact Analysis (PIA) required.

(c) Promotion of the construction for more stable Flood and Sediment Control Structures based on lessons learned from the Philippines and Japan

There are some facilities and structures constructed by the projects in the past of which functions have not performed well and the initial expectation of benefit and effectiveness has reduced,

because of damage by extensive external forces, seepage failures and/or improper maintenance activities. In addition, it should be considered that unexpected seismic forces may bring serious harm to flood and sediment control structures to be constructed since the Philippines is an earthquake-prone country like Japan. Through several harmful earthquake disasters in Japan, such as Hanshin-Awaji Earthquake in 1995 and the Great East Japan Earthquake in 2011, the design criteria and guidelines for flood and sediment control facilities and structures have repeatedly been amended and improved in Japan. In the current design guidelines and standards for Water Engineering Projects (2015) in the Philippines, detailed instructions and procedures on how to design flood and sediment control structures have not been specified. Design criteria and standards in Japan with basic design concepts against seismic forces and phenomena will be useful to update and improve the current design guidelines since both counties have similar topographic and geographic conditions. In this regard, it is recommended that the flood and sediment control structures which are stable against seismic forces, seepage phenomena and other external forces to be considered shall be constructed in future projects based on the common issues and lessons learned in both countries.

Furthermore, the life-span extension of constructed structures has currently been a focus in Japan. In the Philippines, the discussion about the extension of structural life-span will arise in the near future because of accumulated assets of structures for disaster risk reduction year by year. This challenge should also be discussed and tackled in the Philippines.

(d) Enhancement of Engineering Level of RO/DEO of DPWH and LGUs in Terms of Flood Control

Flood control projects in important river basins which encompass a number of regions/provinces shall be carried out by the DPWH Head Office (UPMO) with the coordination of concerned LGUs due to the high project cost. On the other hand, small and medium-size rivers should be administrated by the DPWH Regional Office (RO), District Engineer's Office (DEO), or LGUs.

However, it is difficult for LGUs, DPWH-RO or DPWH-DEO to formulate flood control plans taking into consideration the comprehensive and integrated management for the whole river basin. Besides, most of the local consultants have no capability to support the public agencies in the formulation of flood control or river management plans. For flood control management, suitable maintenance activities are also required to sustain the benefits of flood control, because the flood control projects without proper maintenance of constructed river structures have reduced benefits. To solve this issue, DPWH should fully accelerate the ongoing inventory survey of flood control facilities to enable the utilization of the inventory results for the operation, maintenance and budgetary management of the flood control facilities constructed in the past.

Overall, capacity enhancement of DPWH-RO/DEO on the implementation of flood control projects and the formulation of an O&M system for river structures is required. In addition, the

establishment of a support system from DPWH-RO/DEOs to LGUs for the planning, design and implementation of flood/sediment disaster control measures are also noteworthy activities.

As to capacity development of DPWH in terms of flood control, DPWH has designated two Flood Control Coordinators for all ROs and one Flood Control Coordinator for all DEOs due to DO No.94-2015 (Transferring the Flood Control Management Cluster (FCMC) under the Supervision of the Office of the Undersecretary for Regional Operation). In addition, R-PMO in each DPWH-RO is created in accordance with DO No.123-2016. These achievements of ROs and DEOs by DPWH are a breakthrough for flood control management. Hereafter, DPWH needs enhancement of capacity of these flood control coordinators to accelerate flood damage risk reduction.

3) Much Further Sophisticated, Rapid and Unified Weather Forecast and Flood/Sediment Hazard Warning

(a) Rapid Capacity Development of River Centers and LGUs

Based on the modernization plan, PAGASA is aiming to enhance its capabilities. As one of the modernization activities, the river centers for the eighteen major river basins to enhance PAGASA's capacity for flood forecasting and warning are to be established within a few years. However, there is anticipation that these river centers might not be operated appropriately unless the capacity of operating staff and grasp of the complicated river features are improved with proper timing. On the other hand, the number of hydrological observation stations is still insufficient for a suitable forecast. The following issues on flood forecasting and warnings have been confirmed: inadequate points of meteorological and hydrological stations and insufficient periodical verification of meteorological and hydrological equipment and facilities.

Correspondingly, capacity development of the river centers is essential. The capacity of each staff member of PAGASA, especially those newly hired, needs to be strengthened in terms of improving accuracy and swiftness of flood/sediment disaster forecasting and warning. A verification system for instruments and the O&M guidelines/manuals for their proper operation are necessary for the issuance of flood/sediment disaster information/warning. In addition, it is also necessary to consider the utilization of satellite data for areas where installation/operation of ground observation network is difficult.

The above directions will at first be considered in the "Project for Strengthening Capacity of Integrated Data Management of Flood Forecasting and Warning" which is expected to commence under JICA in a few months. The project will include the establishment of integrated data management between PAGASA's Central Office and the regional river centers, and capacity enhancement, but excluding the development of flood analysis models and preparation of hazard maps. Each river center needs to establish a flood/sediment disaster forecasting and warning system for the principal river basins within its jurisdiction as well as the system for major river basins.

PAGASA has advised LGUs about the CBEWS. However, PAGASA's advice depends on the requests by LGUs. PAGASA should establish an advisory system for LGUs to improve the CBEWS without any requests from the LGUs.

(b) Capacity Enhancement for Weather Prediction of PAGASA

JICA started the "Project for Enhancing Capacity on Weather Observation, Forecasting and Warning" in 2014 with completion in 2017 (JICA-PAGASA Capacity Project). The overall goal of the project is to enhance the capacity on weather observation, forecasting and warning. The project activities include the utilization and operation of weather radars and weather observation facilities, method to correct radar data by using surface observation data, improvement of warnings, preparation of criteria of warnings and guidance of numerical prediction as well as training. Based on these activities, the project goal is capacity enhancement for weather observation, forecasting and warning of PAGASA's Central Office and the operation areas of Southern Luzon PAGASA Regional Services Division.

The capacity of other PAGASA offices which are excluded in the above project also basically needs to be enhanced subject to the confirmation of the actual contents of the above JICA PAGASA Capacity Project. In addition, the capacity enhancement activities for PAGASA staff conducting numerical prediction are under consideration as additional activities in the JICA PAGASA Capacity Project.

(c) Standardization and Unification of Hydro-Meteorological Observation and Monitoring Facilities by PAGASA

As outlined in sub-section 3.5.4, one of the gaps/issues on weather forecasting and flood forecasting & warning system (FFWS) is that observation and monitoring facilities installed for weather forecast or FFWS have not been standardized and the data obtained have not been shared with related agencies smoothly. For instance, there are four flood warning systems in Pasig-Marikina River Basin installed by PAGASA, MMDA, LGU (Marikina City) and so on. Therefore, different systems have different accuracy from other systems and require different maintenance and data transmitting systems to communicate with each other.

To establish FFWS in each river basin hereafter, the lack of standardization of FFWS between the facilities and equipment to be utilized would be destined to cause lots of problems. Moreover, FFWS recipients would be confused unless the accuracies among the warning systems are the same. The maintenance costs would increase and maintenance procedures would be complicated.

Hence, PAGASA should take the initiative to standardize and unify the system and facilities/equipment to be utilized for a nationwide warning system.

3.6 Coastal Disaster

3.6.1 Efforts of the Government of the Philippines

(1) Standards and Guidelines

More than twenty typhoons affect the Philippines every year and Typhoon Yolanda caused catastrophic destruction in 2014. Consideration on the methodology to evaluate some factors' effects such as wave force, tide level and tidal current and on the protection against coastal disasters were generated due to the impact of the storm surge disaster in Leyte. Because "coastal disasters countermeasures" is a new theme to focus on in the near future, standards and guidelines are under preparation.

(2) Organizational Structure

The Local Government Code (LGC) mandates the Local Government Units (LGUs) to implement coastal disaster prevention and protection countermeasures but there is no specific designation of a responsible agency or bureau at the central level. For example, the Department of Public Works and Highways (DPWH) is responsible for the protection of coastal roads, the Philippine Reclamation Authority (PRA) is involved in the case of land reclamation, the Department of Environment and Natural Resources (DENR) implements coastal environment conservation projects and the Department of Tourism (DOT) develops coastal touristic sites; but there is no specific agency to consider and implement coastal works as an independent task and coastal projects are generally attached to other projects.

3.6.2 JICA's cooperation

The outline of the major JICA cooperation projects such as the storm surge disaster project in Leyte and tsunami disaster project are shown in Table 3.6.1.

Table 3.6.1 JICA's Cooperation

Project title	Outline
Development Planning Technical Cooperation Project "Urgent development study on the project on rehabilitation and reconstruction from Typhoon Yolanda" Feb.2014 ~ Oct.2016	Based on the basic concept of "Build back better", the following programs were implemented: • Comprehensive planning of Disaster Rehabilitation and Reconstruction • Build-up of Rehabilitation and Reconstruction Projects • Implementation of pilot project for urgent rehabilitation and reconstruction project.
Technical Cooperation Project－Science and Technology Research Partnership for Sustainable Development (SATREPS) "Enhancement of Earthquake and Volcano Monitoring and Effective Utilization of Disaster Mitigation Information Project" Feb.2010 ~ Feb.2015	• Accurate and quick seismic source parameters analysis and seismic intensity (emergency) information. ➢ Accurate and quick seismic source parameters analysis ➢ Development of seismic intensity (emergency) information system ➢ Upgrade of tsunami information ◆ Low-power and wireless tide observation ◆ Tsunami simulation database • Evaluation of potential earthquake occurrence • Real-time comprehensive volcano observation • Promotion of the utilization of disaster prevention information.

Project title	Outline
Grant Aid "Improvement of Equipment for Disaster Risk Management in the Republic of the Philippines" Project Cost :1.006 billion yen (Japan 1.0 billion Yen, Philippines 6.0million yen) June 2012 ~ Dec.2012	• Real-time earthquake monitoring system • Tsunami warning system ➢ Real-time tsunami monitoring system, installation of: ◆ Nineteen tsunami wave detectors for the whole country ◆ Nineteen data transmission stations ◆ Tsunami information system • Equipment for emergency response and infrastructure integrity assessment (eight mobile drainage pumps)

Some considerable efforts were undertaken during the "Urgent development study on the project on rehabilitation and reconstruction from Typhoon Yolanda". For example, different disaster scale (event return period) risk maps were prepared and coastal measures to be implemented and funded by DPWH were identified during this project.

Through the "Improvement of Equipment for Disaster Risk Management in the Republic of the Philippines" project, nineteen (fifteen were already installed and four are under installation) real-time tsunami detectors were installed and materials to establish a database for tsunami simulation were provided. Through such efforts, tsunami observations and an early warning system started to be established near the Philippines. The enlargement of the observation area, upgrade of the simulation data and enhancement of the forecast capacity are needed.

3.6.3 Other Donors' Cooperation

The outline of the reconstruction assistance programs provided by the other international donors is shown in the following table.

Table 3.6.2 Other Donors' Cooperation

Donor	Year	Name of project	Contents
ADB	2013	Typhoon Haiyan(Yolanda) Project	Grant US$23million immediate relief fund
	2013-2015	Emergency Assistance for Relief and Recovery from Typhoon Yolanda	Loan US$500 million
WB	2013	Post Typhoon Recovery Loan	Loan US$500 million for reconstruction

3.6.4 Identification of Gaps

(1) No legislation specific to coastal disaster prevention

The major challenges faced by the Philippines are the lack of a legislative framework and implementation capacities.

Through LGC, LGUs are responsible to implement coastal disaster prevention infrastructures and no national agency is capable of implementing coastal countermeasures specialized projects. In the aftermath of the Yolanda disaster, DPWH was designated by an extraordinary Presidential Decree to manage coastal tasks; however it was a special case that is not permanent.

On the other hand, LGUs do not have enough technical expertise to deal with coastal engineering issues; and consequently, they cannot formulate basic plans for coastal disaster prevention measures and LGUs cannot make a request for technical assistance because of the absence of coastal projects implementing agency and lack of coastal engineering knowledge at the national level.

(2) Low recognition of coastal engineering as an academic

The number of students studying coastal engineering in the Philippines is small and only a few of them become coastal engineers (There are only two coastal engineering professors in the whole country, and three students majoring in the coastal engineering course in UP).

The following table shows the basic elements of coastal engineering and the present status of the implementation of each of them.

Table 3.6.3 Basic information and the current situation for the study and practice of Coastal engineering

Subject	Element	Status of implementation
Marine Phenomenon	Tide level	NAMRIA is responsible of the continuous observation and the publication of the yearly tide table.
	Wave	No agency is assigned to conduct wave observation and none of the NGAs is planning to do it.
	Tidal current	NAMRIA is doing partial observations but not nationwide.
Geology	Topographic survey	NAMRIA accomplished the preparation of topographic information/digital maps of the whole of the Philippines.
	Bathymetric survey	NAMRIA is preparing bathymetric information/digital maps of the whole country. NAMRIA is planning to complete this program in 2020.
	Shoreline alteration survey	MGB is preparing shoreline maps covering the whole country and is planning to analyze the alteration (erosion and accretion) of the shoreline by comparing these maps with 1950 topographic maps. This study is scheduled to be completed in 2018.
Technical Standard ・ Manual ・ Guideline	Technical Standard of DPWH	A chapter on Coastal Structures was added to the “Design Guidelines, Criteria and Standards (DGSC)” of DPWH as Volume 3 Chapter 7. Because only basic matters were included, DGSC has to be reviewed and upgraded.
	Technical Standard of PPA	PPA is responsible to manage, construct and maintain port facilities and engineers already have a guideline to design port facilities. A similar guideline or some additional mentions have to be included to design structures against coastal disasters.
	Guideline formulated by UP-MSI*	UP-MSI is implementing the “Shoreline Stability Project” funded by DENR and is preparing the “Guideline on the Management of Coastal Erosion in the Philippines” based on the results of the project. There is no concrete plan to finalize the guideline because of the lack of human power and funds.

* UP Marine Science Institute

3.6.5 Direction of Future Cooperation

Direction of future cooperation reflecting the gaps cited above are discussed below.

(1) Motivation to implement coastal disaster prevention and protection measures

The recognition of the necessity of coastal disaster prevention and protection countermeasures by understanding the (good) effects of such structure implementation is fundamental. That is why it is important to understand the activities and procedures and to evaluate the effects of coastal measures by following the whole process of project implementation (research - planning - project implementation - follow-up). The implementation of coastal disaster prevention and protection projects in highly eroded coastal areas (such as Boracay Island, Luzon Island-La Union Province-San Fernando, etc) can present an opportunity to enhance the awareness of national and local governments and the motivation to implement coastal disaster prevention and protection measures.

(2) Development of Technical Standards

Technical cooperation to revise DPWH's DGSC should be provided to formulate technical standards and guidelines for coastal disaster prevention and protection structures; such as it was when JICA supported the formulation of DPWH-FCSEC's technical standards and guidelines for river improvement work.

(3) Capacity building and training / human resources development

The active cooperation with inter-disciplinary organizations such as UP may present the opportunity to develop awareness on coastal engineering. For example, the conduct of On-the-Job Training during project implementation will enhance the technical capacity of the engineers. The increase in the number of engineers and the enhancement of technical expertise will take time, and the recognition of coastal engineering is an indispensable condition. To enhance the awareness and sense of responsibility, the implementation of projects by Filipinos following the standards prepared by the government of the Philippines is needed.

(4) Legislation relating to coastal disaster prevention and protection

Through the enactment of a "Coastal Act" including coastal protection and development, the roles and responsibilities of national and local organizations will be clarified. If the roles and responsibilities toward coastal and disaster prevention of each agency are determined, further and more concrete considerations on complex issues such as Climate Change and on capacity building of engineers can be conducted.

(5) Establishment of a wave monitoring system

Through the establishment of a wave monitoring system and installation of needed equipment and machinery, accurate data on marine phenomena will be recorded. The analysis of such data will

contribute to the development of coastal engineering; and consequently to the implementation of coastal disaster prevention and protection work.

(6) Considerations on Climate Change

The Philippines is affected by more than twenty typhoons every year; and the projected effects of climate change such as erosion acceleration/setback of the shoreline caused by more intensive typhoons and wave dynamics and sea level rise will cause important impacts to residential areas and consequently the economy of the coastal areas. To implement mitigation measures, consideration of countermeasures based on coastal engineering reflecting climate change simulation is needed.

(7) Countermeasures against tsunami disaster

Tsunami disaster prevention projects are usually recognized as high-level coastal disaster prevention and protection projects and implementation of structural and also non-structural countermeasures is needed. As shown in Table 3.6.1, JICA provided assistance to establish systems for real-time tsunami monitoring and tsunami warning. It is important to maintain and upgrade such systems in the future. Regarding the implementation of structural countermeasures, planning, design and implementation of concrete and efficient countermeasures will be possible through the directions cited above.

On the other hand, regarding the port facilities, the secondary damage such as the boats that are washed ashore has to be considered and mitigation measures have to be implemented.

3.7 Earthquake Disaster

3.7.1 Efforts of the Government of the Philippines

(1) Regulations and guidelines

There are a plenty of active faults inland of the Philippines, such as Philippine Fault Zone (PFZ), and the seismicity in the surrounding plate boundary is also high, which results in the frequent occurrence of earthquakes in and around the Philippines. The causalities of the Moro Gulf earthquake, which took place in 1976 near the islands of Mindanao, where there were more than 8,000 deaths and the Bohol earthquake, occurred in 2013, caused more than 200. The National Building Code of the Philippines (NBCP) was created in 1977 and The National Structural Code of the Philippines (NSCP) was first developed in 1972 and published its 6th edition in 2010. Both NBCP and NSCP are under revision by the cooperation of DOST, UP, DPWH etc., and is scheduled to have its draft in the first half of 2017. As the international trend for strengthening seismic performance of buildings, the seismic design has shifted from allowable stress design to performance-based design. In the meantime, seismic diagnosis and retrofitting for existing buildings were promoted.

(2) Institutional framework

The Philippines enacted the Philippine Disaster Risk Reduction and Management Act in 2010, which stipulates the integrated disaster risk management for the whole disaster cycle, covering prevention/mitigation, preparedness, response and recovery and reconstruction. As a result, DRRMOs, which are in charge of disaster risk management and are responsible for the creation of LDRRMP and contingency plans, have been established in all the LGUs.

A national earthquake observation network, composed of a short-period seismometer, accelerometer, broad-band seismometer and broad- band accelerometer, has been established by PHIVOLCS, which improved the precision on the determination of an earthquake source parameter, such as magnitude and hypocenter, and shortened analysis time. The observation network for instrument intensity is now under installation, which is expected to provide rapid damage information after an earthquake.

The Philippines has carried out a series of projects, such as MMEIRS、READY、READS、GMMA RAP, for seismic hazard analysis and risk assessment for different purposes, e.g. the creation of a multi-hazard map, seismic risk assessment and the development of software for risk assessment, etc.

Regarding the buildings and other infrastructures, DPWH is working with the Association of Structural Engineers of the Philippines (ASEP) on the revision of the design standards for bridges, and UP is working on the revision of the building code. However, because the capacity of the LGUs in charge to check and release construction permits is lacking, the number of LGUs following the national standards and law is small.

3.7.2 JICA's Cooperation

The past cooperation of JICA covers earthquake observation, seismic risk assessment, capacity building for OCD and the seismic strengthening of bridges, etc. The projects are as below.

Earthquake observation:

- The Project for Improvement of Earthquake and Volcano Monitoring System (Phase 1: 1999-2000; Phase 2: 2000-2004)
- The Project for Improvement of Equipment for Disaster Risk Management (2012-2015)
- Enhancement of Earthquake and Volcano Monitoring and Effective Utilization of Disaster Mitigation Information Project (SATREPS, 2010-2015)

Seismic risk assessment:

- Earthquake Impact Reduction Study for Metropolitan Manila (2002-2004)

Seismic strengthening of bridges:

- Study on Improvement of Bridges through Disaster Mitigating Measures for Large Scale Earthquakes (2012-2013)
- Metro Manila Priority Bridges Seismic Improvement Project (2015)

3.7.3 Other Donors' Cooperation

WB is now financing the revision of the National Building Code of the Philippines (NBCP) and provided a Catastrophe Deferred Drawdown Option (CATDDO) in 2011 and 2015 with US$500 million each. WB also planned to support a project for the vulnerability assessment and seismic retrofitting for 100 schools in Metro Manila, but did not reach the implementation stage due to the effect of Typhoon Yolanda. During 2006 - 2013, UNDP and AusAID supported a project to make multiple hazard maps for earthquake, tsunami, flood and landslide for 28 provinces. PHIVOLCS, with the financial support of AusAID, developed software for seismic hazard analysis and risk assessment, which can evaluate ground motion, liquefaction, tsunami and earthquake induced landslides if data is prepared. AusAID conducted the Greater Metro Manila Risk Assessment Project (GMMA-RAP) from 2010 to 2015, through the use of LiDAR data, a detailed analysis on land-use and buildings was done and the estimation on damage as determined in the Earthquake Impact Reduction Study for Metropolitan Manila Project (2002-2004) conducted by JICA was updated. NZAID provided NZ$ 2.6 million to the Red Cross of the Philippines during 2013 - 2016 for the construction and retrofitting of its warehouses and the procurement of essential supplies for stockpiling. WFP supported the food stockpiling for Clark and Pampanga Provinces.

3.7.4 Identification of Gaps

Based on the efforts of the Philippines, JICA's past cooperation projects and the experience of Japan on disaster risk management, the recognition and gaps for seismic disaster mitigation are summarized as below in terms of earthquake observation, risk assessment, disaster risk reduction and management plan, the strengthening of seismic performance of buildings and emergency response.

(1) Earthquake observation

There are two kinds of earthquake observation, one is for the determination of source parameters and another is for understanding the strong ground motion characteristics. PHIVOLCS has developed a nationwide earthquake observation network and improved the source parameter accuracy and the processing time. In addition, 36 accelerometers were provided by The Project for Improvement of Equipment for Disaster Risk Management of JICA. However, active faults are widely distributed in all of the country and the accelerometer network is insufficient considering the large land area of the Philippines. On the other hand, the intensity observation has just begun and how to utilize the intensity information to the response activities after an earthquake is a challenge to be faced.

(2) Risk assessment

Seismic risk assessment software RADAS was developed, but the building inventory was not sufficiently prepared for the use of the software. More than a decade has passed since the implementation of the JICA MMEIRS project, which conducted the risk assessment for buildings, infrastructure and human loss in 2004 for Metro Manila. The update of MMEIRS with the current building, social and economic situations and the verification of its recommendations is necessary. The detailed risk assessment for the other major cities or nationwide is also necessary.

The database to provide the information for the priority of retrofitting and cost, etc. for the purpose of the seismic performance strengthening of schools, hospitals and critical public buildings is not available. Such a database should cover the vulnerability to multi-hazards, such as earthquakes, tsunamis, typhoons, storm surges, floods and landslides.

(3) Disaster risk reduction and management plan (DRRMP)

It is the responsibility of LDRRMO of LGU to formulate and implement DRRMP and contingency plans. There are big differences in the organization structure and disaster management capacity among LGUs. The capacity of LGUs, especially in the rural areas, is not sufficient. The current DRRMP is mainly focusing on the emergency response and lack of the contents on long-term disaster prevention/mitigation countermeasures. The long-term disaster management master plan, on both the central and local level, requires the seismic risk assessment and making use of its results as a baseline to incorporate targets and measures into the plan. The current disaster management plan doesn't include the numerical target and the approach to verify the achievement of the target.

In urban areas, the integrated land use plan is also important to make it resilient through the re-development and land readjustment for the old city area.

For seismic disaster risk reduction, there needs to be long-term and continuous implementation on the research and development of seismic resistant technology, structural measures to reduce vulnerability and the development of building inventory for improving the accuracy of seismic risk assessment. There is no organization at the national level for the strategic planning and the integrated management for integrating various technical resources and the effective use of data owned by individual organizations.

(4) Strengthening of the seismic performance of buildings

The need cannot be over emphasized for the strengthening of the seismic performance of buildings for earthquake disaster mitigation because earthquakes are not predicable now. In the Philippines, there are many buildings, called no-engineered buildings, which were constructed without complying with the seismic design code. To improve the earthquake resistant performance of the no-engineered buildings, it is important to develop the seismic resistant method, establish the standard design drawings, formulate construction manuals, conduct technical training for the construction companies and strengthen the inspection system of LGU. There is also a need at the national level to have an authority responsible for policy making and promotion on the seismic design and inspection of buildings. LGU is clarified into six categories according to its size and the small LGUs have limited capacity in terms of human resources and technology for seismic design review and construction inspection. In this case, it could be a useful resource for the Philippines in allowing designated private companies to perform design review and construction inspection, on behalf of local governments, like it is practiced in Japan. On the other hand, it is also important to improve the seismic performance of existing buildings through seismic diagnosis and retrofitting. It requires the research and development on the seismic diagnosis and retrofitting technology, development of technical standards for retrofitting and the national policy and concrete measures for promotion.

(5) Emergency response

Natural events, such as earthquakes and typhoons, could cause wide area disaster and human loss, which may be beyond the disaster management capacity of a single LGU. In order to respond to the wide area disaster rapidly and efficiently, it is necessary to establish a national strategic disaster prevention base, including a stockpile of search and rescue equipment and relief materials and the secure spaces for the gathering and distributing of material and personnel.

It is also a big issue for large cities, like Metro Manila, to secure the rapid and smooth transport of materials and personnel for search and rescue and relief activities in the case of a large scale earthquake disaster. Traffic congestion occurs frequently in Metro Manila. It would also have a high possibility of traffic difficulty due to road blockage by the debris of damaged buildings. There is yet

neither plan to configure the emergency road network nor the traffic regulation in case of an emergency in Metro Manila.

A large scale earthquake disaster may require a variety of assistance activities for affected people. For the efficient implementation of assistance, it is important to rapidly collect the information on building damage, infrastructure and lifeline damage and the number of injured. However, on the other hand, it may take time to figure out the whole picture of the disaster in the case of a large scale disaster. It may cause delay in the preparation for search and rescue and relief activities relying on the initial incomplete damage information. Therefore, a national damage information sharing system, including rapid damage estimation, is necessary.

3.7.5 Directions of Future Cooperation

The directions for future cooperation for earthquake disaster risk reduction is considered based on the Priority for Action of SFDRR: (1) understanding disaster risk, (2) strengthening disaster risk governance to manage disaster risk, (3) investing in disaster risk reduction for resilience, and (4) enhancing disaster preparedness for an effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction, and the situation of the Philippines and the past accomplishment of JICA cooperation.

(1) Implementation of seismic risk assessment

- Review and update 2004 JICA MMEIRS results considering the change of social conditions
- Implementation of risk assessment for major cities like Cebu and Davao

(2) Strengthening seismic performance of important public buildings and facilities

- Implementation of seismic diagnosis for schools, hospitals, government buildings, city halls, bridges, etc. and formulation of master plans and prioritizing and promoting for seismic retrofitting and reconstruction.

(3) Formulation and implementation of earthquake disaster risk reduction and management plan

- Creation of a seismic countermeasure policy with emphasizing prevention/mitigation and revision of LDRRMP, including strengthening of seismic performance of buildings, widening of roads and promotion of relocation, etc.
- Review on the implementation status of MMEIRS recommendations and the implementation of the recommended priority actions.
- Short-, medium- and long- term plans for the strengthening of building construction governance, including the creation of regulations and capacity building at all administration levels.

(4) Strengthening of earthquake observation, analysis and utilization capacity

- Strengthening of the earthquake observation network
- Establishment of an intensity information dissemination system
- Research, investigation and information dissemination on the utilization of intensity information

3.8 Volcanic Disaster

3.8.1 Efforts of the Government of the Philippines

There are 23 active volcanoes in the Philippines. Six of them are considered most active. They are Pinatubo, Taal, Mayon, Bulusan, Kanloan and Hibok-Hibok. Pinatubo is believed being the most active and the Taal is the most dangerous. Volcano monitoring, eruption prediction and warning information dissemination are carried out by PHIVOLCS. Seven volcanoes are monitored now and six of them have manned observation stations. The observation instruments include short period seismometer, broadband seismometer, GPS, tilt meter, EDM instrument, etc. The warning information is given in five levels: Level 1: abnormal, Level 2: increasing unrest, Level 3: increasing tendency towards eruption, Level 4: hazardous eruption imminent and Level 5: hazardous eruption. The observation instrument list for each volcano is shown in Table 3.7-1.

Through interviews given to the LDRRMO of Batangas province and Tailisay municipality, it is noticed the LGU has prepared for the volcano disaster by the creation of a contingency plan and conducting evacuation drills. There is no automatic warning information transmission system and the information is transmitted now mainly by mobile phone and person to person. A big challenge is that there are about 6,000 residents living on the volcano island of Taal. Relocation is encouraged but difficult to realize because of the selection of a relocation destination and employment after relocation. It is also rumored that the people relocated after the 1991 Pinatubo eruption returned to their original place of residence.

Table 3.8.1 Location of Volcano Observation Instrument

	Taal	Mayon	Bulusan	Kanloan	Hibok-Hibok	Pinatubo	Parker Matutum
BB seismometer	6	3	5	3		2	1
SP seismometer	3		6	3	3	1	2
GPS	7	1	4	5			
EDM instrument	1	1					
Tilt meter		1					
Infrasonic sensors	1	1					
Magnetometer	1						
CO_2 flux sensors	1						
Air and water temperature	1						
Self-potential probes	1						
pH meter	1		1				
resistivity meter	1						

3.8.2 JICA's Cooperation

The cooperation project of JICA for volcano disaster mitigation was carried out mainly for Pinatubo lahar countermeasures and strengthening of volcano observation by grant and loan. The details of the projects are as below.

- The study on flood and mudflow control for Sacobia-Bamban Abacan River draining from Mt. Pinatubo (1992 - 1994)
- Pinatubo hazard urgent mitigation project (I、1996 - 2001；II、1999 - 2004；III、2007 - 2014)
- The study on sabo and flood control for western river basins of Mount Pinatubo (2002-2003)
- The Study of Mayon volcano sabo and flood control project (1978 - 1983)
- The study on comprehensive disaster prevention around Mayon Volcano (1998 - 2000)
- The Project for Evacuation Shelter Construction in Disaster Vulnerable Areas in Province of Albay (2011 - 2014)
- The Project for Improvement of Earthquake and Volcano Monitoring System (Phase 1, 1999 - 2000; Phase 2, 2000 - 2004)
- Enhancement of Earthquake and Volcano Monitoring and Effective Utilization of Disaster Mitigation Information Project (SATREPS, 2010 - 2015)

3.8.3 Other Donor's Cooperation

PHIVOLCS has a technology exchange with USGS and USGS dispatched an expert to the Philippines during the 1991 Pinatubo eruption. The Earth's Observatory of Singapore (EOS) and PHIVOLCS are performing a joint study on Mayon Volcano now. The Spain International Cooperation Agency (AECID) has supported the construction and retrofitting of five schools and one public market for an evacuation center in Albay Province.

3.8.4 Identification of Gaps

The Philippines has conducted volcano monitoring over many years and reached a high level for volcano monitoring and eruption prediction. But the volcanic observation is not aligned to the same level for all volcanoes. Since each volcano has its own features, the investigation on the optimal observation for each individual volcano is required.

In order to improve the accuracy of eruption prediction for all of the volcanoes, the research results of Taal obtained from SATREPS should be extended to the other volcanoes. At the same time, the research on further improvement of eruption prediction by seismic observation in the deep ground to monitoring small earthquakes and introducing geochemistry observation is also needed.

Volcanic ash may reach a wide area. It is necessary to make the ash fall hazard map by ash fall simulation. Based on the hazard map, the effects of volcanic ash on important facilities should be assessed. The wide area disaster response capacity should be strengthened by formulating the wide area evacuation plan and with cooperation and collaboration among LGUs. The measures to prevent the potential increase of flood risk in the rivers downstream due to the flow of volcano ash, which may elevate river beds, after an eruption is also necessary.

A volcano warning information transmission system is not sufficient. The warning system is necessary not only for volcanoes but also for multi-hazards.

As a long term challenge of volcano disaster mitigation, it is necessary to establish the promotion policy to encourage the relocation of residents in high risk areas and set up non-residence areas by land use regulation.

3.8.5 Directions of Future Cooperation

The key points for volcano disaster mitigation are improvement of eruption prediction, land use regulation and an evacuation plan. The directions for the future cooperation could be the continuation of the past cooperation on the strengthening of volcano monitoring and formulation of an evacuation plan. The strengthening of volcano monitoring could be the extension of the SATREPS results of Taal and maintenance of the existing monitoring system for improvement of the eruption prediction precision for all volcanoes. The land use regulation and evacuation plan should include the ash fall simulation, a wide area contingency plan for large scale volcano eruption and capacity building for emergency response.

(1) Formulation of national policy aiming to enhance volcano measures

(2) Extension of volcano monitoring and eruption prediction improvement

- Maintenance and management of existing observation instruments
- Extension of the results of Taal to the other volcanoes for better eruption prediction

(3) Enhancement of volcano disaster mitigation

- Development of ash fall hazard map by ash fall simulation
- Measures for potential flood disaster due to ash flow and elevation of river beds
- Formulation of evacuation plan and strengthening of wide area disaster response capacity by cooperation and collaboration among LGUs.
- Strengthening of land use regulation

3.9 Gaps and Directions Matrix

The gaps and directions described in sections 3.3 to 3.8 are summarized in the matrix in the following pages.

Gaps and Directions Matrix (DRRM Governance)

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Policy / Legal framework	<u>Policy</u> • Strategic National Action Plan (SNAP) on Disaster Risk Reduction 2009-2019 • Philippines Development Plan (2011-2016) ⇒Paradigm shift from reactive to proactive DRRM and appropriate balance of measures in each thematic area to establish a sustainable and disaster-resistant society. <u>Related laws and regulations</u> • PD1566 (1978): states the formal establishment of Disaster Coordinating Councils at the National, Regional and Local levels; mainly focusing on disaster response and recovery. • RA7160 (Local Government Code of 1991, Amended Local Government Code of 1996): specifies that LGU is responsible to ensure the public safety; so that to implement DRRM measures at the local level. • RA9729 (Climate Change Act of 2009): establishes a legal and institutional framework to consolidate climate change governance. • RA10121 (Disaster Risk Reduction and Management Law of 2010) : shifts the disaster management approaches and strategies from reactive disaster emergency response to proactive risk reduction and management • 2015 : Sunset review of RA10121 and its IRR (in progress)	<Strengths> • Sunset-review of RA10121 and its IRR was conducted in 2015, five years after the enactment of the law. • Gaps related to “DRRM governance”, “Risk assessment”, “Implementation of DRRM related activities” were identified during the review, and the creation of a new DRRM Authority is now under consideration. <Gaps> • Functionality and leadership of OCD/New DRRM Authority has to be ensured. • Roles and responsibilities of each vice-chair and other organizations need to be clarified to avoid the duplication of activities and maximize capacities and initiatives. • LGUs need to be supported by NGAs to enhance DRRM capacity at the local level.	• Capacity enhancement (Human resources development) of OCD/New DRRM Authority, NGAs and LGUs ➢ Establishment and enforcement of a system/framework lead by OCD and involving all NGAs. ➢ Support of LGUs by OCD and other NGAs
Plans / Guidelines	<u>National Plans</u> • NDRRMP: sets the goals to be achieved by 2028 and identifies the activities to be implemented and responsibilities of agencies. • NDPP and NDRP : identify the roles and responsibilities of agencies towards Disaster Preparedness and Disaster Response.	<Strengths> • Concrete action plans were identified in NDRRMP and responsible agencies are working to implement these actions. • OCD and the four Vice-chairs took leadership to formulate NDPP and NDRP and facilitated the coordination between agencies by clarifying roles and responsibilities during the Disaster Preparedness and Disaster Response phases. The effectiveness of NDRP was tested and proved during real typhoon events. <Gaps> • Some activities stated in NDRRMP are behind schedule and the related agencies’ awareness and capacities including human resources towards such activities are not enough. • Implementation of activities behind schedule has to be accelerated.	• Concretization of activities, clarification of roles and responsibilities of each actor • Enhancement of DRRM awareness, capacities and formulation of directions to secure the DRRM budget. • Enhancement of OCD’s leadership and provision of technical assistance to other NGAs • Establishment of a system to accelerate the implementation of NDRRMP (monitoring and evaluation of the implementation status and budget allocation, identification and provision of needed technical assistance)
	<u>Local Plans</u> • LDRRMP : RA10121 mandates LGUs to “formulate and implement a comprehensive and integrated LDRRMP” that shall be the justification of the LDRRMF allocation.	<Strengths> • OCD is supporting the formulation of LDRRMP by creating a LDRRMP template and guidelines, conducting/supporting the DRRM summit and other campaigns addressed to LGUs. Other NGAs such as DILG and HLURB are also supporting the formulation of LDRRMPs with guidelines on DRRM mainstream in local planning. As a result of such efforts, almost all LGUs have submitted their LDRRMPs. • OCD prepared a checklist to monitor LDRRMPs’ contents and DILG is elaborating an evaluation system to improve the LDRRMPs’ quality. <Gaps> • LDRRMPs following the OCD’s template and guideline were prepared in Metro Manila, disaster prone areas (high awareness) and LGUs supported by international donors. However, the majority of the LGUs submitted their LDRRMF investment plan (one page matrix) instead of a comprehensive and integrated LDRRMP.	• Enhancement of LGUs’ DRRM awareness and human resources./Enhancement of LDRRMC’s knowledge on LDRRMF, risk assessment, local DRRM planning. • Clarification of roles and responsibilities to efficiently support LGUs • Establishment and enforcement of a system to improve the quality/contents of LDRRMPs (check of the contents, monitoring of the implementation status, identification and provision of the needed technical assistance)

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
	Guidelines • LDRRMP formulation training manual • Guidelines on the Mainstreaming of CCA and DRRM in CLUP, CDP • DRRM Training programs and modules • CBDRRM training manual • Circular on the establishment of LDRRM Offices	• Contents and activities of LDRRMPs are depending on the LGUs' awareness and knowledge and because the importance to implement pre-disaster activities is not recognized by LDRRMC's members who have to monitor LDRRMF utilization, the budget is mainly allocated to disaster response and disaster rehabilitation. • NGAs are not monitoring/cannot monitor the quality of LDRRMPs. <Strengths> • OCD, DILG, HLURB and other NGAs prepared various guidelines and manuals and are giving instructions to LGUs and other organizations on the utilization of such tools and are providing additional technical assistance if needed. <Gaps> • Guidelines and manuals were prepared but not fully used (cannot be used). • The formulation and implementation status of the plans following such guidelines are not/cannot be monitored and evaluated. ※ The reasons of the non-use of the guidelines are: ✧ Guidelines and manuals were prepared at the National agencies but not released to LGUs. ✧ LGUs' knowledge and expertise is not enough to follow the guidelines and standards consolidated by national agencies (such as risk assessment, SWOC analysis etc.) • Although the adequacy of the guidelines was tested through pilot-projects, the lessons and good practices gained through such experiences are not shared to other LGUs.	• Human resources development of LGUs and other organizations • Enhancement of OCD's leadership • Clarification of roles and responsibilities to support efficiently LGUs
Organization / Responsibilities	National level • With the enactment of RA10121, NDRRMC administrated by OCD was established to oversee the whole DRRM system of the Philippines; and four vice-chair agencies (DOST, DILG, DSWD and NEDA) were designated to oversee each thematic area (Prevention/Mitigation, Preparedness, Response, Rehabilitation/Recovery). • * Some topics were raised during the Sunset Review to designate the President as the chairman of NDRRMC and to create a new DRRM Authority under the Office of the President. • The goals to be achieved by 2028, activities to be implemented and responsible agencies were identified in NDRRMP. • The roles and responsibilities regarding Disaster Preparedness and Disaster Response were integrated and clearly written in NDPP and NDRP. • Plans to enhance the capacity of OCD were formulated.	<Strengths> • OCD and four vice chairs are overseeing the implementation of DRRM activities as mandated by RA 10121 and NDRRP. • The formulation of NDRP specifying the roles and responsibilities of each agency during disaster response is the result from an inter-organizational dialog mainly lead by DSWD and technically supported by OCD. • DILG formulated NDPP. • DOST is upgrading the observation system and risk assessment. • NEDA/OPARR gave directions and supported the LGUs affected by Typhoon Yolanda to facilitate the formulation of reconstruction and rehabilitation plans. • OCD is planning to augment personnel to ensure the office's functionality as required by RA10121. <Gaps> • NDRP for hydro-meteorological disaster was formulated and approved. NDRPs for other disasters need to be formulated/finalized and approved. • Although the roles and responsibilities of each agency were clarified, there are some duplication and missing responsibilities (for example, roles and coordination of NGAs regarding search and rescue, rehabilitation, and to promote pre-disaster investments).	• Clarification of roles and responsibilities regarding Prevention/Mitigation, Rehabilitation/Recovery • Enhancement of DRRM awareness and human resources development • Enhancement of OCD's leadership and provision of technical assistance to other NGAs, capacity-building of new officers.

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
	Local level • RDRRMCs chaired by the regional directors of OCD and overseen by four vice-chairs (regional offices of DOST, DILG, DSWD and NEDA) are appointed to coordinate, integrate, supervise and evaluate DRRM activities at the local level. • LDRRMCs chaired by the Governors or Mayors are formed at the provincial, city and municipal levels. LDRRMOs are/will be established in each province, city and municipality to set the direction, development, implementation and coordination of DRRM programs and activities.	<Strengths> • OCD and DILG issued guidelines/JMCs to accelerate the LDRRMOs' formation. Some LGUs recognized the importance of such documents and established LDRRMOs as required. • OCD prepared a checklist to monitor the establishment of LDRRMOs and DILG is developing a system to monitor DRRM activities conducted by LGUs. <Gaps> • Most of the LGUs are unable to comply with the guidelines' requirements, especially regarding the LDRRM officers' qualifications limited by the concurrent holding of positions. • Although a checklist and system to monitor the LDRRMOs' presence/absence were prepared, priorities to be set (such as capacity-building, enrollment, procurement of machinery etc.) were not discussed and an evaluation index needs to be considered.	• Enhancement of DRRM awareness and human resources development • Clarification of roles and responsibilities to efficiently support LGUs
	Private Sector, CSO(Civil Society Organizations) • Roles and responsibilities of private sector and CSOs are defined in Section 13 of RA10121.	<Strengths> • PDRF (Philippines Disaster Recovery Foundation) and other private bodies have joined NDRRMC meetings during past disasters and actively supported the national and local governments by providing needed resources such as fuel, machinery, manpower etc. <Gaps> • Private companies and CSOs guided by a spirit of volunteerism are supporting governmental activities during disaster response; but private bodies and CSOs do not participate actively during reconstruction, recovery and implementation of pre-disaster countermeasures phases that take time (There is no incentives to promote the participation of private and civil sectors?).	• Clarification and definition of the private sector's role in each thematic area. • Enhancement of DRRM awareness and human resources development
	Women's participation /gender • RA7192 (Women in Nation- Building Act) was enacted in 1992.	<Strengths> • Around 20% of the BFP officers are women who have the same tasks as men. (In Japan, the percentage of women in fire section is around 2.4%) • Dep Ed, DILG and DSWD prepared an evacuation center operation guideline in which some specific considerations on women and children are written. <Gaps> • Difficulties to prove gender inequality in DRRM sector because of the lack of data (various sources but low reliability) • The participation of women in the planning process of DRRM activities is low at the local and community levels. • Many specific issues such as the relief goods have to be considered.	• Collection, analysis and evaluation of data to determine/illustrate the gender inequality • Enhancement of DRRM awareness and human resources development at the national and local levels

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Prevention and Mitigation	<u>Enhancement of DRRM literacy</u> • Various programs to study and share the newest knowledge on DRRM are conducted in UP, other universities, institutes and centers. • DRRM curriculum and degree were developed by DepEd and CHED.	<Strengths> • Programs to integrate DRRM in the general education are actively considered and conducted. • The public DRRM awareness is promoted through CBDRRM programs. <Gaps> • Need of human resources development to implement the new modules/need to train the teachers. • The knowledge of private universities and institutes recognized by the international society is not approved officially in the Philippines.	• Human resources development, formulation of training programs • Platform establishment to share and optimize the knowledge of universities and institutes.
	<u>Consideration of Risk assessment in the planning process</u> • PAGASA, PHIVOLCS, MGB, DPWH, DOST (Project NOAH) etc. are preparing disaster risk maps. • Maps are generally prepared based on the 1/50,000 scale topographic maps. DOST is cooperating with UP to prepare 1/10,000 scale flood maps for the eighteen major river basins. • Instruction to reflect risk assessment results in LDRRMPs are given to LGUs though OCD's guidelines.	<Strengths> • Technical agencies are preparing maps based on their expertise and are cooperating with universities and donors to upgrade and cover the whole nation. • Technical agencies are providing assistance to LGUs to help the integration of risk assessment results in LDRRMPs, CLUPs and CDPs. • Through the "One Nation, One Map" project, NAMRIA is sharing the formulated risk maps on the Web/uniform management <Gaps> • There is no map in some areas and no uniform rules to define the meaning and methodology of the maps, so that LGUs are not able to understand and use such tools in DRRM planning and conduct efficient DRRM activities. • Different bodies are preparing flood and rain-induced hazard maps by using different methods and base maps; and are planning to distribute these maps to barangays. • There are not enough resources (expertise, fund etc.) to prepare and update the maps at the local level.	• Clarification of roles and responsibilities to conduct efficient and nationwide risk assessment • Capacity enhancement of technical agencies (Risk assessment, impacts of climate change) • Capacity enhancement of LGUs (Use of risk assessment to plan DRRM activities, human resources development) • Establishment of organizational protocol to secure the conduct of risk assessment reflecting the local situation; and to maintain/improve the quality of risk assessment. • Establishment of a system to promote the conduct of risk assessment (monitoring, guidelines and manual, budget allocation) • Distribution of maps to barangays and communities and manuals on how to use such tools.
	<u>Structural / Non-structural countermeasures</u> • DPWH implemented and is continuing to build structures against flood, landslide and volcano disasters. • Regarding earthquakes, the Design Guidelines, Criteria and Standards, Building Code are under revision. Checklists were prepared to assess critical infrastructures and buildings (such as bridges, governmental building, hospitals, schools etc.) by DPWH, DepED, DOH and some structures were reinforced. • Some river improvement works were/are designed based on the consideration of Climate Change impacts and events exceeding the design level.	<Strengths> • DPWH and donors implemented flood countermeasures in important cities, major river basins and areas affected by disasters. • With the support of various donors, earthquake countermeasures were established in Metro Manila and the assessment of critical infrastructures is starting. To enhance safety in the whole nation, structural guidelines, standards and Code are/will be revised and upgraded. • PAGASA and PHIVOLCS established early warning systems in important cities, major river basins and areas affected by disasters. Some LGUs developed local early warning systems with the support of various donors. <Gaps> • Because of no clear and concrete policy, nor for goal and priorities on disaster Prevention/Mitigation at the national level, the support from donors and implementation of countermeasures are limited to specific areas. • Because the importance of structural countermeasures is not highly recognized, the capacity enhancement to plan, design and implement such work is not a high priority. • Project design and implementation are not always reflecting the results of risk assessment. • The assessment of critical structures against multi-hazards has to be conducted.	• Formulation of directions and plans to implement and promote Prevention/Mitigation programs • Assessment/analysis of the (good) effect of structural countermeasures and advocacy. • Assessment and reinforcement of critical infrastructures against multi-hazards. • Capacity enhancement (planning, design, implementation) • Formulation of guidelines (Evaluation of seismic capacity, countermeasures) • Capacity enhancement of LGUs (Planning, human resources development) • Enhancement of OCD's leadership and provision of technical assistance to other NGAs

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Preparedness	<u>Human resources development:</u> • DRRM-TI was established by OCD; modules, training programs addressed to national and local DRRM officers were created and some training sessions were already conducted. • Training programs for LGUs (LCEs) are also conducted by DILG-LGA. • DRRM degree was integrated in some universities. • Resilience Institute at the University of the Philippines for Disaster Risk Reduction and Management was officially established as of July 2016, both for policy research and for training (1319th meeting of UP Board of Regents). • OCD issued a guideline to conduct CBDRRM in the whole nation; and OCD, DILG, DSWD and other organizations are conducting CBDRRM training sessions by following this guideline. NGAs such as DTI-PEZA (BCP formulation), NHA (housing provision to low-income households), DOT (impacts of disaster to touristic sites and protection), and BFP (capacity enhancement) expressed their willingness to implement DRRM activities.	<Strengths> • DRRM-TI was established as stated in RA10121 and capacity enhancement programs of DRRM officers, including the LGU level, were prepared. Although there is no training center and no management system yet, some training sessions such as PDNA training were conducted. • DILG-LGA is actively conducting training to LGUs' officers including DRRM training. • OCD issued a guideline to provide a standard CBDRRM training. <Gaps> ● DRRM-TI is not fully functioning and the courses required by RA10121 cannot be conducted. ● Although their willingness, some NGAs and LGUs do not have enough capacity (human resources, materials, funds) to implement DRRM activities. ● Various organizations are providing DRRM training but DRRM-TI/OCD is not informed about the contents, participants and level of such training.	• Establishment of DRRM-TI management system and acceleration of actions to ensure the full functionality of DRRM-TI. • Clarification of roles and responsibilities (DRRM-TI, LGA, UP etc.) • Enhancement of OCD's leadership and provision of technical assistance to other NGAs • Formulation of guidelines (BCP etc.)
	<u>Coordination</u> • DRRM plans and programs were formulated resulting from multi-stakeholders. • NDPP is defining the roles and responsibilities of each agency towards implementing disaster preparedness programs. • OCD, DILG and technical agencies (MGB, PHIVOLCS, PAGASA etc.) are supporting LGUs to formulate LDRRMPs.	<Strengths> • The formulation of DRRM plans (MDRRMPs etc.) and programs is facilitated by the strong leadership of responsible agencies and active participation of related agencies. • Various NGAs are supporting the formulation of LDRRMPs. <Gaps> • Plans are formulated with the active participation of various stakeholders but are not implemented. • NGAs are not coordinating to support LGUs and capacities are not enough.	• Enhancement of OCD's leadership/strengthen coordination between NGAs • Enhancement of DRRM awareness and capacities (human resources, expertise etc.)
	<u>Database development</u> • Various agencies developed different database. ● OCD developed an IMS database to record past disasters damage, resources and status of DRRM training.	<Strengths> • Agencies are managing databases independently and there was/is a plan to designate DOST-ICTO as responsible agency to conduct unified management of the various databases (but there is no progress). <Gaps> • Some databases need to be updated to maintain/improve the quality. • The past disaster damage records are not used to formulate policies and, the existing databases cannot be fully used to help the coordination between the first responders during disaster response.	• Capacity enhancement (Database Management and use) • Enhancement of OCD's leadership (Data Sharing) • Promotion of pre-disaster investment through the formulation of "White paper on Disaster prevention" (as one example of databases' utilization)

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Response	<u>Coordination</u> • NDRP for Hydro-meteorological disasters in which the roles and responsibilities of each agency were identified was prepared by DSWD. Work to finalize NDRP for earthquakes are under progress and NDRP for other disasters are planned to be formulated. • NDRRMC and TMG members are regularly convened during disaster to exchange information and facilitate disaster operations. • PDRF and CSOs joined NDRRMC meetings during the past disasters to provide support. • OCD is preparing a guideline to coordinate international humanitarian assistance activities. • BFP in charge of search and rescue is planning to enhance capacities.	<Strengths> • Because the nation was hit by Yolanda during the NDRP preparation, disaster response awareness was raised and an effective/realistic NDRP was formulated. OCD supported DSWD as a coordinating body and this experience can be recognized as a good practice of organizational structure coordinated/chaired by OCD. • During recent disasters after Yolanda, NDRRMC meetings were held and member agencies acted as mandated in NDRP. Disaster operations were led by NDRRMC and the dependence on donors was lower than what it used to be before the formulation of NDRP. <Gaps> • Only NDRP for hydro-meteorological disasters was formulated. • Test of NDRP is needed to evaluate the adequacy and effectiveness of the plan. • The coordination with international donors and the private sector need to be improved. • Regarding search and rescue, BFP does not have enough capacities (human resources, materials and funds) to implement a strategic deployment plan and the lessons learned at the ”scene” are not effectively shared and optimized. Regarding emergency medical services, LGUs, BFP and DOH are providing different services and a control system including human resources development is needed to sustain the effectiveness of each operation. • The information dissemination system has to be improved to provide timely and clear disaster information to people.	• Formulation of NDRP for other hazards and local DRP • Conduct of training sessions based on NDRP and evaluation of NDRP • Capacity enhancement and coordination strengthening (including response and management skills of BFP and other NGAs) • Promotion of the participation of the private sector and strengthening of coordination. • Improvement of the information dissemination system
Rehabilitation and Recovery	<u>Coordination</u> • PDNA led by OCD and involving various organizations are conducted in the aftermath of disasters. To instruct stakeholders on PDNA, OCD is providing some training programs. • OPARR was formed during Yolanda and affected LGUs were instructed to formulate recovery and rehabilitation plans. <u>Consideration on risk assessment and Build Back Better (BBB)</u> • PPA and NEA considered the concept of Build Back Better to repair/reconstruct facilities damaged by Bohol earthquake and Typhoon Yolanda (PPA considered the liquefaction and settlement of the ground to re-build “resistant” port facilities affected by Bohol earthquake and NEA advised Electricity Company to elevate their equipment based on the experience of Yolanda) <u>Lessons learned from disaster</u> • Actions were taken to sustain the memory of Yolanda such as the “Survival Stories” collected and distributed by Dep Ed.	<Strengths> • The importance of PDNA as an activity to accelerate the recovery and rehabilitation process is highly recognized and guidelines and training programs on PDNA were issued. • Activities reflecting the concept of BBB were implemented after the Bohol earthquake and Typhoon Yolanda <Gaps> • Although initiatives to strengthen the coordination during the reconstruction and recovery phases were considered, activities are not smoothly implemented. • Coordination with donors, CSOs, private sector has to be strengthened to avoid unbalanced assistance. • MGB and other technical agencies are mandated to conduct risk assessment of the re-housing land provided by LGUs but the results of risk assessment are not always reflected (and re-housing is conducted in risk prone areas).	• Formulation of reconstruction and rehabilitation directions and plans/clarification of roles and responsibilities • Formulation of reconstruction and rehabilitation guidelines (including concept of BBB and good practices) • Enhancement of OCD’s leadership and provision of technical assistance to other NGAs • Capacity Enhancement of LGUs.
Budget	• RA10121 mandates LGUs to allocate at least 5% of their yearly budget for disaster risk reduction and management as LDRRMF and LDRRMF shall cover the 30% lump-sum allocation for Quick Response Fund (QRF) and 70% allocation for the implementation of pre-disaster countermeasures.	<Strengths> • Because “Projects and activities to be charged against LDRRMF shall be incorporated in the LDRRMP”, the majority of the LGUs formulated an LDRRMP. <Gaps> • NDRRMF is mainly used for the rehabilitation from large scale disasters such as the Typhoon Yolanda disaster. • Because of the budget limitation, low-income LGUs are usually allocating LDRRMF for disaster response, not for pre-disaster measures. The utilization of LDRRMF is low and measures to enhance appropriate expenditure of LDRRMF are not considered, so that LDRRMF is still mainly used to cover rehabilitation efforts.	• Capacity enhancement of LGUs (Enhancement of awareness and human resources development) • Establishment of a system to improve the quality of plans (check of the contents, monitoring of the implementation status) • Capacity enhancement of related agencies (budget allocation, risk assessment, support to LGUs)

Gaps and Directions Matrix (Disaster Risk Finance and Insurance)

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Philippine Central Government	<u>Catastrophe risk model for DRFI (DOF / World Bank)</u> • Philippines Catastrophe Risk Model (developed by AIR Worldwide) is implemented in 2014.	<Strengths> • The Philippines Catastrophe Risk Model (PCRM) is a probabilistic model used to establish the basis of disaster risk finance and insurance. <Gaps> • The coverage of PCRM is limited to earthquakes, disasters generated by typhoons such as winds and floods caused by excessive rainfall and river floods risk cannot be assessed. • Public and private assets are evaluated through PCRM. However because of the fast change of assets in highly growing countries such as the Philippines, the exposure data should be updated to ensure the accuracy of the analysis.	• The majority of the information required to develop an in-house catastrophe model are owned by each relevant agency, and considerations on the integration of these various data have to be conducted. • Improvement and coverage extension of PCRM is needed.
	<u>Funds for disaster recovery (DOF / World Bank)</u> • Catastrophe Deferred Drawdown Option (CAT DDO II), the new credit line following “a state of calamity” declared by the President. is signed in January 2016 (USD 500M) • Issuing Catastrophe Bonds (CAT BOND) has been discussed (September 2016) but not yet implemented and the discussions grounded to a halt as of June 2016.	<Strengths> • CAT DDO II includes projects to enhance the technical and financial capacities of the government to reduce disaster risk and manage fiscal impacts of natural disasters, being an integral part of the government’s DRFI strategy • Credit line is a complement to NDRRM Funds and LDRRM Funds <Gaps> • CAT DDO I and SECURE were consumed after the declaration of State of Calamity by the national government in 2014 • Only CAT DDO II signed in April 2016 is still available. • GOP has made extensive efforts in DRRM and similar works are needed to cope with the demands for response and recovery funds in the aftermath of the disaster.	• In the point of view of disaster magnitude and damage impacts, the current CAT DDO II may not be enough. • CAT DDO II includes various measures focusing on risk reduction and financial capacity enhancement. While most of the actions are conducted by the national government and agencies, incentive mechanisms to encourage LGUs to follow the same trend may be necessary. (need further review)
	<u>Disaster Risk Reduction and Management Funds (DRRM Funds)</u> • National Disaster Risk Reduction and Management Fund (NDRRMF) • is funded through annual allocations from the national budget. USD 115M in 2011 and USD 174M in 2012 • Local Disaster Risk Reduction and Management Fund (LDRRMF) • Quick Response Fund (QRF) • The amount of the allocated funds set aside for the payment of pre-disaster costs including insurance premiums has been increasing.	<Strengths> • The central government sets up DRRM funds to cope with the needs of emergency funds in a disaster. • The allocation of national funds to NDRRM has been increased. • Not less than 5% of the estimated revenue of the LGU is allocated as LDRMMF. • 30% of this is for Quick Response Fund (QRF) to be used as standby fund for disaster recovery and rehabilitation. The 70% is for pre-disaster activities (prevention, mitigation and preparedness) including insurance premiums. • Unexpended funds accrued to a special trust fund to support disaster reduction for the following five years. <Gaps> • Note that not all LGUs would allocate an amount for insurance, especially the 3rd to 6th class LGUs considering the very minimal amount of their LDRRMF. These LGUs would rather use the 70% to pre-position relief goods, medicines and life-saving equipment.	• Review if the funds are spent for disaster prevention and mitigation. A mechanism that enables the fund to be applied to insurance premium.

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Public Agencies	<u>Insurance for Public Assets (GSIS)</u> • Laws/regulations in Philippines mandate that the insurance of public assets be introduced by GSIS. Public Private Partnership projects that the assets will be transferred to the government are also included.	<Strengths> • Insurance of public assets is mainly provided by GSIS through the general insurance fund. This is a compulsory insurance scheme to indemnify or compensate the government for any damage to, or loss of, its properties due to fire, earthquake, storm, flood or other casualty. <Gaps> • While this is a compulsory insurance scheme, the public assets are often uninsured or underinsured. • Insurance claims may be adjusted due to a co-insurance clause when the particular policy is underinsured when the damage has occurred. Underinsurance leads to a lesser payment than expected by the insured. • Inadequate awareness by the insured to the insurance and no mandatory mechanism to implement valuation are issues to be addressed.	• Establishment of a mechanism to increase awareness regarding the insurance • Set on mandatory requirements to assess the insured property by the insured every three to five years. • Conduct nationwide inventory analysis if the property is insured per the relevant Act. • Establishment of an incentive mechanism to enhance pre-disaster investment on disaster prevention and mitigation measures such as a risk based premium scheme and BBB premium.
	<u>JICA /National Electrification Administration (NEA)</u> • Data Collection Survey on the Incentive Mechanism for Improving Disaster Resiliency of Electric Power Distribution Network <u>IFC /National Electrification Administration (NEA)</u> • IFC is ready to finalize an index-base insurance program for electrical distribution network retained by ECs. A proposed insurance scheme is already in place, but is on halt to propose due to transition of the government.	<Strengths> • As evidenced by Typhoon Yolanda, the distribution network is the most vulnerable facility in the power sector as it is located outside. Power disruption causes a delay in recovery from disasters. • Hardening of the electrical distribution network system as well as capacity enhancement of EC are necessary. Therefore, mechanism for investment is necessary. • An insurance scheme that will secure cost of restoration of the damaged facility is also required. A proposed index-base insurance scheme of IFC should be implemented. <Gaps> • Many of the local ECs are financially vulnerable. Further review and study for an effective scheme to enhance investment of system hardening of the facilities are necessary.	• Implementation of a pilot scheme for incentive mechanism on investment on the resiliency of the distribution network.
Local government units	<u>Joint catastrophe risk insurance for LGUs (DOF / GSIS / World Bank)</u> • The scheme uses a parametric insurance for prompt payment. A pilot program is to start on May 2016.	<Strengths> • A parametric catastrophe risk insurance program to be led by GSIS with assistance from the World Bank. The concept of the scheme is to establish direct access to LGU for the overseas insurance market. • LGU may be allowed to apply PSF (People Survival Fund) for premium payment up to 50%. <Gaps> • The current pilot program is likely to start in six LGUs. It is required to increase the number of LGUs in the program for more stable operations. • River floods are not covered	• The objective of the program is to introduce to LGUs a direct access to insurance market for immediate funding needed after disasters. Therefore, a combination with a conventional insurance scheme is necessary for complete recovery from disasters.
Cities	<u>Catastrophe risk insurance program for large cities (DOF / IC / PIRA)</u> • Parametric Insurance program for Davao and Marikina is under preparation	<Strengths> • It is still on the way to implementation.	
Households	<u>Residential Catastrophe Insurance Pool (DOF / IC / PIRA)</u> • Insurance scheme of housing to be mandatory required for mortgage loan. • Covered perils are typhoon (with typhoon generated flood) and EQ, and the covered property is small houses made of RC.	<Strengths> • In order to cope with emergency cash needs, while loss payment is indemnity based but it is featuring an emergency partial payment triggered by a pre-agreed index. • The program is an insurance pool actively led by a private sector / PIRA. <Gaps> • An executive order was not signed by the former administration. Currently not firm schedule is set to implementation.	• The reason for not approved should be identified, and it is critical to push to issue an executive order in the new administration.

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
The poor	<u>Emergency income support program after a disaster</u> • Emergency income support program for the victims by a disaster utilizing existing CCT (Conditional Cash Transfer) scheme. <u>Micro Insurance for households</u> • Micro Insurance for households	<Strengths> • CCT program was an effective tool as a platform to delivery emergency cash to the victims after the Typhoon Yolanda. • In order to further utilize the CCT program for an efficient mechanism as an emergency income support. This is listed as B4 of result indicators of the World Bank CAT DDOII. <Strengths> • At the household level, a study to develop micro-insurance was conducted by ADB and JFPR (Japan Fund for Poverty Reduction). • IC is strengthening the regulatory framework and developing frameworks to introduce other products like micro-agri, micro-health, and micro-preneed. GIZ is also involved to develop the framework. <Gaps> • IC needs support on Micro-insurance. This division was only established last year and parametric insurance is just being developed	• Co-working with private insurers for Micro Insurance system
Agriculture	<u>Crop Insurance – PCIC</u> • Crop insurance is introduced by PCIC. A total of 1.117 million farmers are now insured (10% of the total number of farmers) • One hundred percent of the premium is subsidized by the government since 2013. <u>Weather Index based Crop Insurance</u> • Weather Index-Based Insurance (WIBI) 2011- 2017, under ILO and UNDP for rice • Weather Index-Based Crop Insurance (WIBCI) under Philippines Climate Change Adaptation Program (PhilCCAP) for rice and corn. Pilot-testing is ongoing.	<Strengths> • One hundred percent is subsidized by the government since 2013. • Government allocation: 2013-P1B, 2014-P1B, 2015-P1.3B, 2016-P1.6B • P1 Billion subsidy can only cover about 600,000 farmers • According to a study done by NEDA, the government allocation should be increased to P8-10 Billion if they want to cover all registered farmers. <Gaps> • 100% of the premium is currently subsidized by the government, and requires increasing the budget for subsidies to 500% of the current budget. • The insurance program is heavily dependent on government support but the continuance of this support is not certain. <Strengths> • The coverage of the current WIBI pilot projects is limited to excessive rain and drought, and therefore, the premium is cheap. • While all of the current projects are “pilot projects”, PCIC is interested in the further development of WIBI programs as a less cost of claim adjustment although there are constraints to be addressed. <Gaps> • One of the constraints is the coverage of “Automatic Weather Data stations”. Another concern in WIBI is the correlation between index and real damage.	• A review of the insurance program based on the subsidy plan in the future is required. A review of target farmers to be included in the program is also suggested. • Several issues to successfully implement this insurance scheme is clearly described in the SEARCA study-Implementation Issues in Weather Index-Based Insurance In Agricultural Crop Production in the Philippines • The current pilot program should be transferred to a permanent program. It is necessary to develop an expansion plan of coverage of the automatic weather stations.

Gaps and Directions Matrix (Flood and Sediment Disaster / Meteorological Phenomenon)

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Policy / Legal Framework	<u>(Basic Code for Flood Control)</u> • PD 1067: Water Code of the Philippines (1976); PD 1067_IRR (2005) The Code specifies that DPWH is the implementing agency for flood control projects. The Code is being revised. <u>(Flood Control by LGU)</u> • PD 477 (1974) • RA 7160: Local Government Code of 1991; RA 8185: Amended Local Government Code (1996) • RA 10121: DRRM (Disaster Risk Reduction and Management) Act (2010) These codes/acts specify that the LGU is basically the implementing agency for DRRM including flood control. <u>(Integrated River Basin Management)</u> • EO (Executive Order) No. 510-2006 and No. 816-2009 • RBCO was established under DENR. RBCO works on flood control projects of DPWH/LGU as a part of river basin management. <u>(Climate Change Mitigation and Adaptation)</u> • RA 9729: Climate Change Act (CCAct), (2009) • RA 10174: People's Survival Fund (2009) • EO No. 43-2011 (2011) • These acts/Executive Order specify that the impacts of climate change are considered in DRRM including flood control. <u>(Capacity Development for Forecasting: Establishment of DOST-NOAH and Strengthening of PAGASA)</u> • PD 78: Establishment of PAGASA (1972); PD 1149: Regulated jurisdiction of PAGASA (1977) • President's Call for Project NOAH (2012) • RA 10692: PAGASA Modernization Act (2015) The national capacity to strengthen forecasting is promoted. <u>(Others: Project Implementation, Structural Code and Building Code)</u> • RA 9184: Government Procurement Reform Act (2003) • NSCP: National Structural Code of the Philippines, 2015 Edition (under revision) • NBCP: National Building Code of the Philippines (under revision) • Acceleration of implementation and improvement of structural standard/guideline for flood control	<Strengths> • Policies and legal frameworks are developed in conformity with the international trend of water- related issues. ■ Formulation by RBCO of integrated river basin management and development M/P for Major River Basins ■ Consideration of climate change adaption for flood control projects ■ Preparation by DPWH of various manuals/guidelines for flood control projects ■ Promotion of capacity development for forecasting < Gaps > <u>LGU</u> • LGUs have no technical and financial capacity to implement flood control projects even although LGUs are required to work on DRRM including flood control. ■ Very few LGUs formulate a flood control plan and/or drainage plan. ■ Drainage M/P and F/S are formulated and prepared by some big cities, like Davao. ■ LDRRMF (Local Disaster Risk Reduction and Management Fund) is not enough for fundamental flood/sediment control projects. <u>River Basin Management, Climate Change</u> • River management agency is not clarified by law. • Implementation agency for sediment disaster is not clear. ■ Thus, the main action for sediment disaster is not disaster preparedness but disaster response, rehabilitation and recovery. • DPWH's flood control plan is not clearly specified by DENR-RBCO in the integrated river basin management and development plan ■ NEDA occasionally points out the low relevance to the river basin management plan of RBCO during the application for project implementation. <u>Flood Forecasting and Warning</u> • Transfer of all information on flood/sediment disaster to PAGASA is not assured and no law/act has been developed. ■ PAGASA could not issue the correct alert level because the transfer of hydrological data of dam/weir by the related agencies is not assured. • There is no law/act to regulate observation facilities for forecasting and warning ■ Hydro-Met observation facilities/system differ depending on the agency or project ◆ Difficult data arrangement ◆ Difficult system unification [for instance, 4 EWS (Early Warning System) in Pasig-Marikina River Basin]	• New Guideline to clarify Roles and Responsibilities of River Basin Management related to Agencies ➢ Clarification of Roles and Responsibilities on the Implementation of Flood and Sediment Control Projects ◆ Ways to implement Prevention/Mitigation Projects for Major River Basins, Principal River Basins, Other Rivers, Drainage, Slope Protection Works ➢ Preparation of Executive Order/Department Order or equivalent order(s) that all related data for EWS are automatically related to PAGASA. ➢ Preparation of Act/Guideline for Weather Monitoring, Warning/Alert, Equipment Qualification for Weather Monitoring, Division of Duties and Penalty Provision • Harmonization between Flood Control Plan and River Basin Development Plan ➢ Guideline for the Formulation of River Basin Management Plan including Flood Control Measures with Clarification of Duties of Agencies Concerned ➢ Clarification of Responsibilities of LGUs and LGU Supporting System by NGAs <u>Programs and Projects to Solve Issues in line with Challenge</u> (Activities-1) • Program for the Establishment of a Flood and Sediment Disaster Control/Mitigation Group (Group shall be established under Prevention/Mitigation TMG of the NDRRMC) The Group shall discuss the following agenda: ➢ Review of Laws/Acts and Guidelines related to Flood/Sediment Disasters ➢ Clarification and Confirmation of Roles and Responsibilities of Agencies ➢ Standardization of Weather and Disaster Monitoring with Periodical Verification System Etc.
Plans / Guidelines / Standards	<u>(National Level: Plan and Guideline/Standard/Criteria)</u> • Philippine Medium-Term Development Plan (2011-2016) • Watershed protection for flood risk mitigation and efficient/adequate development of infrastructure to become major policies. <u>(Department/Local Level: Plan and Guideline/Standard/Criteria)</u> • DPWH: Design Guidelines, Criteria and Standards (DGCS) (1980's) • DPWH: 2011 Memorandum: River basin Area >40km2: 50-Year Return Period (YRP); <40km2: 25 YRP • DPWH: New DGCS, 2016 Edition Design flood scale is decided based on the risk assessment and/or formulation of M/P. In the absence of risk assessment or M/P, the following design flood scales are suggested as protection levels. ■ River basin >40km^2: 100YRP; <40km^2: 50YRP; Drainage: 15YRP (for culvert: 25YRP) • DENR-RBCO: M/P of Major River Basins Integrated river basin management and development M/P at sixteen major river basins have been formulated • DPWH (FCSEC): Various manuals for flood control (17 types) (2002~2010) • DPWH: Standard Specifications for Public Works and Highways, Volume II, Highways, Bridges and Airports, 2012 Edition • DPWH Cost Estimate Manual: (Utilization for projects of DPWH) • PAGASA: Public Storm Warning Signals (PSWS) and Revised PSWS (2015)		

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Organization / Responsibilities	• NDRRMC/OCD: Leading DRRM • LGU: Establishment of LDRRMC and LDRRMO for LGU • CCC: Policy-making, national climate change mitigation and adaptation • DPWH: Flood control project centered on Major River Basins • DPWH: Organized IWRM section • DOST: Implementation of Project NOAH • DOST-PAGASA: Flood Forecasting and Warning System (FFWS) for Major River Basins and establishment of River Office • LGUs: FFWS by LGU (Formulation of CBFFWS) • DENR-RBCO (River Basin Control Office): River basin management by River Basin Council (RBC) at each river basin and formulation of integrated river basin management and development M/P • NWRB: The highest organization for the formulation of water resources management plans in the Philippines • DENR-MGB: Preparation of Susceptibility Map for flood/sediment disaster • DENR-NAMRIA: Coordination of hazard/risk map, calculation of astronomical tide level and observation of tide level (Promotion of One Nation One Map) • NEDA: Main agency for rehabilitation and recovery	< Strengths > <u>Organization</u> • Establishment of RBCO/RBC ■ Formulation of Major River Basin M/P • Establishment of CCC • Establishment of Project NOAH ■ Preparation of Hazard Map ■ Installation of hydrological observation station • Establishment of PAGASA River Center • Capacity development for implementation of flood control projects of DPWH Regional Office (Tagoloan River and CDO River in Region X) • Integrated section for planning and implementation of flood control in DPWH (Establishment of UPMO) ■ Flood control projects by DPWH: Pasig-Marikina River, Laoag River, Iloilo River, VOM • DPWH: Organized IWRM Section • Capacity Development of NDRRMC/OCD ■ Development of a hazard map of flood/sediment disaster in 28 provinces by READY Project < Gaps > <u>Cooperation among Related Agencies</u> • Data and/or plan of flood/sediment disaster are not shared among NWRB, CCC, DPWH, LGU, DOST-ASTI/NOAH, DENR-RBCO/EMB/MGB, etc. <u>LGU</u> • LGUs have no technical and financial capacity to implement flood control projects even though LGUs are required to work on DRRM including flood control. ■ Very few LGUs formulate a flood control plan and/or drainage plan. ■ Drainage M/P and F/S are formulated and prepared by some big cities, like Davao. ■ LDRRMF (Local Disaster Risk Reduction and Management Fund) is not enough for fundamental flood/sediment control project <u>PAGASA</u> • Capacity development for the personnel of the River Center is needed but it takes time. • It takes more time for each River Center to formulate a flood control model <u>DPWH</u> • Regional/District offices have no technical capacity to formulate flood control plans even though they are increasing their skills to implement flood control projects. • DPWH head office has no capacity to formulate flood control plans for all small/medium sized rivers simultaneously. • There are few dependable local consultants.	• Place-making for Discussion and Presentation of Plans for Flood and Sediment Disaster Control ➢ Clarification of Roles and Responsibilities for Implementation of Flood and Sediment Control Projects ◆ Ways to implement Prevention/Mitigation Projects for Major River Basins, Principal River Basins, Other Rivers, Drainage, Slope Protection Works ➢ Preparation of Executive Order/Department Order or equivalent order(s) that all data related to EWS are automatically related to PAGASA. • Preparation of Guidelines for Flood and Sediment Disaster Prevention/Mitigation Projects geared toward LGUs which can formulate the plan and implement the projects. • Enhancement of Staff of PAGASA ➢ Capacity Enhancement of Staff of River Centers ➢ Formulation by each River Center of EWS Standards including H-Q Chart and designated Water Levels at each important point with flood simulation models • Enhancement of DPWH Regional/District offices • Supporting System for LGUs in terms of Flood and Sediment Control Measures ➢ Strengthening of Capacity of DPWH Regional/District offices and LGUs to formulate and implement Flood Control Projects for most of the Principal River Basins. <u>Programs and Projects to Solve Issues in line with Challenge</u> (Program-1) • Program for the Establishment of a Flood and Sediment Disaster Control/Mitigation Group (Group shall be established under Prevention/Mitigation TMG of the NDRRMC) (Program-2) • Capacity Enhancement Program of LGUs for Flood and Sediment Control Measures (DPWH) ➢ Preparation of Guidelines and Manuals ➢ Actual Drainage Improvement Plan by Pilot LGU(s) ➢ Dissemination of Guidelines and Manuals to other LGUs ➢ Creation of Dissemination and Training Action Plan (Program-3) • Capacity Enhancement Program for River Centers of PAGASA (Program-4) • Capacity Development Program for DPWH Regional/District offices

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Structural Measures for Flood Control (Planning, Implementation and O&M)	(Planning and Implementation of Flood Control) • Implementation of flood control projects at high priority and/or flood prone areas of Major/Principal River Basins and small/medium sized rivers Flood Control Project (Completed/Ongoing) (Major River Basin) ■ Agusan: Phase I & II ■ Pampanga: Phase I, II, III with Angat Dam and Pantabangan Dam ■ Agno: Phase I, IIA, IIB with Ambuklao Dam and Binga Dam ■ Pasig-Marikina: Phase I (D/D), II, III, West Mangahan with NHCS and Mangahan FW ■ Tagoloan: Left Bank ■ Etc. (Principal River Basin) ■ Laoag: River Training with 5 sabo dams, Spur Dikes ■ Iloilo/Jaro: Stage 1 with Jaro FW ■ Ormoc: Phase I and II ■ Pinatubo: Phase I and II (Drainage) ■ Metro Manila: 10 P/Ss ■ KAMANAVA: Gates / P/Ss / Ring Dike ■ VOM Flood Control (under Preparation) ■ Pasig-Marikina: Phase IV, Marikina Dam (F/S, D/D) ■ CDO (D/D, Construction) ■ Mindanao River (D/D) ■ Etc. • Update of flood design scale based on Memorandum of DPWH Secretary and DGCS 2016 Edition. Major and Principal River Basin (River Basin Area > 40km^2): 50 or 100-year return period; Major and Principal River Basin (River Basin Area < 40km^2): 25 or 50-year return period; and Other Drainage: 15 or 25-year return period.	< Strengths > Budget increase • Budget of DPWH and PAGASA have sharply increased recently Flood Control Project • Flood control projects with a design flood scale of 10 to 50-year return periods have been implemented at 17% of flood prone areas as of 2014 (Source: Annual Report in 2014) • Design flood scale in Ormoc and Iloilo (Jaro) is 50 and 20-year return period, respectively. Implementation has been completed and the effect achieved. • DPWH-UPMO/FCSEC prioritizes the following flood control projects: Prioritization by DPWH-UPMO/FCSEC Priority-1. Pursuing Completion of Current Flood Control Projects (Pasig-Marikina III, FRIMP, VOM, etc.) Priority-1. Establishment of Database for Appropriate O&M and Selection of Priority Projects Priority-2. Continuous Implementation of Flood Control Projects * Pasig-Marikina River, including Dam/Retarding Basins (RBs) * Pampanga River including San Antonio/Candaba RBs * Rivers in Cavite including RBs Priority-2. Conduct of M/Ps for 7 Major River Basins out of 18 * Davao, Agus, Buayan-Mlngn, Abulog, Tagum-Lbgnn, Abra, Jalaur, Ilog-Hilabangan Priority-2. Drainage Improvement in Major Cities (Such as Cebu) Priority-2. Improvement of New Flood Control Projects for Major River Basins * Such as Mindanao, Panay and Ilog-Hilabangan rivers and others Priority-3. Flood Control of Principal Rivers < Gaps > Flood Control Measures • Flood/sediment disasters frequently occur along each river due to long stretches of unimproved river and recent large-scale typhoons even though flood control projects are promoted. • There is a great difference in the design flood scale between Memorandum of DPWH Secretary/DGCS 2016 Edition and under-planning flood control projects. • Explanation on the prioritization of flood control projects to stakeholders is difficult because the evaluation of each project's priority is not clear. • Few local consultants formulate flood control plans. • Hydro/Met observation facilities have not been fully developed to appropriately conduct flood control projects. O&M • Status/plan of a flood control project is not accurately grasped and shared within DPWH. ■ Inventory survey results for river structures are not shared in DPWH ■ Some river structures constructed by DEOs are demolished by UPMO projects within several years after completion. • LGU does not appropriately conduct O&M for river structures, or refuses a handover from DPWH Budget Expenditure • Individual agencies, particularly DPWH, could not expend the increased/approved budget	• Review of Prioritization of Flood Control appropriate for Risk (Review of JICA-DPWH Study in 2008) ➢ 120 river basins were selected by poverty, population, run-off ratio, disaster record, etc. ➢ Then, 56 river basins are selected as high priority river basin by B/C estimation. ➢ However, the selection/screening needs to be updated using the latest flood disaster record and asset evaluation ◆ Some of the eighteen major river basins have no flood control plan formulated ➢ Updating M/P and F/S, and implementing flood control project at the high risk river basin. ◆ Project evaluation system is formulated so that DPWH can adequately explain the flood control project. • Review of Flood Control Scale according to Guidelines and Actual Conditions ➢ Discussion of policy for flood control project (Prevention/ Mitigation activity) by GOP ➢ Build-up local consultant to support the flood control plan of DPWH • Appropriate O&M Activities for Flood Control Facilities mainly by DPWH ➢ Development of asset management system for flood control to continue effective and comprehensive O&M activity • Establishment of Support System of Flood Mitigation to LGU by DPWH Programs and Projects to Solve Issues in line with Challenge (Program-2) • Capacity Enhancement Program of LGUs for Flood and Sediment Control Measures (DPWH) (Program-4) • Capacity Development Program for DPWH Regional/District offices (Program-5) • Prioritized River Basin Flood Control Program (DPWH) ➢ Study on Prioritization of Flood Control Projects ➢ Formulation of M/Ps for Prioritized River Basins ➢ Implementation of Continuous/New Flood Control Projects for Prioritized River Basins (Program-6) Program for Establishing an Asset Management System for Implementation of Flood Control Projects and Appropriate O&M Activities (DPWH)
	[Operation and Maintenance (O&M)] • O&M for river structure is conducted by DPWH and LGUs (by MMDA in Metro Manila) • Inventory survey of river structures which is paper-based is irregularly conducted by DPWH "Geotagging" for river structure is promoted to grasp the location of the existing structures in accordance with D.O. 65, 2014: Enhanced Project Monitoring		
	(Budgetary Provision) DPWH • Budget amount has sharply increased recently ■ Budget amount for flood control project increased by about 3.4 times from 11.3 Billion Pesos (BP) in 2011 to 38.0 BP in 2016. ■ Budget for flood control project is about 10% of the total budget of DPWH • Rate of budget expenditure has recently reduced ■ The amount of Obligation (28.0 BP) is about 65% of amount of Allotment (43.2 BP) in 2015		

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Non-Structural Measures (FFWS, Hydro-Met Observation)	[Flood Forecasting and Warning System (FFWS)] DOST-PAGASA • FWS have been formulated in five river basins ■ Flood Forecasting and Warning System for Dam Operation (FFWSDO) have been formulated for five dams (Angat, Pantabangan, Ambuklao-Binga, San Roque and Magat). ■ The existing equipment/facilities in Cagayan River Basin will be rehabilitated due to aging. • FWS in thirteen of the eighteen major river basins, excluding the above five river basins, shall be formulated • Law on the Modernization of PAGASA was enacted in 2015 ■ Implementing Rules and Regulations (IRR) for PAGASA modernization is being prepared. The modernization is aimed for completion within three years DOST-NOAH • Installation of rain/water gauges (Approximately 1,800 locations) Formulation of a flood forecasting system (Hydrological and Meteorological Observation) DOST-PAGASA • 10 Doppler radars are operated. PAGASA will add 5 Doppler radars. • 58 Synoptic Station are installed nationwide. • 67 manual rain gauge stations and 104 automatic rain gauge stations are installed nationwide • 73 Automatic Weather Station (AWS) were installed from 2007 to 2011 • Weather forecast by the Weather Research & Forecasting (WRF) model and Global Spectral Model (GSM) DOST-NOAH Installation of automatic hydrological observing devices (Approximately 1,800 sets as of January 2016) (Observation Data of Tide level) Observation of tide level by NAMRIA (Hazard/Risk Map) • Preparation by Ready Project of hazard maps in 28 provinces Preparation by Project-NOAH of hazard maps in flood prone areas of the eighteen major river basins (Budgetary Provision) DOST-PAGASA Budget for modernization of PAGASA including increasing personnel is being requested from DBM	< Strengths > Capacity Development for Weather Prediction • Entire Philippine area is almost covered by ten existing Doppler radars and five additional ones. • Rainfall observing density is 200 km2 per equipment when including the rain gauges installed by Project NOAH in addition to PAGASA's rain gauges. • The capacity development program for the PAGASA Central and Southern Luzon region in cooperation with JICA is carried out. Capacity Development for Flood Forecasting and Warning • Establishment of River Centers for eighteen major river basins is ongoing to enhance the flood forecasting capacity of the basins. Preparation of Hazard Map • Flood risk hazard maps for disaster-prone 28 provinces (READY Project) • Hazard map for low-lying areas in eighteen major river basins (Project-NOAH) Budget Increase • PAGASA's budget is increasing dramatically. < Gaps > Weather Prediction • The accuracy of numerical prediction is low. • The capacity development activities are not progressing except in the PAGASA Central and Southern Luzon regions. • PAGASA's current weather information is sometimes criticized for its difficulty. Flood Forecasting and Warning • The number of water level gauges is not sufficient to conduct hydraulic study, flood management planning and flood observation. • The equipment and system are not unified and are different according to the agencies' projects. ■ Equipment for FFWS is not installed at proper locations ■ The accuracy of observed data differs widely according to equipment, which makes the data arrangement difficult. ■ The system is not integrated. (Co-existence of four kinds of EWS in Pasig-Marikina River Basin, etc.) • Capacity development plans for PAGASA's Regional River Centers have not been discussed in detail although the Centers are being established. • Development of flood analysis models to be taken by each River Center takes a long time. • Development of flood forecasting and warning systems in principal river basins is not progressing. (CBEWS is hardly developed except a few river basins established by foreign donors.) Gaps in Hazard/Risk Assessment • The preparation of hazard maps in principal river basins is not progressing. • Future utilization of hazard maps is not discussed. • There are some hazard maps whose information is not accurate. On the other hand, the preparation of an accurate hazard map is costly and takes time. ■ The measured data and mapped data are not accurate due to land subsidence along the coast line. ■ Updating of the base map to make it more accurate is necessary.	Weather Prediction • Improvement of accuracy of weather prediction to contribute to the issuance of weather forecasting and warning which are quantitative and reflect variation by area. ➢ Further capacity enhancement of PAGASA staff members to extend the current activities to the entire Philippines. ◆ (Output of the ongoing TA should be confirmed) Flood Forecasting and Warning • Installation of additional hydrological observation facilities to contribute to the proper issuance of flood/sediment disaster forecasts and warnings • Utilization of satellite data for areas where the installation of a ground observation network is difficult like Mindanao • Capacity enhancement of PAGASA River Centers to contribute to proper issuance of flood/sediment disaster forecasting and warning ➢ Capacity Enhancement of PAGASA staff members. ➢ Development of flood analysis models that contributes to accurate flood forecasting and warning. ➢ Facilitation of Development of CBEWS in principal rivers. ◆ Preparation of guidelines which help LGUs properly develop CBEWS in their community. • Preparation of guidelines regarding weather observation, prediction, warning and verification of instruments. Hazard / Risk Assessment • Standardization of the preparation of hazard maps. • Utilization of hazard maps for the development of CBEWS and CLUP by LGU as well as its harmonization with flood mitigation projects conducted by DPWH/LGU. Programs and Projects to Solve Issues in line with Challenge (Program-2) • Capacity Development Program for Flood and Sediment Risk Management for LGUs ➢ Establishment by PAGASA of Guidelines and Manuals Regarding O&M, Observation and Risk Management of Weather Observation Instrument for LGU (Program-3) • Capacity Enhancement Program for River Centers of PAGASA ➢ Standardization of Hydrological Monitoring Activities of LGUs ➢ Enhancement of FFWS Activities and Preparation/Upgrading of Hazard Maps ➢ Enhancement of Flood Simulation Modeling for Primary Rivers (Introduction of RRI, IFAS, etc.) (Program-7) • Project for Enhancing Capacity on Weather Observation, Forecasting and Warning (Phase II) (PAGASA) ➢ Development and Enhancement of Numerical Weather Prediction Model • Further Installation of Meteorological Radar(s)

Gaps and Directions Matrix (Coastal Disaster)

<table>
<tr><th>Item</th><th>Efforts undertaken by the Government of the Philippines</th><th>Strengths and Gaps</th><th>Directions for improvement</th></tr>
<tr><td>Policy / Legal Framework</td><td>(Basic concept)
• PD1067:Water Code of the Philippines (1976) and its IRR (execution rule(2005))
• This law mandates LGUs to implement Coastal disaster prevention work
(Coastal management by LGU)
• RA 7160 Local Government Code of 1991, RA8185 : Revision of Local Government Code(1996)
• RA10121 DRRM Law(2010)
• Through these laws, LGUs are responsible to ensure the public safety against coastal disasters
(Climate change adaptation)
• RA9729 Climate Change Act(CC Act)(2009)
• RA10174 People’s Survival Fund(2009)
• EO No.43-2011(2011)
• These laws and order specify the integration of Climate Change issues in DRRM planning
(Improvement of observation, forecast and warning system)
• PD 78: Establishment of PAGASA(1972)PD1149: prescribes the jurisdiction of PAGASA (1977)
• President’s Call for Project NOAH(2012): launches project NOAH
• RA10692: PAGASA Modernization ACT(2015)
• These law, decree and President’s call identify the need to improve the observation, forecast and warning system against natural disasters
(Others)
• RA9184 : Government Procurement Reform Act(2003)
NSCP: National Structural Code of the Philippines, 2015 Edition (Under revision)
• These laws specify the requirements, projects implementation rules including coastal works</td><td rowspan="2">< Strengths >
• Policy and Legal system for disaster prevention reflecting the international trend were established.
• The need to improve the observation, forecast and warning system is recognized and some measures are under implementation.

< Gaps >
National
• Need to enhance the awareness against coastal disasters, clarify the roles and responsibilities related to coastal prevention structures and management.
■ The technical capacity of NGAs is not enough to answer LGU’s requests related to the construction of Coastal disaster prevention infrastructures.

Local
• LGUs do not have enough technical capacity to plan, design and construct coastal infrastructures.
■ LDRRMF is not enough to manage coastal disaster prevention and tsunami disaster management projects.

Coastal management / Climate Change
• The roles and responsibilities of NGAs are not clear.
• The technical and engineering knowledge on coastal disasters and countermeasures are not enough to implement prevention measures.
■ Consequently, the weight of post-disaster measures is high.

Observation / Forecasting / Warning
• Legal system or framework has to be established to enforce the transmission of tsunami and storm surge information to PAGASA.
• The coastal observation system has to be improved to enable forecast and analysis on coastal phenomena.
• There is no agency or organization responsible for wave observation.</td><td rowspan="2">• Clarification of roles and responsibilities of NGAs and LGUs
➢ Need to clarify the roles of national and local governments for coastal management/disaster prevention projects.
➢ Need to form an agency or organization responsible of wave and other data observation and of the uniform management of such data/establishment of a platform or network to share information.
➢ Clarification of the roles and responsibilities to elaborate technical know-how on coastal management planning and implementation of structures.
➢ Clarification of roles and responsibilities of LGUs and designation of NGAs to provide technical support to LGUs.

Activity Plan or Program/Project to solve the subject
(Activity Plan-1)
• Clarification of roles and responsibilities of NGAs for coastal disaster management.

(Activity plan-2)
• Revision and upgrade of DPWH technical standards on coastal facilities.
• Preparation of a manual or guideline for the planning of coastal (disaster) management.</td></tr>
<tr><td>Plan and Guideline</td><td>(Design Guidelines)
• Through the revision of the Design Guidelines, Criteria and Standards (DGCS) by DPWH in 2015, chapters on coastal structures and climate change considerations were added
(Plan)
• There is no plan to implement coastal protection measures and planning guideline at both the national and local levels.</td></tr>
</table>

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Organization / Responsibilities	• NDRRMC/OCD: oversees the whole DRRM framework of the Philippines • LGUs: are responsible to implement DRRM measures • CCC: formulates the country's policy for Climate Change • DPWH: implements coastal protection facilities to prevent coastal roads damage • DOST and PHIVOLCS: established and are strengthening coastal, tsunami observation and forecast systems. • DENR-MGB: is preparing shoreline-erosion and sediment maps • DENR-NAMRIA: prepared digital topographic/bathymetric maps and tide observation and is preparing a tide prediction table (propulsion of "One Nation One Map") • NEDA: gave directions to the LGUs affected by Yolanda to formulate Disaster Recovery and Reconstruction Plans	< Strengths > <u>Organization</u> • Establishment of CCC • Launch of Project NOAH ■ Hazard Map preparation < Gaps > <u>National</u> • Recognition of the necessity of coastal disaster prevention/coastal management and set lead agency ■ There is no national agency amended to answer to LGU's requests related to coastal disaster prevention. • Although DPWH added Coastal Facilities in DGCS, some upgrades are needed. <u>Local</u> • LGUs do not have enough technical capacity to implement coastal disaster prevention measures. LGUs, however, do not have sufficient technical potential. ■ LDRRMF has insufficient capability to comprehensively manage coastal disaster prevention/tsunami disaster management projects	• Establishment of a national body responsible for Coastal Disaster Prevention ➢ Need to clarify the roles of national and local governments for coastal management/disaster prevention projects. ◆ Establish a system to support LGUs with significant shoreline erosion problems. • Need to enhance the technical capacity of the officers in charge of coastal management/disaster protection project at the national and local level.
Structural Countermeasure (Plan, Implementation)	(Planning and implementation of coastal disaster prevention facilities) • Design of the coastal dike in Leyte Island after Typhoon Yolanda. (Structure is not constructed yet)	< Strengths > • DPWH was assigned to implement the Coastal Dike after Yolanda • DPWH added the Part of Coastal facility to the Technical Standards. < Gaps > • Although DPWH added Coastal Facilities in DGCS, some upgrades are needed.	<u>Activity Plan or Program/Project to solve the subject</u> (Activity Plan-1) • Carrying out of coastal disaster prevention/management project including survey, planning, design, implementation, tracing in order to recognize the necessity of coastal management. ➢ Selection of the target area/severe shoreline erosion ➢ Preparation of Coastal Management Master Plan ➢ Design and construction of facilities ➢ Monitoring and evaluation of the effectiveness of the project and advocacy. ➢ Capacity building through OJT • Cooperation with the educational sector such as UP (to enhance awareness and knowledge on coastal engineering in Philippines)
Non-Structural Countermeasure (Warning Observation)	(Warning system) <u>DOST-PAGASA:</u> Diffuses warnings referring to the Project NOAH's Prediction <u>DOST-NOAH:</u> established a forecast system for floods caused by storm surge etc. <u>DOST-PHIVOLCS:</u> is establishing real-time tsunami observation system, Tsunami Hazard Map and Tsunami Simulation Database (Tide data) Tide observation and preparation of a tide table by NAMRIA	< Strengths > <u>Improvement of tsunami observation</u> • 35 tsunami gauges were installed to cover the whole of the Philippines. <u>Improvement of tsunami prediction</u> • The system which is able to predict the tsunami disaster area within one minute after the first tsunami wave observation based on the real time tsunami observation network and tsunami simulation database is now under processing. <u>Preparation of Hazard Map</u> • Preparation of Tsunami Hazard Maps < Gaps > <u>Installation of wave observation network</u> • Wave observation system/network not limited to tsunami has to be installed in coastal areas	<u>Activity Plan or Program/Project to solve the subject</u> (Activity Plan-1) • Establishment of a wave observation network ➢ Designation of NGA responsible for wave observation and clarification of roles and responsibilities ➢ Installation of wave gauge, data collection and analysis.

Gaps and Directions Matrix (Earthquake / Volcanic Disaster)

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
Policy / Legal Framework / Standards	• National Building Code of the Philippines (NBCP), PD1096 • National Structural Code of Philippines (NSCP) • Bridge Seismic Design Specifications : Development with the cooperation of JICA in 2013 (waiting for approval) • Predecessor of PHIVOLCS was established by Republic Act No.766 in 1952 to monitor Hibok-Hibok volcano. The current PHIVOLCS was formed in 1987	< Strengths > • Laws and technical standards for seismic design are provided • Laws and technical standards are revised/under revision to enhance safety • Earthquake and volcano observation, analysis and early warning are being performed by PHIVOLCS < Gaps > • Low seismic resistant buildings exist in both newly constructed and old ones • There is no clear national policy and target for earthquake and volcano DRRM	• Legal framework and technical guidelines for the promotion of seismic diagnosis and seismic retrofitting. • National policy and target for earthquake and volcano DRRM, including observation, structural and non-structural measures.
Plans / Guidelines	• NDRRMP and LDRRMPs are formulated.	< Strengths > • DRRM plans were developed in both national and local levels. < Gaps > • The majority of the LDRRMPs are only short-term plans mainly focusing on emergency response.	• Formulation of a long-term comprehensive DRRM plan (priority to mega cities and urban areas).
Organization/ Responsibility	• NDRRMC/OCD: Leading role for DRRM • LGU: Design review and building permission of buildings • PHIVOLCS: Earthquake and volcano observation, risk assessment and early warning of seismic and volcano hazard • NAMRIA: National land survey and mapping, GPS observation • MGB: Geological mapping • UP: Research on design of buildings and civil structures • DepEd: Seismic strengthening of public school buildings, disaster prevention education • DOH: Seismic strengthening of public hospital buildings DPWH: Seismic strengthening of public buildings	< Strengths > • Earthquake and volcano observation, analysis and early warning are being performed by PHIVOLCS • The revision of building code and structure standard are being conducted by the collaboration of DOST, UP, DPWH, etc. < Gaps > • The capacity of LGUs are not enough for the planning and implementation of DRRM for earthquakes and volcanoes • The knowledge and technical skills of local constructors regarding seismic resistant designs and constructing methods are not enough.	• Establishment of national educational and training system for strengthening the LGU's capability for design review and construction inspection (through LGA) • Establishment of an educational and training system to improve local contractor's technical skills (through TESDA). • Development of standard design drawings and construction manual for small and non-engineered buildings to improve their technical skills.
Seismic countermeasure (observation, risk assessment, DRRM plan, seismic retrofitting and emergency response)	(Earthquake observation) • Earthquake observation, analysis and information dissemination are conducted by PHIVOLCS. The earthquake observation network is as follows at the end of 2014. • Short period seismometer, accelerometer:36 (Off-line), 39 (On-line) • Broad band seismometer:18 (On-line) • Intensity meter:More than 400 (including to be installed) (Risk assessment) • MMDA:Seismic risk assessment of Metro Manila (MMEIRS, JICA) • OCD, HIVOLCS、PAGASA、NAMRIA、MGB : Multi-hazard mapping for earthquake, tsunami, flood and landslide (READY, UNDP & AusAID) • PHIVOLCS:Software for seismic risk assessment (REDAS, AusAID) • PHIVOLCS:Risk assessment for earthquake, flood and typhoon (GMMA RAP, Geoscience Australia)	< Strengths > • Basic earthquake observation network was established (short period seismometer, broad band seismometer and accelerometer covers the whole country • Analysis on earthquake parameters (location, magnitude) and analysis time is being continuously improved. • Intensity observation network was launched and is used for rapid damage information collection after an earthquake. < Gaps > • Many faults are active but the current observation network is not enough to get detailed information. • The data intensity observation is at its preliminary stage and the information has not been connected to the activities of emergency response < Strengths > • Damage estimation of buildings, infrastructure, lifeline and human loss for Metro Manila with scenario earthquakes was conducted (MMEIRS) • Multi-hazards map were prepared for 28 provinces (READY) • Estimations of building damage, human and economic loss are ready to be conducted through REDAS. • Human and economic losses in Metro Manila caused by earthquake, flood and typhoon were estimated (GMMA RAP)	• Continuous improvement of seismic observation instruments and strengthening maintenance and operation system. • Development of an intensity information dissemination system. • Research and investigation on the utilization of intensity information. • Update the risk assessment results of MMEIRS and check the implementation status of its recommendations. • Seismic risk assessment for the other mega cities.

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
		< Gaps > • More than ten years have elapsed after MMEIRS and there is no monitoring on the implementation of the recommendations. Makati city is proactive for DRRM, and has a budget, but has difficulties for implementation. • The mega cities, except Metro Manila, do not have detailed and comprehensive risk assessment like MMEIRS. • Building inventory for risk assessment is not prepared nationwide.	
	(DRRM plan) • NDRRMC:Development of NDRRMP • LGUs has to formulate LDRRMPs	< Strengths > • Both central and local governments have developed their DRRMPs • DRRM activities up to 2028 and the implementation organizations are identified in NDRRMP < Gaps > • Current DRRMP has no concrete target of DRRM and monitoring mechanism for its accomplishment. • Majority of the LDRRMP are mainly short term plans focusing on emergency response. That means that LDRRMPs are not master plans and are not considering long term disaster prevention measures and budget arrangements.	• Development of a long-term DRRM master plan including concrete risk reduction targets with seismic risk assessment results as a baseline. • DRRM master plans need to set priorities to emergency response, like an emergency road network. • Development of integrated land use plans, especially in disaster prone urban areas through policies to enable land use change and redevelopment resulting in the creation of a resistant city.
	(Seismic design) ✧ <u>Seismic design regulations</u> • National Building Code of the Philippines (NBCP), PD1096 • National Structural Code of Philippines (NSCP) ✧ <u>Design review, building permission</u> • According to NBCP, the design and construction management of buildings shall be done by qualified staff. • The design review and building permission for public and private buildings are conducted by the building officials of LGU	< Strengths > ✧ <u>Seismic design code</u> • NBCP was created in 1977 and it applies to all buildings except the traditional and native buildings for their design, construction and retrofitting. NBCP stipulated the procedure for application and permission of building construction. NBCP is under revision conducted by UP with the support of WB, expected to be published within this year. • Structure design must follow NSCP, which was enacted in 1972 and the newest version (6th version) enacted in 2010. The revision of NSCP is going on now and scheduled to finish early next year. ✧ <u>Design review, building permission</u> • According to the city of Leyte, a widely used software program is adopted to conduct the seismic design of the city (the document is under review). • Most of the LGUs are reviewing the design but the review is limited to the new building permission. < Gaps > • Most of the LGUs review their designs by confirming the qualification of the designers and do not make a detailed check on the structural design due to the lack of personal and technical skills. Inspections during construction are not appropriately performed. • Many small buildings like private houses are not designed and constructed by a qualified person. • There are no national organizations responsible for building administration including policy, permission and inspection.	• Strengthening of design review and inspection system of LGUs through the capacity building of personnel and technology. The design review and inspection system by designated private organizations may be necessary. • Education and training for local contractors on the knowledge and technical skills of design and construction. • Development of standard design drawings and a construction manual for small and non-engineered buildings to improve their technical skills for design and construction. • Provisions of seismic design in loan examination to building owners. • Strengthening of the administrative guidance, corrective actions and penalty to building owners. • Establishment of a national organization for building administration including policy, permission and inspection within DPWH.

<table>
<tr><th>Item</th><th>Efforts undertaken by the Government of the Philippines</th><th>Strengths and Gaps</th><th>Directions for improvement</th></tr>
<tr><td></td><td>(Seismic retrofitting)
• The necessity of seismic diagnosis and retrofitting for existing buildings based on the new structural code is widely recognized.

(Emergency response)
• Contingency plan of LGUs
• Construction and retrofitting of the warehouse of the Philippine Red Cross supported by NZAID
• Stockpiling of food in Clark and Pampanga supported by WFP</td><td>< Strengths >
• The responsibility for seismic diagnosis and retrofitting of public schools, hospitals and public buildings are DOE, DOH and DPWH, respectively.
• PHIVOLCS has developed a simple seismic diagnosis method for concrete hollow block (CHB) house and conducted promotion activities for its application.
• DPWH is implementing strengthening the main bridges in Metro Manila with the support of JICA

< Gaps >
• Little progress in seismic retrofitting of existing buildings
• Damage to schools, hospitals and critical public buildings will result in a significant effect on the relief and recovery activities.

< Strengths >
• LGUs are performing evacuation drill based on their contingency plans.
• Incident command system (ICS) was adopted by OCD and LGU for emergency response. The training on ICS is being carried out.
• BFP and the firefighting unit of LGUs are preparing for search and rescue.
• OCD and PHIVOLCS are promoting for CBDRRM

< Gaps >
• No inter-LGUs emergency response plan has been developed to consider a large scale disaster which exceeds the capacity of one LGU.
• Not enough structural measures to secure the function of lifeline facilities, like power and water supply and tele-communication.
• Lack of nationwide rapid and efficient damage information collection and sharing system.</td><td>• National policy and administrative measures (subsidy) for the promotion of seismic diagnosis and retrofitting.
• Development of seismic diagnosis and retrofitting technology and the creation of technical guidelines.
• Priority to schools, hospitals and critical public buildings for seismic diagnosis, retrofitting and reconstruction.

• Establishment of an inter-LGUs disaster prevention base (including emergency material stockpiling, open space, etc.) and the network among the bases.
• Creation of transportation regulations during large scale disaster for mega cities.
• Set up of the emergency road network as recommended in MMEIRS and the strengthening of seismic resistance of the buildings along the road.
• Set up of the national disaster collection and sharing system.</td></tr>
<tr><td>Volcano countermeasure (early warning, evacuation and land use regulation)</td><td>(Early warning)
• Volcano monitoring, analysis and information dissemination are being conducted by PHIVOLCS
• There are 23 active volcanoes and seven of them are monitored. The six most active volcanoes Pinatubo, Taal, Mayon, Bulusan, Kanloan, Hibok-Hibok, are monitored with manned observation stations.
• Early warning information is provided in five levels according to the situation of volcano activity

Observation instruments and locations deployed
<table><tr><th></th><th>Taal</th><th>Mayon</th><th>Bulusan</th><th>Kanloan</th><th>Hibok-Hibok</th><th>Pinatubo</th><th>Parker Matutum</th></tr><tr><td>BB seismometer</td><td>6</td><td>3</td><td>5</td><td>3</td><td></td><td>2</td><td>1</td></tr><tr><td>SP seismometer</td><td>3</td><td></td><td>6</td><td>3</td><td>3</td><td>1</td><td>2</td></tr><tr><td>GPS</td><td>7</td><td>1</td><td>4</td><td>5</td><td></td><td></td><td></td></tr><tr><td>EDM instrument</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Tilt meter</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Infrasonic sensors</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Magnetometer</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO_2 flux sensors</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Air and water temperature</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Self-potential probes</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>pH meter</td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>Resistivity meter</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td><td>< Strengths >
• Volcano monitoring and eruption prediction has been operated and implemented for a long time.
• Research and investigation for Taal and Mayon performed and improved the prediction of volcanic eruptions with the cooperation of SATREPS.
• New observation instrument is verified effective for improving the precision of volcanic eruption prediction through SATREPS.

< Gaps >
• Observation for other volcanoes except for Mayon and Taal are on the way of strengthening and the observation for all active volcanoes is not at the same level.</td><td>• Make use of the results of Mayon and Taal activities and extend it to all the other active volcanoes. The continuous research and investigation on the observation system and eruption prediction technology is necessary.
• Deep seismic observation and geochemistry observation may further improve the capability of eruption prediction.</td></tr>
</table>

Item	Efforts undertaken by the Government of the Philippines	Strengths and Gaps	Directions for improvement
	(Evacuation) • According to the results of interviews, the province and municipality in the vicinity of Taal volcano have prepared contingency plans • Several kinds of hazard maps for volcano eruption have been prepared by PHIVOLCS	< Strengths > • LGUs in the vicinity of Taal volcano are conducting evacuation drills. • Six schools in Mayon were reconstructed/renovated as evacuation shelters with the support of JICA. < Gaps > • The ash fall hazard map based on simulation was not prepared. The preparedness for wide evacuation is not enough. • According to interviews, the early warning information is usually disseminated through telephone and oral transmission.	• Inter-LGUs cooperation and collaboration plan for strengthening wide area DRRM capability. • Preparation of ash fall hazard map based on simulation for all active volcanoes. • Establishment of an end-to-end disaster early warning information dissemination system.
	（Land use regulation） • PHIVOLCS has prepared several kinds of hazard map for volcano eruption	< Strengths > • LGUs recognized the high risk of the residents living near a volcano crater. < Gaps > • Many residents are living near a volcano crater, for example, 6,000 people are living near the Taal volcano crater. • People relocated after 1991 Pinatubo eruption returned to their original place.	• Land use regulation to promote the relocation of residents living in high risk areas and the policy for concrete implementation.

Chapter 4 Proposed Measures for Further Improvement of DRRM Sector in the Philippines

Measures to be undertaken for further improvement of the DRRM sector in the Philippines are proposed according to the results of a study on the present situations, existing gaps and directions for their improvement for each DRRM sector, based on the long term vision for development of the country and the international trends.

4.1 Proposal of Road Map for the DRRM Sector

(1) Targets by the Philippines and the international community

As is described in 3.2.1, the Ambisyon Natin 2040 program was launched by NEDA in March 2014, which aims to formulate the collective long-term vision of the Filipino people for themselves and for the country by 2040. USD11,000 per capita incomes and 0.6% poverty rate by 2040 are set as the targets of this vision. The vision cites three items to achieve the targets such as “Economic growth”, “Investing in people”, and “Protection against instability”, and emphasizes the importance of DRRM by citing “expenses due to natural disasters” as one of the instabilities based on the idea that economic growth is obstructed by the disasters.

As is also described in 3.3.1, NDRRMP was formulated in 2011 as the national level plan on DRRM. A total of 93 activities to achieve fourteen objectives will be implemented by 2028.

On the other hand, the international trends around the DRRM sector are described in 3.1.1. A total of seventeen sustainable development goals (SDGs) and 169 targets for 2030 were agreed in 2014, and some targets for DRRM are included in SDGs such as “build their resilience and reduce their exposure and vulnerability to disasters”. The targets related to the DRRM sector are shown in the table below.

Table 4.1.1 Targets of SDGs related to DRRM sector

No.	Contents	Target Year
1.5	Build the resilience and reduce exposure and vulnerability to disasters	2030
2.4	Ensure sustainable food production systems that strengthen capacity for adaptation to disasters	2030
11.5	Significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses caused by disasters with a focus on protecting the poor and people in vulnerable situations	2030
11.b	Substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resilience to disasters, and develop and implement, in line with SFDRR 2015-2030, holistic disaster risk management at all levels	2020
11.c	Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials	－
13.1	Take urgent actions, strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	－

In the third UN World Conference on Disaster Risk Reduction held in 2015, the Sendai Framework for Disaster Risk Reduction (SFDRR) was agreed with four Priorities for Action and seven global targets for 2030.

Table 4.1.2 Priorities for Actions and Global Targets under SFDRR

No.	Contents	Target Year
Priority for Action 1	Understanding disaster risk	-
Priority for Action 2	Strengthening disaster risk governance to manage disaster risk	-
Priority for Action 3	Investing in disaster risk reduction for resilience	-
Priority for Action 4	Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction	-
Global Target (a)	Substantially reduce global disaster mortality by 2030.	2030
Global Target (b)	Substantially reduce the number of affected people globally by 2030.	2030
Global Target (c)	Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.	2030
Global Target (d)	Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030.	2030
Global Target (e)	Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.	2020
Global Target (f)	Substantially enhance international cooperation with developing countries through adequate and sustainable support to complement their national actions for implementation of this Framework by 2030.	2030
Global Target (g)	Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments for the people by 2030.	2030

The target years in the Philippines and the international community are summarized in the figure below.

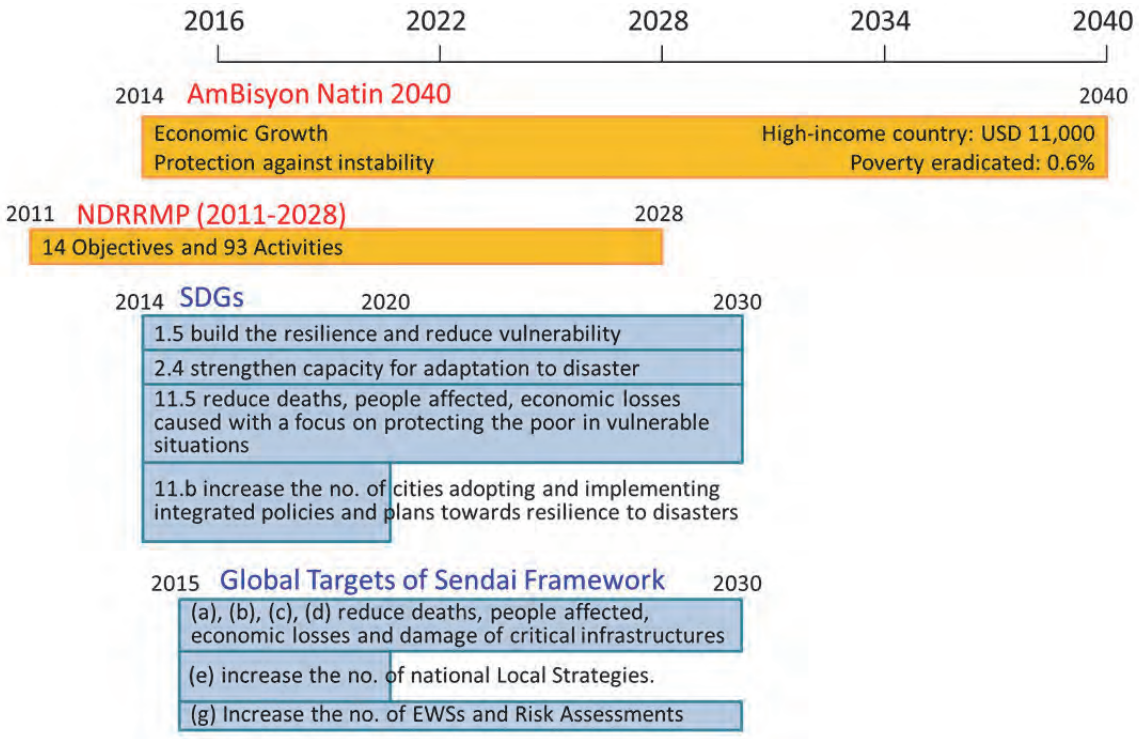


Figure 4.1.1 Target Years in the Philippines and the International Community

(2) Proposal of Road Map regarding DRRM Sector

In order to realize the "Economic growth" and "Protection against instability" set in Ambisyon Natin 2040, efforts not only for the DRRM sector but also for various other sectors are necessary. However, the "Promotion of DRRM activities" is one of the most important activities to achieve the long-term vision by 2040 since one of the major instabilities in the Philippines is "natural disasters" and "natural disasters" are the obstacles for economic growth. The implementation of DRRM activities for achieving SDGs and global targets of SFDRR by 2020-2030 will contribute to promote the SFDRR's Priorities for Action, and this means "Promotion of DRRM activities" for achieving the long-term vision by 2040.

On the other hand, the directions for improvement of each DRRM sector in the Philippines described in Chapter 3 are categorized into the following three major countermeasures to be promoted for further improvement of DRRM sector in the Philippines from the point of view of SDGs and Global Targets.

Major countermeasures to be promoted

1) Science-based risk assessment
2) Further strengthening of disaster risk governance
3) Sustained DRRM measures

Table 4.1.3 Relationship of SDGs, Global Targets and three major countermeasures

No.	Contents	Major Countermeasures
SDG 1.5	By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	Further strengthening of disaster risk governance
SDG 2.4	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen the capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	Further strengthening of disaster risk governance
SDG 11.5	By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	Sustained DRRM measures
SDG 11.b	By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the SFDRR 2015-2030, holistic disaster risk management at all levels	Further strengthening of disaster risk governance
SDG 11.c	Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials	Sustained DRRM measures
SDG 13.1	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	Further strengthening of disaster risk governance
Global Target (a) (b) (c) (d)	reduce deaths, people affected, and economic losses caused with a focus on protecting the poor in vulnerable situations	Sustained DRRM measures
Global Target (e)	increase the number of National Local Strategies	Further strengthening of disaster risk governance
Global Target (g)	Increase the number of EWSs and Risk Assessments	Science-based risk assessment

As shown in the table below, the above three major countermeasures closely correspond to SFDRR's Priorities for Action.

Table 4.1.4 Relationships of three major countermeasures and SFDRR's Priorities for Action

Major Countermeasures	SFDRR's Priorities for Action
1. Science-based risk assessment	Understand disaster risk
2. Further strengthening of risk governance	Strengthen risk governance
3. Sustained DRRM measures	Reduce disaster risk

Therefore, promotion of the above three major countermeasures corresponds to the promotion of Priorities for Action in SFDRR, and it will lead to the achievement of the long-term vision by 2040. These relationships are shown in the figure below as a road map of the DRRM sector in the Philippines.

The target years of the three major countermeasures are set as 2028 considering the target years of SDGs and Global Targets (2030), the target year of NDRRMP (2028) and the president's term. The

target year of "Sustained DRRM measures" is set as 2040, since it should be continuously conducted up to the target year of the long-term vision.

A Road Map of countermeasures for DRRM Sector in the Philippines for 2040 is proposed as follows.

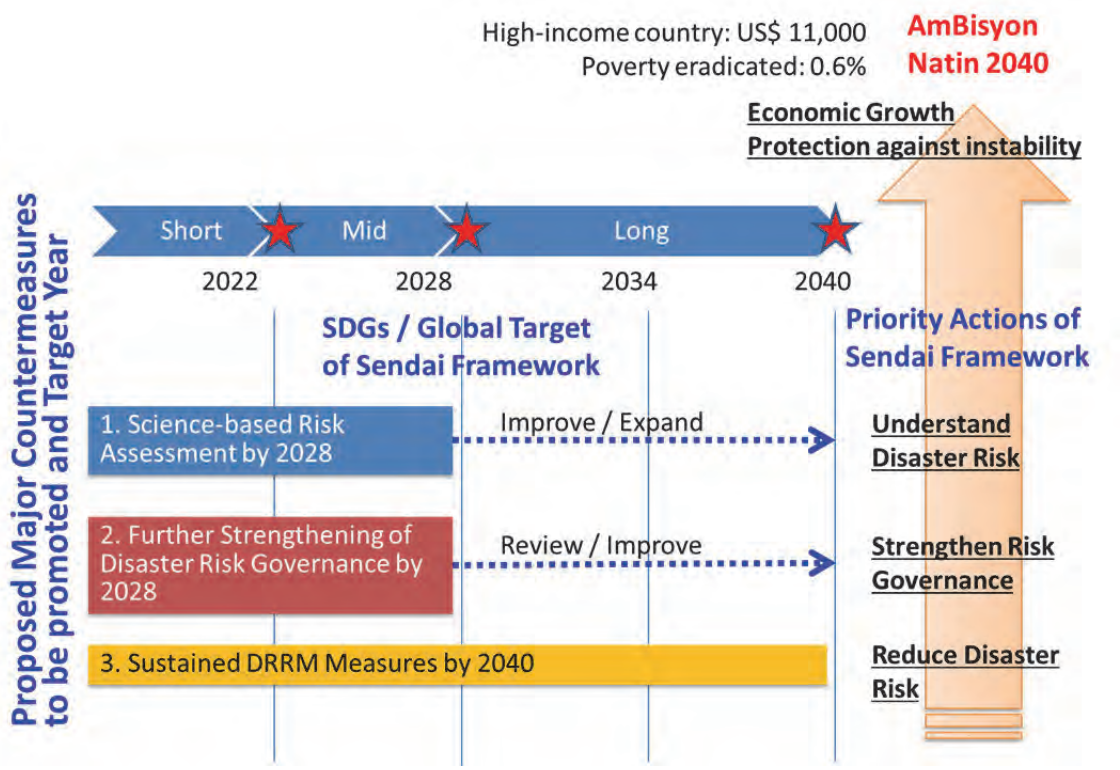


Figure 4.1.2 A Road Map of DRRM Sector for 2040 (Proposal)

4.2 Necessary Measures for Further Improvement of DRRM Sector in the Philippines

The directions for improvement of each DRRM sector described in Chapter 3 are re-organized as necessary measures to be conducted for further improvement of the DRRM sector in the Philippines according to the above three major countermeasures to be promoted.

4.2.1 Science-based Risk Assessment

Risk assessment has been conducted extensively in the Philippines. However, the methodology to conduct the risk assessment has not been shared and unified and the methodology to utilize the results of these risk assessments has not been shared yet. The degree of risk assessment is still not adequate from the points of view of areas and accuracy. The following measures are proposed.

(a) Overall DRRM

- Collection and analysis of existing risk assessments
- Standardization of methodology of risk assessment, establishment of a system to promote the implementation of risk assessment, and study and instruction of methodology for utilization of risk assessment

(b) Flood / Sediment / Coastal Disaster

- Risk assessment of priority rivers and areas (considering the effects of climate change)

(c) Earthquake / Volcanic Disaster

- Earthquake risk assessment of major cities
- Risk assessment of priority volcanoes (including risk assessment of ash fall)

4.2.2 Further Strengthening of Disaster Risk Governance

Strengthening of disaster risk governance is divided into “Policy/Institutional Improvement” and “Capacity Enhancement”.

(1) Policy / Institutional Improvement

Two major measures are proposed for policy/institutional improvement. The first one is “Preparation of national level plans” to set the detailed long-term objectives. The second is “Promotion of implementing DRRM activities” through policy and institutional improvement.

1) Preparation of national level plans

Although several national level plans have been formulated based on RA10121 and NDRRMP etc., there are still many DRRM activities which are not promoted, are overlapped and are not efficiently conducted due to unclear roles and responsibilities. Therefore, the following plans are proposed to be formulated and discussed.

(a) Overall DRRM

- Preparation of National Disaster Prevention and Mitigation Plan
- Preparation of National Disaster Rehabilitation and Reconstruction Plan
- Preparation of Disaster Response Plan at each level for each disaster

(b) Flood / Sediment / Coastal Disaster

- Harmonization between Flood Control and other related plans in terms of River Basin Management
- Recognition of importance of coastal DRRM and protection

(c) Earthquake / Volcanic Disaster

- Preparation of National Earthquake DRRM Basic Plan
- Preparation of National Volcanic DRRM Basic Plan

2) Promotion of Implementing DRRM Activities

Some DRRM activities cannot be conducted properly due to the lack of human resources, capacities, equipment and budget etc., even though the roles and responsibilities are clarified. Therefore, a policy and institutional improvement, including the detailed methodology for human resources development and securement of budget etc. is necessary. The following policy and institutional improvement activities are proposed.

(a) Overall DRRM

- Establishment of a system to promote the implementation of NDRRMP
- Establishment of a system to promote the preparation and implementation of LDRRMP
- (Establishment of methods to monitor progress and details of DRRM activities)
- Establishment of a system to promote the operation of DRRM-TI
- Strengthening of industrial, academic, and government cooperation
- Strengthening of the system of Disaster Risk Finance and Insurance (DRFI)

(b) Flood / Sediment / Coastal Disaster

- Preparation of legal framework and technical standards on coastal DRRM and protection

(c) Earthquake / Volcanic Disaster

- Strengthening of building administration on seismic diagnosis and retrofitting

(2) Further Capacity Enhancement

Two kinds of capacities have to be enhanced, the "administrative capacity" from the point of view of the overall DRRM system and "technical capacity" from the point of view of each technical organization.

1) Administrative Capacity Enhancement

The Philippines government has been promoting to enhance the administrative capacity on DRRM based on RA10121 and NDRRMP, especially for OCD. The following measures are proposed to continue the capacity enhancement.

(a) Overall DRRM

- Capacity enhancement to implement DRRMP (NGAs and LGUs)
- Capacity enhancement for disaster response (human resources) (preparation of BCP, preparation of evacuation plan, implementation of drills etc.)
- Capacity enhancement for disaster response (equipment) (equipment for BFP, special vehicles etc.)
- Capacity enhancement to implement DRFI

2) Technical Capacity Enhancement

It is necessary to enhance the technical capacity of technical organizations such as DPWH, PAGASA, PHIVOLCS and LGUs etc. to produce effective and efficient DRRM activities. The following measures are proposed.

(a) Flood / Sediment / Coastal Disaster

- Technical capacity enhancement of DPWH and LGUs on countermeasures for flood, sediment and coastal disaster.
- Capacity enhancement of PAGASA for meteorology and flood forecasting
- Improvement of monitoring system and its standardization (hydro-meteorology and wave height)

(b) Earthquake / Volcanic Disaster

- Capacity enhancement for seismic retrofitting
- Strengthening of capacity on seismic monitoring and analysis
- Strengthening of capacity on volcanic monitoring, analysis and forecasting

4.2.3 Sustained DRRM Measures

It is necessary to conduct the prevention and mitigation measures continuously in order to reduce the risk for economic growth. The following measures are proposed.

(a) Flood / Sediment / Coastal Disaster

- Implementation of flood control measures for priority river basins (promotion of comprehensive flood control/mitigation measures) (prioritization, master planning, feasibility study, implementation etc.)
- Seismic retrofitting and asset management of river structures

(b) Earthquake / Volcanic Disaster

- Preparation and implementation of Earthquake DRRM plan for major cities (including emergency response plan)
- Seismic retrofitting of structures (small to mid-sized general structures, and important public structures)
- Preparation and implementation of plans for priority volcanoes (evacuation plan, wide area DRRM plan, land use plan etc.)

The above measures for the improvement of the DRRM sector in the Philippines are summarized in the table below.

Table 4.2.1 Proposed Measures for Further Improvement of DRRM Sector in the Philippines

	Overall DRRM	Flood/Sediment/Coastal Disaster	Earthquake/Volcanic Disaster
1. Science-based Disaster Risk Assessment	**Promotion of Implementing Risk Assessment**		
	• Collection and analysis of existing result of risk assessment • Standardization of risk assessment, and establishment and utilization of promotion system of risk assessment	• Risk assessment of priority rivers (considering the effect by climate change)	• Earthquake risk assessment of major cities • Risk assessment of priority volcanos (including risk assessment of ash fall)
2. Further Strengthening of Disaster Risk Governance **2-1 Policy/ Institutional Improvement**	**Preparation of National Level Plans (Clarification of Role Allocation / Setting Targets)**		
	• Preparation of National Disaster Prevention and Mitigation Plan • Preparation of National Disaster Recovery and Reconstruction Plan • Preparation of Emergency Response Plan at each level for each disaster	• Harmonization between Flood Control and other Related Plans in terms of River Basin Management • Enhancement of recognition of importance of coastal DRRM and protection	• Preparation of National Earthquake DRRM Basic Plan • Preparation of National Volcanic DRRM Basic Plan
	Promotion of Implementing DRRM Activities (Policy/Institutional Improvement)		
	• Establishment of system to promote the implementation of NDRRMP • Establishment of system to promote the preparation and implementation of LDRRMP • Establishment of system to promote the operation of DRRM TI • Strengthening of cooperation with industry-government-university • Strengthening of system of Disaster Risk Finance and Insurance (DRFI)	• Preparation of legal framework and technical standard on coastal DRRM and protection	• Strengthening of building administration on seismic diagnosis and retrofitting
2-2 Further Capacity Enhancement	**Administrative Capacity Enhancement**	**Technical Capacity Enhancement**	
	• Capacity enhancement to implement DRRMP (NGAs and LGUs) • Capacity enhancement for disaster response (human resources) (preparation of BCP, preparation of evacuation plan, implementation of drill etc.) • Capacity enhancement for disaster response (equipment) (equipment for BFP, special vehicles etc.) • Capacity enhancement to implement DRFI	• Technical capacity enhancement of DPWH LGUs on countermeasures for flood, sediment and coastal disaster. • Capacity enhancement of PAGASA for meteorology and flood forecasting • Improvement of monitoring system and its standardization (hydro-meteorology and wave height)	• Capacity enhancement for seismic retrofitting • Strengthening of capacity on seismic monitoring and analysis • Strengthening of capacity on volcanic monitoring, analysis and forecasting
3. Sustained DRRM Measures		**Implementation of DRRM Measures**	
		• Implementation of flood control measures for priority river basins (promotion of comprehensive flood control / mitigation measures) (prioritization, MP, FS implementation etc.) • Seismic retrofitting and asset management of river structures • Establishment of DRRM System for Tsunami	• Preparation and implementation of Earthquake DRRM plan of major cities (including emergency response plan) • Seismic retrofitting of structures (small-mid general structures, important public structures) • Preparation and implementation of plans for priority volcanos (evacuation plan, wide area DRRM plan, land use plan etc.)

Chapter 5 Formulation of JICA DRRM Sector Cooperation Strategy for the Philippines

5.1 Background

Japan and the Philippines are countries highly prone to various disaster risks and have experienced many catastrophes in the past. Both countries are located in the Circum-Pacific orogenic belt. Both countries have suffered from earthquakes and volcanic activity and have experienced floods and storm surges generated by typhoons every year. Through these common experiences derived from shared geological features, both countries prioritize DRRM as an important national strategy fundamental to guarantee the safety of their peoples and the realization of sustainable development. Against this backdrop, JICA has been continuing cooperation activities for decades, to strengthen countermeasures against floods, landslides and earthquakes, and is contributing to the capacity-building and technical transfer to national and local government agencies, academic institutions, and communities.

Similarities in exposed disaster risks and accumulation of close cooperation in the DRRM sector between Japan and the Philippines have enhanced a bilateral partnership and have contributed in establishing a relationship that both sides benefit from. For example, when Japan was hit by the Great East Japan Earthquake and Tsunami in 2011, the Government of the Philippines dispatched emergency medical teams and provided relief supplies, and private groups from around the Philippines provided various types of support. When the Philippines was affected by Typhoon Yolanda in 2013, the Government of Japan undertook one of the largest oversea disaster relief operations, including dispatching Self-Defense Forces, to support rehabilitation and reconstruction efforts in the affected areas under the concept of Build-Back-Better. Moreover, the partnership between Japan and the Philippines is not limited to bilateral cooperation, but is now expanded to a multilateral sphere. Both countries actively contributed to the formulation of global frameworks such as the “Sendai Framework for Disaster Risk Reduction 2015-2030” and the “2030 Agenda for Sustainable Development”, the formulation of regional frameworks such as the “APEC DRR Framework” and the “ASEAN Agreement on Disaster Management and Emergency Response (AADMER)” by sharing DRRM knowledge and providing substantial inputs to the negotiation processes.

As outlined, the partnership between Japan and the Philippines in DRRM is evolving to a more strategic nature encompassing both bilateral and multilateral fields. Embracing this evolved strategic partnership, in formulating its “DRRM Sector Cooperation Strategy for the Philippines”, JICA outlined the two principles to guide the process as described below.

(1) The new “JICA DRRM Sector Cooperation Strategy for the Philippines” should contribute and/or support the implementation of DRRM efforts undertaken by the Government of the Philippines. JICA will fully utilize advanced proven technologies of Japan, lessons learned and

practices accumulated during the past cooperation programs/projects. Future DRRM programs/projects will be in line with measures described in Chapter 4.

(2) The new “JICA DRRM Sector Cooperation Strategy for the Philippines” will be in accordance with the Philippines Development Plan, sectoral strategies, Ambisyon Natin 2040, 10-Point Socioeconomic Agenda and with global and regional DRRM frameworks. Based on this new strategy, the enhanced partnership between Japan and the Philippines should contribute in enabling both countries to undertake leadership in the field of DRRM at the international and regional levels. Both countries will cooperate in formulating, accumulating and sharing good practices to reduce the vulnerability to realize a safe and resilient society.

5.2 JICA DRRM Sector Cooperation Strategy for the Philippines (draft)

Upon extensive discussion internally and with Philippine stakeholders, JICA formulated the following strategic framework guided by the principles mentioned above.

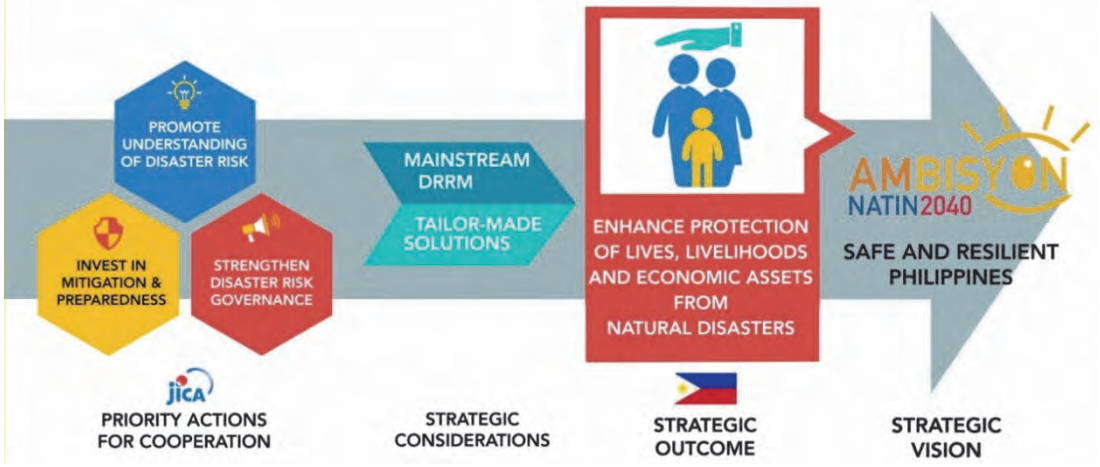


Figure 5.2.1 New JICA DRRM Sector Cooperation Strategy (draft)

<u>Strategic Vision: Safe and Resilient Philippines</u>

There are various definitions that outline the term "resilience". According to the "UNISDR Terminology on Disaster Risk Reduction (2009)", resilience is referred as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner". This can be understood that resilience is more of a capacity to recover to the same status by accepting the impact of a disaster. On the other hand, UNDP is defining resilience as a "transformative process of strengthening the capacity of people, communities and countries to anticipate, manage, recover and transform from shocks" and is including the pre-disaster preparedness and mitigation phase as well as the post disaster response phase.

JICA's cooperation aims to contribute to the establishment of a "resilient" society guided by the concept of "Build Back Better" that is not limited to recovering to the same status after disasters, but to pursue establishing a stronger society less vulnerable to disaster risks than before, and to support eradicating poverty so that sustainable development can be realized. On the other hand, considering that the pace of urbanization varies among areas in the Philippines, especially those areas where there is an aggregation of population and economic assets, "resiliency" itself will not be sufficient to protect people's livelihoods. Highly urbanized areas need to be "safe" from impacts of disasters, which require heavy investment in developing physical protection infrastructures to enhance the safety level of such areas that need to be protected. This is exactly why JICA is emphasizing the importance of investing in DRRM infrastructures in order to protect people's safety among various forms of cooperation, mindful that such initiatives are more challenging to implement. JICA's overall vision of the new cooperation strategy does not limit itself to the establishment of just a resilient society but a "safe and resilient Philippines".

The prime reason for the numerous casualties caused by the devastating 2004 Indian Ocean Earthquake and Tsunami disaster was a lack of knowledge on tsunamis. The impact of the disaster was repeatedly televised in a sensational manner, which led to the wide spread understanding that early warning systems (EWS) is the solution to save lives from disasters. As the momentum of the time was the pressing need to establish early warning systems, the outcome of the 2005 Second UNWDCRR, Hyogo Framework for Action (HFA), included "Identify, assess and monitor disaster risks and enhance early warning" and "Use knowledge, innovation and education to build a culture of safety and resilience at all levels" as priority actions, which led to increased activities to establish EWS and promote DRRM education globally.

Reflecting the fact that the international society attached too much importance to non-structural DRRM measures including EWS and DRRM education since 2005, and recognition that such measures are not sufficient to reduce disaster risks, the outcome of the 2015 Third UNWCDRR, the Sendai Framework for Disaster Risk Reduction, underlined the importance of structural infrastructures as pre-disaster investments in order to reduce risk, and the Priority for Action "Investing in disaster risk reduction for resilience" was agreed upon. It is safe to conclude that the global consensus is now to implement both structural and non-structural measures in a balanced manner. JICA's strategic vision aiming to support the establishment of "a safe and resilient Philippines" is thus not only in accordance with such global consensus but in the forefront of it.

Strategic Outcome: Enhance the protection of lives, livelihoods and economic assets from natural disasters

NEDA launched "AmBisyon Natin 2040" in March 2016, which is the long term vision of the Filipino people and the country for the next 25 years. To realize the Vision of Filipinos for their Country, three "enablers" were identified, which are "economic growth", "investment in people", and "protection against instability". By supporting the Government of the Philippines to implement DRRM measures to reduce disaster risk and impacts, JICA will contribute to the realization of a "safe and resilient Philippines" and consequently the realization of sustainable development (Figure 5.2.1). Realization of "safe and resilient Philippines" is directly connected to economic growth and people's protection against instability, and will subsequently enable achieving "AmBisyon Natin 2040". Taking into account this close correlation between DRRM and sustainable development, JICA is setting its new strategic outcome as "Enhanced protection of lives, livelihoods and economic assets from natural disasters", which is supported by three priority actions and two strategic considerations. By implementing future DRRM cooperation along these priority actions for cooperation and considerations, JICA envisions to support achieving its strategic outcome, and further its strategic vision so as for the Philippines to grasp the "AmBisyon Natin 2040".

In order to achieve "enhanced protection of lives, livelihoods and economic assets from natural disasters", the following concept as outlined in Figure 5.2.2 will be introduced to analyze disaster risks and mitigation/prevention effects of each DRRM measure. The assumption of this concept is based on the recognition that disaster risks such as an enlarged flood risk due to the climate change

cannot be fully prevented by present scientific technologies. The risk curve illustrates the relationship between the disaster scale (return period in case of flood analysis) shown on the horizontal axis, and damage (direct and indirect) shown on the vertical axis. When DRRM measures to reduce the frequency of a disaster (such as river control projects enhancing the level of protection) are implemented, the risk curve will shift to the right. And when measures to reduce the impact of disaster (such as land-use revision to reduce human and assets, land losses) are implemented, the potential damage will be reduced and inclination of the curve will be reduced. As a result of these two kinds of measures, the red curve will shift to the blue one. It is important to comprehend how a certain DRRM measure impacts the level of disaster risk in order to properly plan the optimal solution. JICA will strategically combine these two types of DRRM measures in its priority actions for cooperation and effectively achieve its strategic outcome.

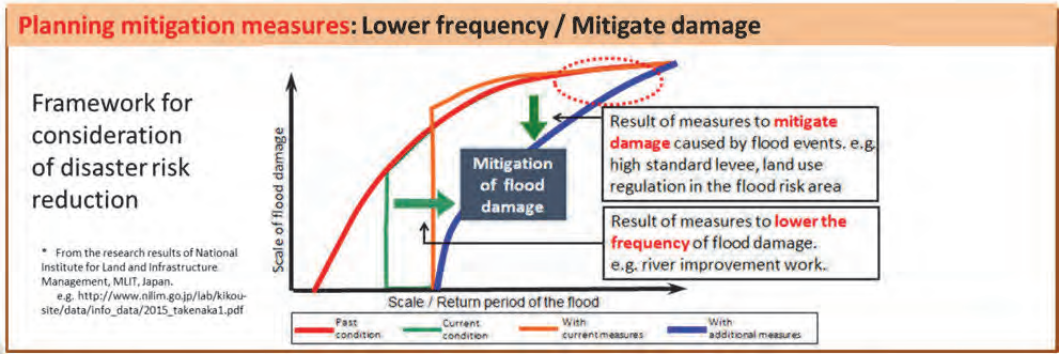


Figure 5.2.2 Risk Curve

The three priority actions for cooperation and two strategic considerations to achieve the strategic vision are outlined below.

The three priority actions were identified reflecting the analysis in Chapter 4. The following Table 5.2.1 shows the relationship between the three priority actions for cooperation and proposed major countermeasures to be promoted for improvement of the DRRM Sector in the Philippines identified in Chapter 4.

Table 5.2.1 Relationship between the three priority actions and proposed countermeasures for improvement of the DRRM Sector in the Philippines

JICA Priority Actions	Major Countermeasures to be promoted
1: Promote understanding of disaster risk	1. Science-based risk assessment
2: Strengthen disaster risk governance	2. Further strengthening of risk governance
3: Invest in Mitigation and Preparedness	3. Sustained DRRM measures

JICA Priority Action 1: Promote understanding of disaster risk

The understanding of disaster risk is the starting point to consider all of the DRRM measures. The lack of evidence or adequate science-based disaster risk assessment will cause wasteful investment and also will provoke the increase of disaster impacts by misleading DRRM measures to be implemented. As such, objective understanding of disaster risk is fundamental to consider the

optimal combination and sequence of DRRM measures and allocate adequate budget to DRRM measures from governmental national programs to community based DRRM activities.

Various agencies undertook efforts to formulate hazard or risk maps in the Philippines. However, as referred to in the Chapter 3.3, the items covered in such maps, such as disaster scale, is not standardized. Such lack of a common standard or guidelines in formulating hazard/risk maps in the Philippines resulted in various maps not being systematically shared to be fully utilized. Furthermore, without proper comprehension of disaster risks, hazard/risk maps cannot fully function as a tool to strategically plan DRRM measures. River control measures such as the construction of levees might be planned based on the reflection of a hazard/risk map illustrating, for example, a 100 year return period flood event, but since a 100 year return period flood causes such a large scale impact in terms of inundated area, it will be difficult to formulate a realistic land-use plan based on this map. On the contrary, land-use plans formulated based on the ten year return period flood map will not be useful to develop river control plans, since the basic assumption of the disaster impact is too small. As such, understanding disaster risks is essential to formulate proper plans that can serve as a base for adequate DRRM measures. Any development plan must take into consideration the "right" disaster impact scale in order for it to become relevant so that optimal resiliency can be realized. Therefore, hazard/risk maps should be able to express multiple scales of disaster impact.

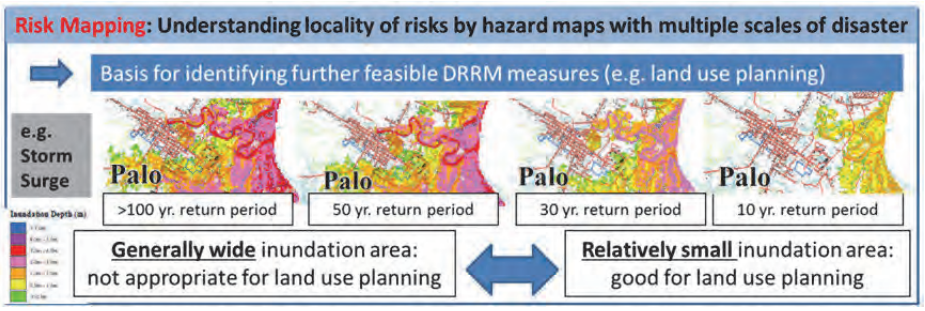


Figure 5.2.3 Risk mapping reflecting different return period events

Moreover, it is important to quantitatively comprehend the effects/benefits of actual DRRM measures. In case of a flood control measure, the effects/benefits of infrastructures are evaluated by calculating the reduction of the annual average of flood damage cost. Although the evaluation of effects/benefits of DRRM measures is not easy, presenting quantitative evidence of the effect/benefit of DRRM measures is essential in promoting pre-disaster DRRM investment and mainstreaming of DRRM. Policy makers and decision makers need quantitative evidence such as cost-benefit analysis to justify the budget allocation of DRRM investment, especially those large scale infrastructure measures that require huge public investment. In addition, the undertaking of quantitative evaluation of DRRM effects/benefits will contribute to enhancing the capacity of monitoring, data management, and analysis of the technical agencies such as PAGASA.

Understanding disaster risk is globally agreed as the Priority for Action 1 of the Sendai Framework for DRR 2015-2030. JICA will contribute to promoting this Priority for Action by supporting:

sorting out organizational framework on DRRM (clarification of roles and responsibilities of each agency); and monitoring of risk assessment activities, incentivizing budget allocation, formulating guidelines, enhancing capacity of technical agencies and LGUs among various others measures.

JICA Priority Action 2: Strengthen disaster risk governance

As outlined in Chapter 3.2, the Government of the Philippines has come a long way to strengthen disaster risk governance such as the adoption of RA10121 and NDRRMP, enhancement of LDRRMPs, introduction of guidelines and others. However, as referred to in Chapter 3.3, DRRM activities and measures identified in each national and local plan are not fully implemented because of the ambiguous definition of roles and responsibilities of related agencies, shortage of implementation capacity, inefficient coordination between national and local agencies, and the weak capacity of OCD as the core DRRM coordinator among others. As such, strengthening of disaster risk governance in the Philippines is still a priority that needs sustained efforts. .

Considering that the strengthening of risk governance is Priority for Action 2 in the Sendai Framework for DRR 2015-2030, JICA is of the view that enhancing the capacity of national government agencies is fundamental to realize safe and resilient Philippines. Of course, empowerment of communities, private sectors and CSOs is also essential to establish effective disaster governance system, but targeting national agencies for capacity development will directly contribute to the strengthening of DRRM governance. The strengthening of DRRM governance requires DRRM to be set as a priority policy at the national level, and subsequently, establishment of supporting laws and regulations, formulation of long-term plans, allocation of a sufficient budget, and enhancement of incentive mechanisms among other measures needed to follow. Such an enhanced DRRM governance prioritized and installed at the national level serves as enabler for a strengthened system covering all levels of the governance system, including local and community levels. Functioning DRRM governance is a prerequisite for realizing a safe and resilient Philippines. This is exactly why JICA will continue to prioritize DRRM capacity development cooperation, especially at the national level, in order support the strengthening of DRRM governance.

Moreover, the above mentioned JICA Priority Action 1 depends very much on the strengthening of DRRM governance in terms of enhanced information and knowledge sharing mechanisms among technical agencies. As such, JICA Priority Actions 1 and 2 are closely linked and JICA will formulate cooperation projects that effectively address such nexus under the new strategic framework.

JICA Priority Action 3: Invest in Mitigation and Preparedness

According to UNDP, “investment of 1 dollar for pre-disaster measures will contribute to the saving of 4 to 7 dollars of post-disaster relief operation cost”. JICA, too, is continuing to emphasize the importance of pre-disaster DRRM investment by presenting economic analysis results that quantitatively prove that such investment is correlated with the overall economic development of a country (such as shown in figure 5.2.4). Such continued effort facilitated a consensus that

pre-disaster investment for disaster mitigation and preparedness is an essential element of DRRM activity, and was clearly positioned as one of the Priorities for Action of the Sendai Framework 2015-2030. The underlining recognition of this Priority Action is that effects/benefits of pre-disaster DRRM are larger than post-disaster response cost and should be pursued as a national strategy. Pre-disaster DRRM measures should be comprehended as investment for the future and for the achievement of sustainable economic growth rather than cost that burdens a national budget. However, not many economic analyses are conducted to prove quantitatively the effects/benefits of pre-disaster investment, and thus many developing countries are still facing challenges to secure a sufficient pre-disaster DRRM investment budget.

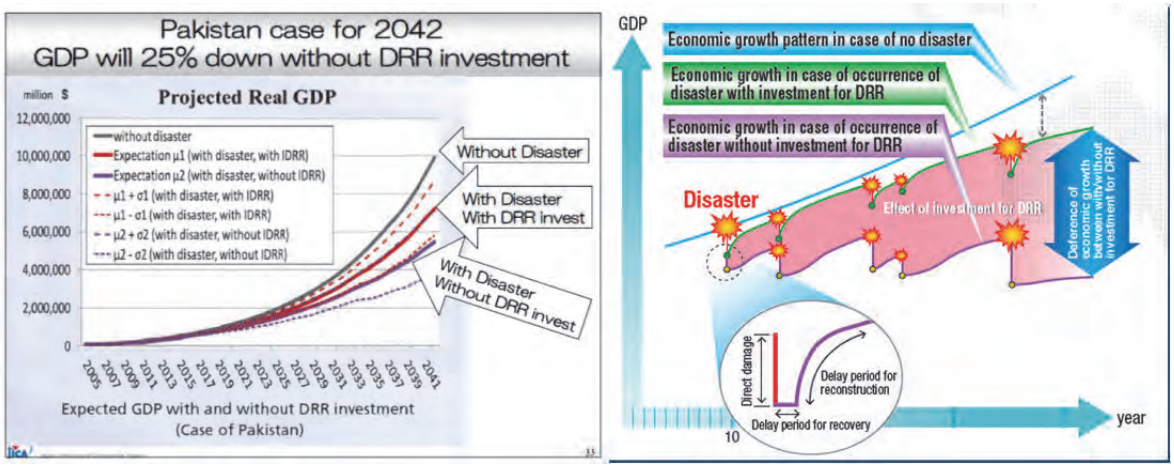


Figure 5.2.4 Economic impact of DRRM investment (on the left) and Conceptual effects/benefits of DRRM investment (on the right)

The Government of the Philippines, on the other hand, has long been aware of the importance of pre-disaster DRRM activities in the overall effort to pursue sustainable development. According to RA 10121, 30% of the amount appropriated for LDRRMF shall be allocated to a Quick Response Fund (QRF), which is a stand-by fund for relief and recovery programs, and that no less than 5% of the estimated revenue from general resources shall be set aside for LDRRMF. This means that 70% of the LDRRMF can be used for disaster prevention & mitigation activities, as well as preparedness activities, which implies that theoretically, pre-disaster DRRM investment is ensured. However, as outlined in Chapter 3.3, the monitoring and evaluation system to check the effectiveness of LDRRMPs or utilization of LDRRMF is very weak, and consequently, it is not possible to check the realization of expected outputs.

Allocating a sufficient budget for the implementation of pre-disaster DRRM measures is a challenge for many countries, including the Philippines. Usually, national priorities are set on development activities directly linked to the economic growth; and in some cases, because of the lack of DRRM considerations during implementation of such development projects, vulnerability to disaster risks increases. For example, floods and landslides generated by the construction of roads without the consideration of risk assessment are reported throughout the world. In the Philippines, the increase in damage due to flooding was reported because of the housing development in high-risk flood

areas. Investment for DRRM is usually recognized such as an “unexpected” cost for the whole society, and the allocation of the DRRM budget cannot be adequately and clearly decided. As such, promotion of pre-disaster DRRM investment was identified as an important Priority for Action in the Sendai Framework for DRR 2015-2030, and that the understanding of the countries’ leaders on DRRM investment is expected to change. On the other hand, because the implementation of DRRM mitigation measures aiming to increase the safety of people’s lives and property will bring a change in land-use, force displacement and cause other impacts to the society, the incentives of local politicians to implement pre-disaster measures is still low in some areas.

JICA prioritizes pre-disaster DRRM investment especially in highly populated areas where economic assets are concentrated, such as Metro Manila and other emerging metropolitan areas, in order to ensure the continuity of economic activities. Furthermore, under the new strategic framework, JICA will support the Government of the Philippines, building on to the past DRRM cooperation outputs to ensure physical safety of its people, especially in highly disaster prone areas. As such, JICA will contribute to the establishment of a safe and resilient country by implementing DRRM measures as a catalyst to accelerate economic growth and as a safety net to promote people’s safety in vulnerable areas.

Pre-disaster DRRM investment is a measure to guarantee the implementation of concrete countermeasures reflecting considerations on the understanding of risk promoted by JICA Priority Action 1 and enhanced disaster risk governance addressed by the Priority Action 2. In order to consider the impact of concrete DRRM measures in specific areas, the monitoring of disaster risk based on the use of the risk curve referred in Figure 5.2.2 is useful.

In order to effectively and efficiently carry out the three JICA Priority Actions, JICA set two strategic considerations to always take into account. These two considerations are a requirement to achieve the strategic outcome “enhance protection of lives, livelihoods and economic assets from natural disasters” and envisioning further the establishment of a “Safe and Resilient Philippines”.

Strategic Consideration 1: Mainstream DRRM within and across all sectors <Sectoral Expansion>

As a bilateral development agency, JICA has been stressing the importance of mainstreaming DRRM into all development sectors (Figure 5.2.5). In order to achieve sustained social and economic growth, it is paramount to incorporate DRRM considerations within and across all sectors that support development in order to set a path towards safe and resilient development. As such, DRRM is a sector that supports development by itself, and at the same time, a crosscutting theme that supports other development sectors. By incorporating DRRM considerations in all development sectors, development activities will be ensured not to result in increasing disaster risk, while unfortunately, too many development activities are reproducing vulnerability and risk exposure instead.

Figure 5.2.5 Image of DRRM mainstreaming

In the case of the Philippines, through adoption of RA10121 and NDRRMP, mainstreaming of DRRM in all development sectors is defined as a requirement. Guidelines to mainstream DRRM and CCA in CLUP were formulated and a coordination platform to facilitate DRRM mainstreaming was established. However, a majority of developing countries are experiencing difficulty in securing sufficient budget to prioritize DRRM measures and as a result, most countries are forced to spend a great portion of their DRRM budget to reactive response and recovery activities. Although the Philippines is in the forefront of the global effort to mainstreaming DRRM consideration into the overall development process, in terms of the amount of DRRM investment in each sector, there still can be further improvement. JICA is thus committed to working closely together with the Government of the Philippines to establish a systematic assessment process to evaluate how disaster risks will be taken care of within development projects before the implementation, similar to the process of environmental impact assessment.

Strategic Consideration 2: Tailor made solutions to fit specific regional context (No One-Size Fits All) <Regional Expansion>

The type and amount of pre-disaster investment will depend on the stage of development of each regional cluster. For example, when a disaster strikes, in rural areas with low population density and concentration of economic assets, it will be easier to recover to the pre-disaster condition than in highly urbanized areas where the population density and concentration of economic assets are high. This suggests that in early stage of development, the most effective DRRM measure is to install early warning systems to ensure that people can evacuate from disaster impacts in order to save their lives. On the contrary, since disasters can bring devastating impact to highly urbanized areas, which can be referred to as in the advanced stage of development, the recovering to pre-disaster condition might take enormous time and the cost. As such, in such advanced areas, multiple DRRM measures to ensure the safety of people and economic assets, and further, business continuity are required, which is often more expensive than to install simple early warning systems.

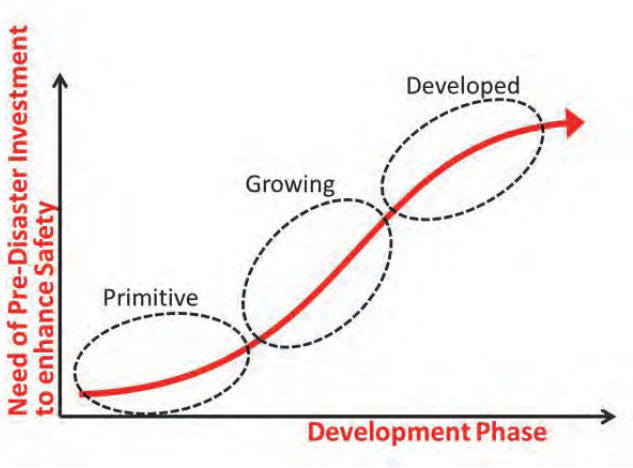


Figure 5.2.6 Relationship between development stage and need for pre-disaster investment

In order to plan DRRM projects based on this new strategic framework, JICA will always look into regional context covering the locality of disaster risks and the stage of development in order to identify the optimal set of measures that best suits the target area. In other words, JICA will not push a one-size-fits-all solution but will formulate plans and implement DRRM measures based on considerations with regional specificity.

Chapter 6 Translating Strategy into Tangible Ways Forward

6.1 Achievement and Lessons Learned from Past JICA's Cooperation

(1) Cooperation based on Experiences, Knowledge and Technologies proven in Japan

In Japan, pre-disaster investment in DRRM is an accumulation of continuous and sustained effort undertaken for many years, which contributes to reducing disaster risks. Investment in DRRM enabled economic development in Japan, and economic development promoted further DRRM investment. However, time to time, devastating disasters have occurred causing damage to Japan. Whenever a devastating disaster occurs, related laws and plans have been reviewed and improved, and the DRRM measures have been taken continuously and effectively by utilizing the latest technologies. JICA's cooperation is based on such experiences, knowledge and technologies proven in Japan. The following table summarizes outcomes of cooperation based on experiences, knowledge and technologies in Japan.

Table 6.1.1 Outcomes of cooperation based on Experiences, Knowledge and Technology

Positive Outcomes	• Disaster damages caused by any kinds of disasters, such as flood, sediment, earthquake and volcanic disaster, have been mitigated based on the science-based risk assessment and subsequent implementation of structural measures. • Effective combinations of structural and non-structural measures have been proposed for each area and each disaster. Mitigation of damages by these measures has contributed to the economic development in Metro Manila and other areas. • As for the cooperation for infrastructure projects such as roads, railways, bridges etc., disaster risks have been assessed and structures have been designed for such risks in each project. This is one of the examples of "Mainstreaming DRR" which is applied both internationally and in the Philippines. • Based on the latest technology in Japan, monitoring systems and early warning systems for any kind of disasters have been established, and the technical capacities of technical agencies have been enhanced. These results have contributed to the reduction of human damage. • Based on the disaster experiences in Japan, cooperation for emergency recovery processes and technology transfer on the concept of BBB for recovery/reconstruction has been conducted. These activities have contributed to the efforts on improvement of safety after a disaster.
Areas that need improvement	• There are some cases in which the technical capacity has not been fully transferred to the Philippines. This is because Japanese engineers or companies have prepared the plans and conducted the projects under their initiatives for "yen loan projects" and "grant aid projects". Coordination with "technical cooperation projects" and utilization of local staff will be effective for this issue. • There are some cases in which the masterplans on floods and earthquakes prepared in cooperation with JICA have not been fully implemented. This is because the implementation capacity of the Philippines side and coordination of priorities of plans with other plans or other sectors were not necessarily adequate, etc. • Concept and necessity of "Mainstreaming DRR", "BBB", "Comprehensive flood control/management", "Countermeasures for excess disasters" etc. have been gradually recognized, but have yet to be fully implemented. It is necessary to promote these concepts continuously for their realization.

As shown in the above table, cooperation based on experiences, knowledge and technologies in Japan have contributed to the reduction of damages, recovery from disasters and economic development. However, some of this knowledge and technology have not been fully transferred to

the Philippines side in some cases. In order to solve this issue, further improvement of awareness and creation of a DRRM culture will be necessary, and cooperation based on experiences, knowledge and technology need to be a continuous effort.

(2) Utilization of Various Schemes

One of the strengths of JICA's cooperation is that there is a variety of schemes such as "yen loan project", "grant aid project", "technical cooperation project", "SATREPS", "JOCV", "grass roots project" etc. Various schemes have been utilized for cooperation in the DRRM sector in the Philippines. The following table shows the advantages and challenges of JICA's cooperation from the points of view of utilization of schemes.

Table 6.1.2 Utilization of Various Schemes

Advantages	• JICA projects have contributed to strengthen the DRRM capacity in the Philippines by utilizing various schemes such as mitigation measures (mainly flood control projects) by yen loan projects, provision of monitoring equipment and construction of evacuation shelters by grant aid projects, strengthening of DRRM governance by technical cooperation projects, LGU and community empowerment by JOCV and grass roots projects etc. • Coordination of schemes has increased their effects. As for FCSEC, knowledge gained in the technical cooperation projects was utilized in the flood control projects by yen loan through utilizing the hydraulic experiment facility constructed by a grant aid project. By this coordination, technologies were demonstrated and their sustainability was secured. Technical cooperation projects are more effective if they are grant aid projects to provide equipment or to construct facilities, or if a yen loan project for prevention/mitigation is conducted at the same time. • Capacity of target organizations was enhanced strategically by combining the projects for prevention/mitigation and policy level cooperation by long-term experts for DPWH and OCD. Sustainability and expansibility of outputs by the project can be enhanced by a follow-up of the long-term experts. • Community based DRRM activity was conducted as a grass roots project in Iloilo city where the flood control project had been conducted. There were no casualties in Iloilo city due to Typhoon Yolanda in 2013, since all the people who had participated in the community activity evacuated by themselves before the disaster. In the Philippines, DRRM activities are conducted at LGU level by grass roots projects and JOCV. Synergy effects can be enhanced if yen loan projects are coordinated with these schemes.
Challenges	• There are some cases in which a part of the structural measures in the master plan was implemented by a yen loan project and other parts of structural measures and non-structural measures were not conducted by the Philippines side, even though the various projects were planned in the master plan. • There was a case of technical cooperation projects for supporting grant aid projects to provide monitoring equipment that were difficult or took a long time to implement, even though the necessity to conduct technical cooperation projects regarding management, analysis and utilization of monitored data was recognized. • If the project period of a technical cooperation project is set at three years, the objectives are requested to be achieved in three years, even though it will take more time for achieving the objectives. Because of this, there are some cases in which capacity enhancement was not conducted properly and it took a long time to start the succeeding project. • Generally, the targets of JICA projects are national level agencies and the dissemination of experiences and effects to the local area is a mandate of the Philippine side. If the mechanism of dissemination to the local area is not established, the local area cannot receive the results of cooperation by JICA.

As is shown in the above table, JICA's various schemes have been effective for the DRRM sector in the Philippines and have contributed to the mitigation of disaster risks and human resources development. Effects of each project can be multiplied by collaborating with other schemes. However, in reality, not many projects have actually collaborated with other schemes. It is encouraged to select projects from a DRRM program which is formulated by considering the efficient reduction of disaster risks, future economic development of the area and long-term visions.

(3) Cooperation with Core Agencies and Officials, and Coordination with related Agencies

Strengthening of the DRRM capacity of the country cannot be realized by enhancing the capacity of a single agency. Enhancing capacity of all related agencies as well as strengthening coordination among related agencies is the way forward. The following table shows the advantages and challenges of JICA's cooperation from the points of strengthening the DRRM capacity of related agencies.

Table 6.1.3 Strengthening of DRRM capacity of related Agencies

Advantages	• JICA has been cooperating with technical agencies such as DPWH, PAGASA and PHIVOLCS for a long time through NEDA and DOF. JICA has contributed to the establishment of the technical base of the Philippines and its improvement. • Policy level cooperation with high level officials such as the Secretary and Under-Secretary has been conducted through dispatching the long-term experts as policy adviser to DPWH and OCD. • The DPWH and JICA Philippine office have been conducting coordination meetings periodically, so that issues can be shared and supporting systems can be established promptly. • In the technical cooperation projects for OCD, preparation of policies and plans was conducted by emphasizing the coordination with related agencies by utilizing acquired assets (close relation with core agencies and officials) from a long history of cooperation.
Challenges	• A single agency cannot implement DRRM activities effectively by itself, if only its capacity is enhanced. Past JICA cooperative activities were mainly for a single technical agency and the results of the cooperation were sometimes not shared with related agencies. • As for flood control projects by DPWH, it is necessary to consider countermeasures on a river basin basis in order to plan and implement comprehensive flood control/management measures. However, coordination with RBCO and NWRB is insufficient. • As for earthquake and volcanic disaster countermeasures, JICA has cooperated with PHIVOLCS on monitoring and early warning, DPWH on structures and LGU on DRRM plans etc. These projects have been individual projects and there has been little coordination among projects, since policies on earthquake and volcanic disaster countermeasures have not existed.

As is shown in the above table, JICA has contributed to the enhancement of technical capacity regarding DRRM of the Philippines through implementing projects continuously targeting technical agencies such as DPWH, PAGASA and PHIVOLCS, which are core agencies regarding DRRM in the Philippines. On the other hand, based on the understanding that coordination is the key in strengthening DRRM capacity at the national level, JICA has recently targeted OCD to capacitate it to be a strong coordinating agency for DRRM. JICA will continue to target core agencies regarding DRRM and will conduct projects emphasizing the inter-agencies coordination, including agencies in river basins, cross-sector agencies, LGUs, and etc.

(4) Dissemination of Effects by Projects

One of the major lessons learned from the past cooperation of JICA is that some of the good practices of projects have not been shared and disseminated effectively. Although most of the counterpart agencies are satisfied with the outputs of the projects and appreciate the continuous cooperation, such outputs are not always shared by related agencies in the DRRM sector. In the case of earthquake DRRM plans for Metro Manila formulated by a JICA project in 2004, the importance of the plan has been recognized recently because of the high awareness for earthquakes across the world and the economic growth in Metro Manila, although the priority to implement the plan was not high when it was formulated. To effectively share and apply the outputs of the projects will promote the implementation of DRRM activities.

JICA has contributed to reduce disaster risks in the Philippines through financial cooperation in a number of DRRM projects. Generally, in the case of flood control projects, cost-effectiveness analysis is conducted before the project implementation, and the actual effects of the projects are evaluated by the post-evaluation mission from JICA. For example, in the city of Ormoc where a flood control project was conducted by grant aid from Japan, there has been no over-flooding of the river and no casualties were reported after completion the project for the same size of flood as past devastating floods. According to a DRRM officer of Iloilo city where the flood control project was conducted by yen loan project, damage by floods has been remarkably mitigated after the project. Since a cost-effectiveness analysis is to compare the amount of reduction of losses due to the project and its necessary cost, it is difficult to know such kind of effects unless a disaster actually occurs after the project, and economic growth of the area for long-term is not included in the analysis. It is recognized by international experts that investing in DRRM will contribute to economic growth. Pre-disaster investment in the DRRM sector in the Philippines will be promoted, if the good practices which show the cases of regional economic development due to the flood control measures are studied and widely shared and applied.

6.2 Consideration of Future Cooperation Projects

Future cooperation projects have been discussed based on JICA DRRM Sector Cooperation Strategy (draft) stated in Chapter 5 and the achievements and lessons learned from past JICA's cooperation stated in Section 6.1. The list of projects to be studied for their implementation and the list of on-going projects are shown in the tables below. (except for grassroots projects, Public-Private Partnerships and JOCVs)

Table 6.2.1 List of On-Going Projects

No.	Scheme	Project Name
1	Yen Loan	Pasig-Marikina River Channel Improvement Project (Phase III)
2	Yen Loan	Flood Risk Management Project for Cagayan River, Tagoloan River and Imus River
3	Grant Aid	Project for Improvement of Equipment for Disaster Risk Management
4	Grant Aid	Project for Reconstruction of Municipal Halls in Lawaan and Marabut Municipalities
5	F/S	Preparatory Study on Industrial Area (Cavite Province) Flood Management Project
6	Long Term Expert	Expert on Flood Management
7	Technical Cooperation	Project for Enhancing Capacity on Weather Observation Forecasting and Warning
8	Technical Cooperation	Project for Strengthening Capacity of Integrated Data Management of Flood Forecasting and Warning
9	Data Collection Survey	Study on the Insurance Mechanism for Incentivizing Disaster Resilient Public Infrastructure in Metro Manila
10	Long Term Expert	Expert on Disaster Risk Reduction and Management
11	Urgent Development Study	Project on Rehabilitation and Recovery from Typhoon Yolanda

Table 6.2.2 Approved Projects (at the preparation stage)

No.	Scheme	Project Name
1	Yen Loan	Flood Risk Management Project for Cagayan de Oro River
2	Yen Loan	Metro Manila Priority Bridges Seismic Improvement Project
3	Special Assistance for Project Sustainability (SAPS)	Special Assistance for Project Sustainability (SAPS) for Laoag River Basin Flood Control and Sabo Project
4	Technical Cooperation	Disaster Risk Reduction and Management Capacity Enhancement Project (Phase II)
5	Technical Cooperation	Philippine Capacity Development and Training Program on Volcano, Earthquake and Tsunami Monitoring, Warning and Information Dissemination
6	SATREPS	Project for Development of Extreme Weather Monitoring and Alert System

Table 6.2.3 List of Projects to be Considered

No.	Scheme	Project Name
1	Yen Loan	Industrial Area (Cavite Province) Flood Management Project
2	Yen Loan	Pasig-Marikina River Channel Improvement Project (Phase IV)
3	Yen Loan	Underground Drainage Tunnel Project for Metro Manila
4	Technical Cooperation	Project for Capacity Development on Flood Control, Sabo and Coastal Engineering
5	Technical Cooperation	Davao City Flood Disaster Risk Reduction Master Plan
6	Long Term Expert	Expert on Flood Management
7	Technical Cooperation	Project for Enhancing Capacity on Weather Observation, Forecasting and Warning
8	Grant Aid	Project for Developing Flood Forecasting and Warning System for Cagayan de Oro River Basin
9	Long Term Expert	Expert on Disaster Risk Reduction and Management

Relationships between the listed projects and JICA DRRM Sector Cooperation Strategy stated in Chapter 5 are shown in the tables below. The tables say that the listed projects correspond to JICA priority actions for cooperation.

Regarding the contents of the projects, the listed projects contribute to the promotion of “prevention/mitigation” and “pre-disaster investment” mainly by yen loan project, and the strengthening of disaster risk governance and the promotion of understanding disaster risk are conducted through technical cooperation projects and individual experts. Regarding the disaster types, volcano, earthquake, coastal and sediment disasters etc. are targeted in addition to flood disasters. The cooperation is focused on risk assessment, monitoring, forecasting and warning for these disasters.

When the listed projects are implemented, the strategic considerations of JICA DRRM Sector Cooperation Strategy (draft) have to be considered such as mainstreaming DRRM into other sectors including DRFI sector, and contribution to the tailor made solutions according to specific regional context.

Table 6.2.4 Relations between On-going Projects and JICA DRRM Sector Cooperation Strategy (draft)

No.	Scheme	Project Name	Organization	JICA Priority Actions for Cooperation		
				Promote understanding of disaster risk	Strengthen disaster risk governance	Invest in Mitigation / Preparedness
1	Yen Loan	Pasig-Marikina River Channel Improvement Project (Phase III)	DPWH			○
2	Yen Loan	Flood Risk Management Project for Cagayan River, Tagoloan River and Imus River	DPWH			○
3	Grant Aid	Project for Improvement of Equipment for Disaster Risk Management	DPWH/ PHIVOLCS	○		○
4	Grant Aid	Project for Reconstruction of Municipal Halls in Lawaan and Marabut Municipalities	DPWH			○
5	F/S	Preparatory Study on Industrial Area (Cavite Province) Flood Management Project	DPWH			○
6	Long Term Expert	Expert on Flood Management	DPWH		○	
7	Technical Cooperation	Project for Enhancing Capacity on Weather Observation Forecasting and Warning	PAGASA	○	○	
8	Technical Cooperation	Project for Strengthening Capacity of Integrated Data Management of Flood Forecasting and Warning	PAGASA	○	○	
9	Data Collection Survey	Study on the Insurance Mechanism for Incentivizing Disaster Resilient Public Infrastructure in Metro Manila	GSIS			○
10	Long Term Expert	Expert on Disaster Risk Reduction and Management	OCD		○	
11	Urgent Development Study	Project on Rehabilitation and Recovery from Typhoon Yolanda	DOF/DILG			○

Table 6.2.5 Relations between Approved Projects (at the preparation stage) and JICA DRRM Sector Cooperation Strategy (draft)

No.	Scheme	Project Name	Organization	JICA Priority Actions for Cooperation		
				Promote understanding of disaster risk	Strengthen disaster risk governance	Invest in Mitigation / Preparedness
1	Yen Loan	Flood Risk Management Project for Cagayan de Oro River	DPWH			○
2	Yen Loan	Metro Manila Priority Bridges Seismic Improvement Project	DPWH			○
3	Special Assistance for Project Sustainability (SAPS)	Special Assistance for Project Sustainability (SAPS) for Laoag River Basin Flood Control and Sabo Project	DPWH			○
4	Technical Cooperation	Disaster Risk Reduction and Management Capacity Enhancement Project (Phase II)	OCD/ UP-RI*1		○	
5	Technical Cooperation	Philippine Capacity Development and Training Program on Volcano, Earthquake and Tsunami Monitoring, Warning and Information Dissemination	PHIVOLCS	○	○	
6	SATREPS*2	Project for Development of Extreme Weather Monitoring and Alert System	ASTI	○		

*1 UP-RI: Resilience Institute of UP

*2 SATREPS: Science and Technology Research Partnership for Sustainable Development

Table 6.2.6 Relations between Projects to be Considered and JICA DRRM Sector Cooperation Strategy (draft)

No.	Scheme	Project Name	Organization	JICA Priority Actions for Cooperation		
				Promote understanding of disaster risk	Strengthen disaster risk governance	Invest in Mitigation / Preparedness
1	Yen Loan	Industrial Area (Cavite Province) Flood Management Project	DPWH			○
2	Yen Loan	Pasig-Marikina River Channel Improvement Project (Phase IV)	DPWH			○
3	Yen Loan	Underground Drainage Tunnel Project for Metro Manila	DPWH			○
4	Technical Cooperation	Project for Capacity Development on Flood Control, Sabo and Coastal Engineering	DPWH/ UP-RI		○	
5	Technical Cooperation	Davao City Flood Disaster Risk Reduction Master Plan	Davao / DPWH	○	○	
6	Long Term Expert	Expert on Flood Management	DPWH		○	
7	Technical Cooperation	Project for Enhancing Capacity on Weather Observation, Forecasting and Warning	PAGASA	○	○	
8	Grant Aid	Project for Developing Flood Forecasting and Warning System for Cagayan de Oro River Basin	PAGASA	○		
9	Long Term Expert	Expert on Disaster Risk Reduction and Management	OCD		○	

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≪ANNEXES≫

ANNEX-1 AVP Production

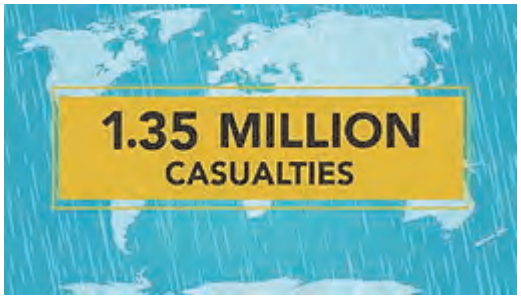
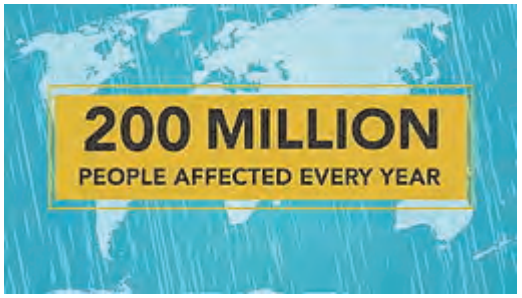
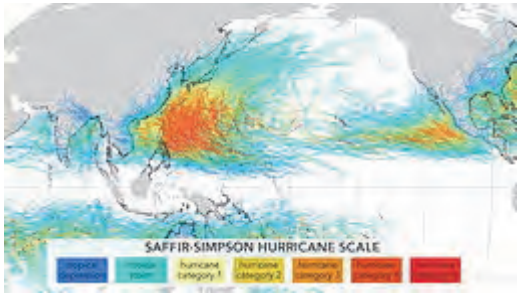
An AVP was produced to introduce and make an appeal for the partnership between the Philippines and Japan in the sector of Disaster Risk Reduction and Management.

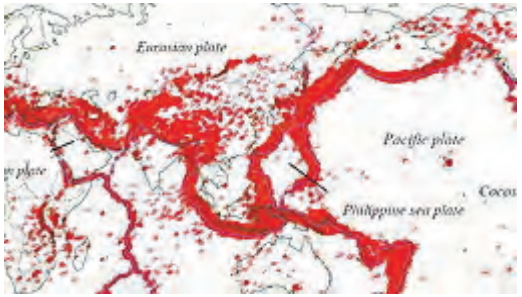
■Concept Paper

Targets	Persons in charge or related to Disaster Risk Reduction Management - New officials (minister, undersecretaries, LCEs) - New DRRM officers - Other donners - Japanese members from other JICA project teams
Purpose	To introduce and make an appeal on the partnership between the Philippines and Japan in the sector of Disaster Risk Reduction Management (such as promotion of pre-investment, build-back better etc).
Concept	Not too long, simple, and Easy to understand.
Style	Style/Format: - Use the still photos and video - If needed, create new illustrations - Include interviews - Try to move the still photos a little bit to get audiences' interest.
	Length: 7 to 8 min. as it is easy to use at any occasion of presentation or meeting.
	Language/Sounds/BGM: - Use music without copy right as a BGM - Insert caption/telop in Japanese. - Take enough time to read the narration.
	Note: -Create a positive atmosphere(fast-moving story and BGM, people's smile) -Provide variation with the use of illustrations, photos, interviews etc.
	Title: Towards Safe and Resilient Philippines
	Sub title: JICA's New DRRM Cooperation Strategy
Projection	- Seminar, JCC and other meetings with members of related project teams - Briefing meeting with new minister, undersecretaries, LCEs, new DRRM officers

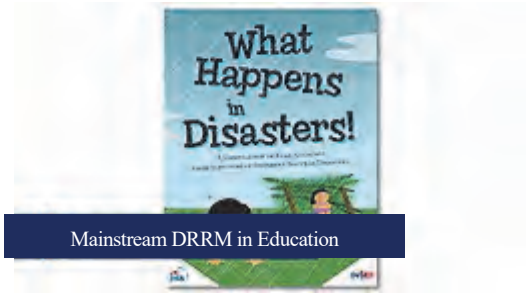
■Scenario

No	Narration	Image
0.		
1.		
2.	Natural disasters can happen anytime and anywhere.	 

No	Narration	Image
3.	And in the last 30 years, 2,600 billion dollars in property damage and 1.35 million lives were lost in the world. And more than 200 million people are affected every year.	  
4.	And recently, the Philippines and Japan experienced catastrophic disasters. Both countries are bombarded by strong typhoons year after year. And the Philippines experienced the full wrath of Super Typhoon Yolanda in 2013.	 

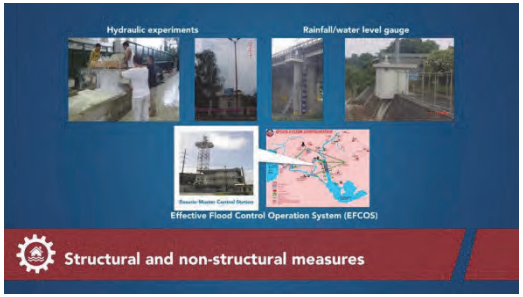
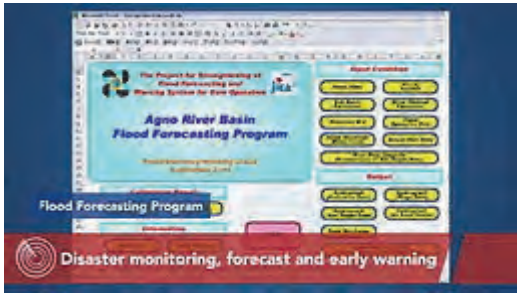
No	Narration	Image
5.	Both countries are located in the part of the globe that is prone to powerful earthquakes, explosive volcanic eruptions, and surging tsunamis. Like back in 2011 when Japan was rocked by the Great East Japan Earthquake and Tsunami.	 
6.	To overcome such situation, the international society recognized the importance to shift from a post-disaster response to a pre-disaster measure, to finally face the challenges of sustainable development.	
7.	Summits and conferences were held for Disaster Risk Reduction and Management, or DRRM. And countries agreed on how to properly implement pre-disaster measures.	 

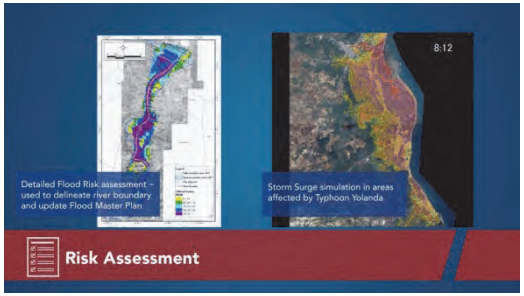
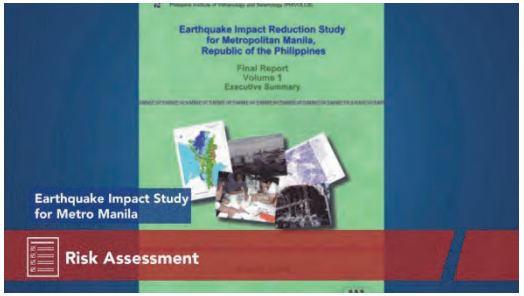
No	Narration	Image
		 
8.	The Sendai Framework emphasized the importance of building disaster resilient societies by pre-disaster investment. And such investment will contribute to the achievement of the sustainable development goals.	**Sendai Framework for Disaster Risk Reduction: Four priority Actions** **Priority 1:** Understanding disaster risk. **Priority 2:** Strengthening disaster risk governance to manage disaster risk. **Priority 3:** Investing in disaster risk reduction for resilience. **Priority 4:** Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction 
9.	The Philippines is following the international trends on DRRM and adopted a new DRRM law and formulated a National DRRM Plan.	 

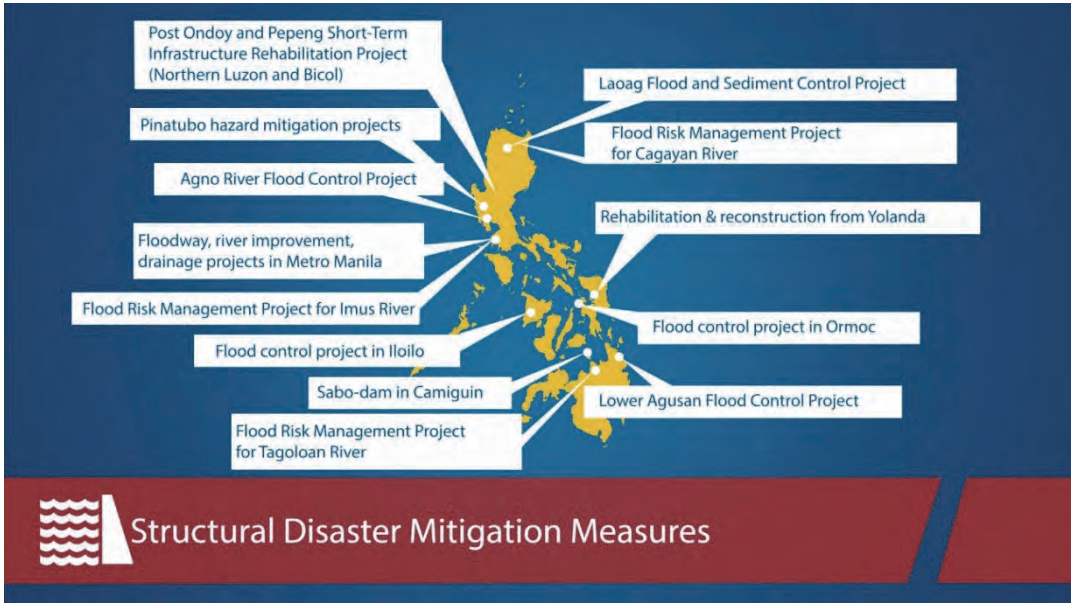
No	Narration	Image
10.	The Philippines and Japan are leading DRRM efforts in the international society. Great efforts are being made to share lessons and experiences.	
11.	Concepts are being made known such as "mainstream DRRM" in all development sectors to secure lives as well as property and assets.	  Mainstream DRRM in Education  Mainstream DRRM in Planning

No	Narration	Image
12.	And a concept such as “Build-Back Better”, that uses disasters as a trigger to rebuild hard-hit communities to be more resilient and be more prepared for the next disaster.	  
13.	And through the establishment of a strong partnership, the Philippines and Japan will strengthen their collaboration on DRRM.	 

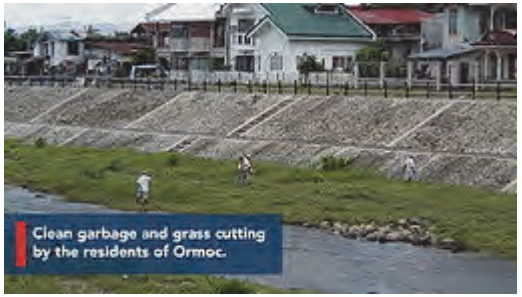
No	Narration	Image
		
14.	The partnership between the Philippines and Japan has a long and storied history.	
15.	The Japan International Cooperation Agency or JICA	

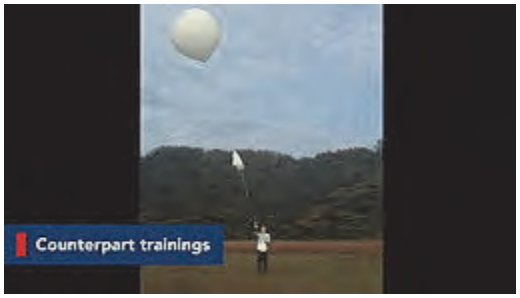
No	Narration	Image
16.	has implemented projects in the whole country by using Japanese advanced technology and experience. JICA's cooperation is seamless and comprehensive, employing the best mix of structural and non-structural measures.	 
17.	Nationwide weather observation, flood forecast and early warning systems were established.	  

No	Narration	Image
18.	And real-time monitoring systems for earthquake and tsunami in the whole nation were installed.	 
19.	Detailed Risk assessment studies were done for various hazards.	 
20.	Interview (Tacloban CDRRMO): During Typhoon Ruby, we were so happy that we were able to use the hazard map of JICA. The hazard maps we presented gave the people an encouragement for them to move out from their coastal residences.	

No	Narration	Image
21.	Structures to mitigate the disaster's impacts were constructed…	
	Such as megadike,	

No	Narration	Image
	Slit-dam sabo-dam and other	 
22.	By following the basic concept of harmonization with Nature and Human livelihood.	

No	Narration	Image
23.	And ownership of the outputs was transferred to local communities to ensure the maintenance of the assets.	  
24.	In addition to the construction of structures and provision of equipment, JICA is working with National Government Agencies to enhance the capacities on DRRM, by dispatching long-term advisors and conducting trainings for government officers.	 

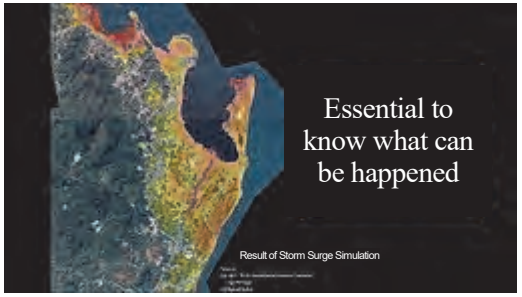
No	Narration	Image
		   

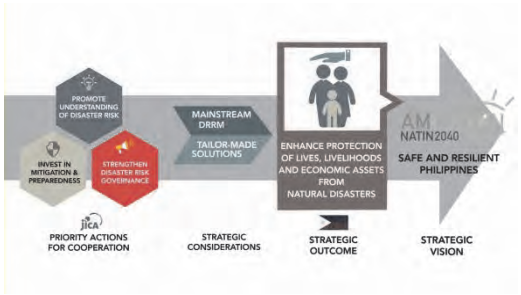
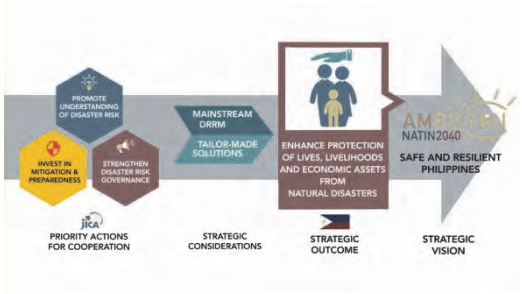
No	Narration	Image
25.	And support LGUs and communities by assisting the local-based activities of Japanese volunteers, civil groups, universities and local governments.	  
26.	…Such cooperation projects are promoting the safety of lives and assets	

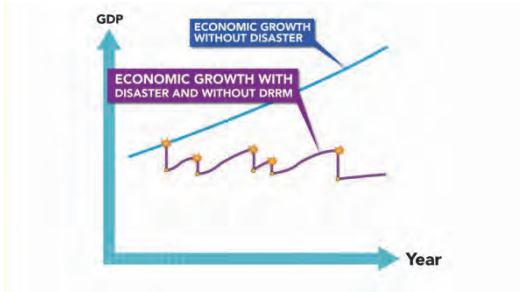
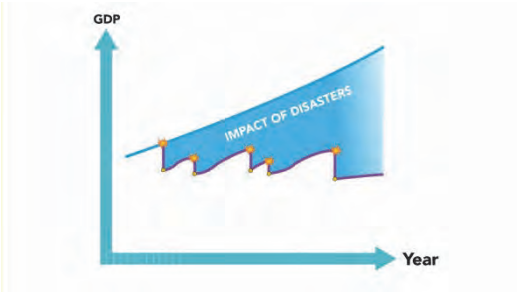
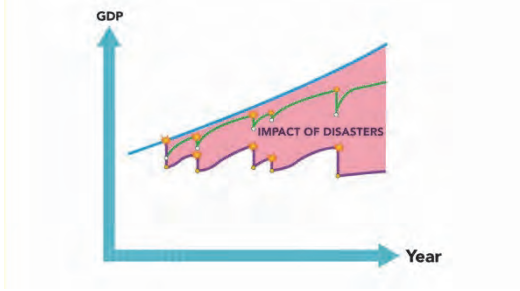
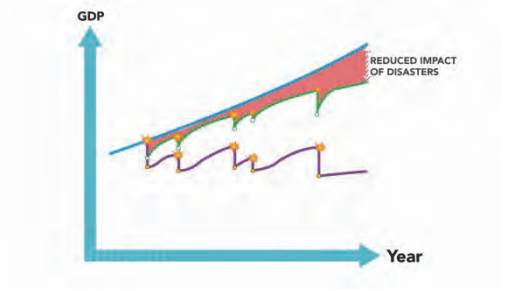
No	Narration	Image
27.	Interview of DPWH-Ormoc: I can see the fruit of my labor that this project is really completed and Ormoc is now safe from rampanging floods.	
28.		
29.	A strong partnership between the Philippines and Japan has been established and has to be empowered to face future disasters.	 

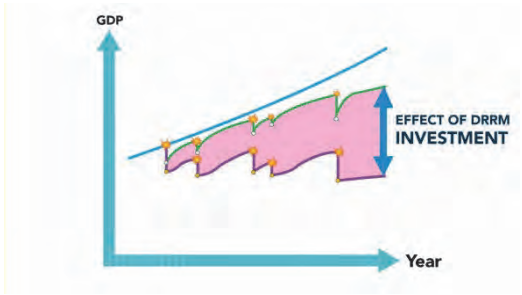
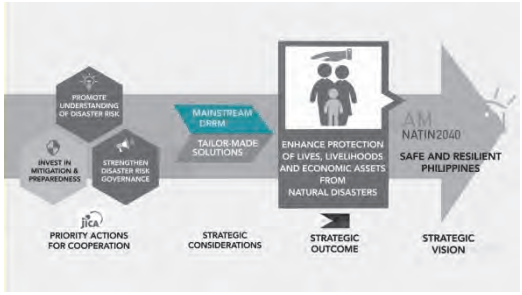
No	Narration	Image
30.	The fury of natural disaster always left deep scars, and People have to consider how to be prepared for the next BIG THING.	 
31.	And JICA is helping build a strong society based on the Build-Back Better concept, implementing pre-disaster infrastructures to reduce the impacts to economy and human life.	   

No	Narration	Image
32.	This is why JICA's new strategy is not to limit itself to the establishment of a just resilient nation but a Safe and resilient Philippines.	
33.	JICA lays out three priority actions for cooperation…	
34.	And two Strategic considerations to always take into account …	

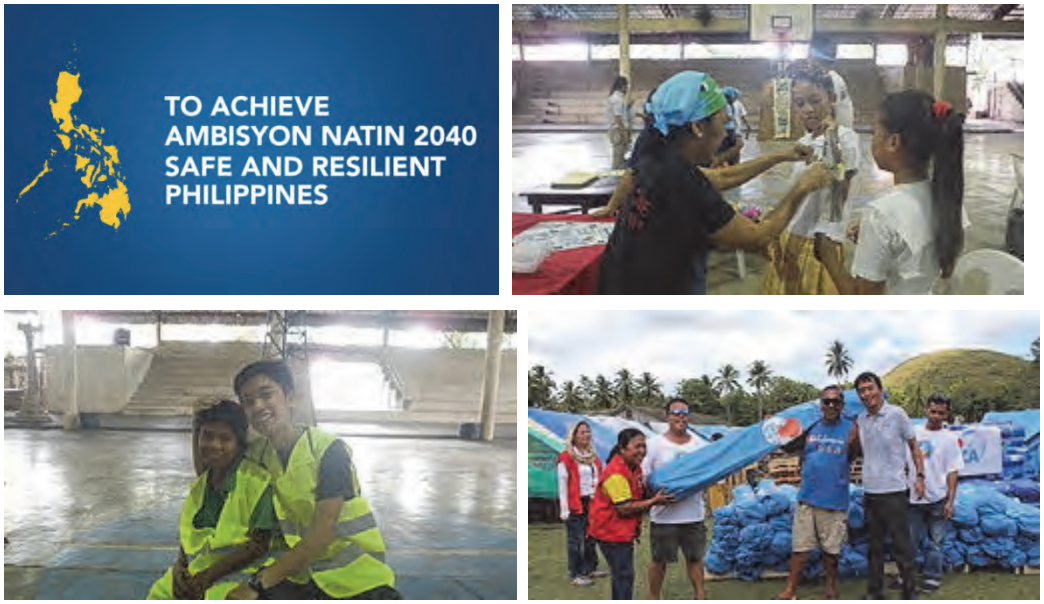
No	Narration	Image
35.	… to reduce disaster risk in order to protect persons, communities, and country by reducing losses in lives and livelihood and help the realization of the long-term vision of a safe and resilient Philippines.	
36.	Action one: Promote understanding of disaster risk To formulate effective DRRM measures, it is essential to understand all dimensions of disaster risks, including potential damage it may cause to local people and assets. That is why JICA will continue to promote understanding of disaster risk as important first step for cooperation.	  

No	Narration	Image
37.	Action two: Strengthen disaster risk governance JICA will continue to cooperate in strengthening the capacity of the central government, and also consider bottom-up approach. Such cooperation will contribute to the functional implementation of the whole DRRM system.	  
38.	Action 3: Invest in Mitigation and Preparedness	 

No	Narration	Image
	The implementation of pre-disaster measures is not a cost, but an investment.	 
	If no measure is implemented, a natural disaster will drastically stop the economic growth and the recovery process will take time.	 
	But if pre-disaster measures are taken, the impact to the economy will be smaller and more manageable. And because the damage is smaller, the work needed to recuperate will be lightened and the recovery process will be shorter.	 

No	Narration	Image
	What this means is that the implementation of pre-disaster measures as investment for DRRM is vital in achieving sustainable development.	 
39.	Strategic consideration 1: Mainstream DRRM in development to ensure sectoral expansion JICA will incorporate DRRM measures at every stage in projects related to development such as land planning, transportation, education and other sectors.	   

No	Narration	Image
40.	Strategic consideration 2: Tailor-made solutions using specific local context to ensure regional expansion. Vulnerability, target, priority and other various factors have to be considered and because there is no “one-size fits all” approach to DRRM, JICA will consider specific local context.	    

No	Narration	Image
41.	To achieve Ambisyon Natin 2040 and establish a “safe and resilient Philippines”, the partnership between the Philippines and Japan will keep going strong.	

No	Narration	Image
42.		

ANNEX-2.1 Outline of Disaster Data Recorded in the Database of the OCD

(1) Types of Disaster

The types of disaster recorded by OCD since January 2005 are shown in Table AN 2-1.1. There are 58 types of man-made incident and 43 types of natural disaster.

Table AN-2.1.1 Types of Disaster recorded by OCD

A. MAN-MADE INCIDENTS					
1.	Structural Fire Incidents	2.	Sea Mishap	3.	Mishap/Maritime Accidents
4.	Missing Fishermen	5.	Maritime Accidents/Sea Mishap	6.	Maritime Accidents
7.	Air Mishap	8.	Air Mishap/Accidents	9.	Plane Crash
10.	Drowning / Drowning Incidents	11.	Cave-In	12.	Collapsed Structure
13.	Structural Damage	14.	Vehicular Accident	15.	Vehicular Fire
16.	Fire Cracker Incident	17.	Minor Incident / Mountain Tragedy	18.	Mountain Climbing
19.	Complex Emergencies	20.	Armed Conflict	21.	Internally Displaced Persons
22.	Shooting Incident	23.	Sabah Crisis	24.	Hostage Taking
25.	Sinkhole	26.	Others	27.	Gas Explosion
28.	LPG Tank Explosion	29.	LPG Explosion	30.	Repatriation
31.	Chemical Poisoning	32.	Gas Leak	33.	Gas/Chemical Leak
34.	Gas Poisoning	35.	Food Poisoning	36.	Mercury Poisoning
37.	Epidemic/Diseases Outbreak/Viral Contamination	38.	Disease Outbreak	39.	Bomb Explosion
40.	Bomb/Grenade Explosion	41.	Bomb/Grenade/Firecracker Explosion	42.	Mine Explosion
43.	Chemical Incident	44.	Chemical Inhalation/Spill	45.	Chemical/Oil Spill
46.	Chemical Leak	47.	Chemical Leakage	48.	Oil Spill
49.	Chemical/Oil Spill	50.	Coal Spill	51.	Molasses Spill
52.	Dengue	53.	Stampede	54.	Others (Fish Kill)
55.	Fish Poisoning	56.	Fish Kill	57.	Bus Burning

B. NATURAL INCIDENTS					
1.	Forest / Bush Fire	2.	Earthquakes	3.	Flashfloods/ Flooding
4.	Typhoon	5.	Destructive Cyclones / Typhoons	6.	Non-Destructive Cyclones / Typhoons
7.	LPA/Southwest Monsoon/La Mesa Dam Overflow	8.	Volcanic Activity	9.	Volcanic Eruption
10.	Lightning	11.	Lightning Strikes	12.	Thunderstorm
13.	Thunderstorm / Heavy Rains	14.	Tornado	15.	Tornado/Whirlwind
16.	Whirlwinds/Tornadoes	17.	Landslides	18.	Mining Incident
19.	Mining-related Incidents	20.	Soil Erosion	21.	Frost
22.	Dry Spell	23.	Heavy Rains	24.	Giant Waves
25.	Big Wave	26.	Big Waves	27.	Drought
28.	Bad Weather	29.	Strong Winds	30.	Storm Surge
31.	Sea Swelling	32.	High Tide	33.	Southwest Monsoon
34.	Continuous Rains	35.	Tail-end of a Cold Front	36.	Soil Movement & Visible Cracks
37.	Effects of El Nino	38.	Others (heavy rains associated w/ strong winds)	39.	Mudflow (Lahar)
40.	Rockfall	41.	Pest Infestation	42.	Electrocution
43.	Bird Strikes				

As listed in the table above, some disasters are similar. Therefore, the study team reviewed the classifications to analyze disaster risk in the Philippines into 11 types of man-made disaster and 16 types of natural disaster.

Table AN-2.1.2 Re-classification of Types of Disaster by the Study Team

Types of Disaster	Name of Disaster
Man-Made Disaster	
Maritime Accidents	Sea Mishap, Mishap/Maritime Accidents, Missing Fishermen, Maritime Accidents/Sea Mishap, Maritime Accidents, Drowning/Drowning Incidents
Air Mishap	Air Mishap, Air Mishap/Accidents, Plane Crash
Fire Incidents	Structural Fire Incidents
Explosion Accident	Gas Explosion, LPG Tank Explosion, LPG Explosion, Mine Explosion
Collapsed Structure	Collapsed Structure, Structural Damage, Cave-In, Sinkhole
Chemical/Oil Accident and Posing	Chemical Poisoning, Gas Leak, Gas/Chemical Leak, Chemical Incident, Chemical Inhalation/Spill, Chemical/Oil Spill, Chemical Leak, Chemical Leakage, Oil Spill, Chemical/Oil Spill, Mercury Poisoning, Gas Poisoning, Coal Spill
Vehicular Accident	Vehicular Accident, Vehicular Fire, Bus Burning
Food Poising	Food Poisoning, Molasses Spill, Fish Poisoning, Others (Fish Kill), Fish Kill
Mountain Distress	Minor Incident/Mountain Tragedy, Mountain Climbing
Epidemic/Pandemic	Epidemic/Diseases Outbreak/Viral Contamination, Disease Outbreak, Dengue
Armed Conflict and Crisis	Complex Emergencies, Armed Conflict, Internally Displaced Persons, Bomb Explosion, Bomb/Grenade Explosion, Bomb/Grenade/Firecracker Explosion, Shooting Incident, Sabah Crisis, Hostage Taking, Repatriation, Stampede, Fire Cracker Incident, Others
Natural Disaster	
Forest Fire	Forest/Bush Fire
Earthquakes	Earthquakes
Flood	Flashfloods/Flooding
Typhoon	Typhoon, Destructive Cyclones/Typhoons, Non-Destructive Cyclones Typhoons
Monsoon	LPA/Southwest Monsoon/La Mesa Dam Overflow, Southwest Monsoon, Tail-end of Cold Front
Heavy Rainfall	Heavy Rains, Continuous Rains, Others (heavy rains associated w/ strong winds)
Volcanic Activity	Volcanic Activity, Volcanic Eruption
Lightning	Lightning, Lightning Strikes, Electrocution
Thunderstorm	Thunderstorm, Thunderstorm/Heavy Rains
Tornado/Strong Winds	Tornado, Tornado/Whirlwind, Whirlwinds/Tornadoes, Strong Winds
Storm Surge/High Wave	Giant Waves, Big Waves, High Tide, Storm Surge, Sea Swelling
Landslides/Lahar	Landslides, Soil Erosion, Soil Movement & Visible Cracks, Mudflow (Lahar), Rockfall
Drought	Dry Spell, Drought, Effects of El Niño
Mining Incident	Mining Incident, Mining-related Incidents
Other Meteorological Disaster	Frost, Bad Weather
Others	Pest Infestation, Bird Strikes

(2) Recorded Items

The following items are recorded for each type of disaster (Table AN-2.1.3).

Table AN-2.1.3 Contents of the Disaster Damage Data

Items	Remarks
Type/Name of Disaster	All recorded data are available.
Name of Region Affected	All recorded data are available excluding disaster by Typhoons.
Date of Disaster	All recorded data are available.
Human Suffering	
Dead	All recorded data are available.
Injured	All recorded data are available.
Missing	All recorded data are available.
People Affected by Disaster	
No. of Families	All recorded data are available.
No. of Affected People	All recorded data are available.
Evacuees	
No. of Families Evacuating	All recorded data are available.
No. of Evacuees	All recorded data are available.
No. of Evacuation Centres Operated	Except for data in 2005 and 2006, all recorded data are available.
Expenses for Emergency Operation (Million PHP)	Data are only available for 2005 and 2006.
No. of people receiving relief money	Data are only available for 2005 and 2006.
Damaged Houses	
Totally Damaged	All recorded data are available.
Partially Damaged	All recorded data are available.
Damage Amount	
Infrastructure	All recorded data are available.
Crops	All recorded data are available.
Private and Commercial	All recorded data are available.
Total	All recorded data are available.

As shown in Table AN-2.1.3, most of the records are available from January 2005 to September 2014 except for the number of evacuation centers in operation, expenses for emergency operations, and the number of people receiving relief funds.

(3) Disaster Data by Region

It is difficult to analyze the disaster situation of each region using the above database. Therefore, the study team collected situation reports and/or media information recorded on the web in order to grasp the situation of each region. However, in cases where the data were insufficiently available, the damage of the whole country was distributed equally to each affected region.

(4) Disasters Set as "Huge Disasters" in this Study

Because large-scale disasters cause outstanding damage, the study team omitted "Huge Disasters" in order to clarify the tendencies of damages caused by small- and medium-scale disasters. The disasters shown in Table AN-2.1.4 were considered as huge disasters in this study.

Table AN-2.1.4 Huge Disasters since 2005

Type of Disaster	Name of Disaster	Date of Occurrence	Reasons as "Huge Disaster"
Typhoon	Milenyo	2006/09/25~29	These names of Typhoons were retired due to huge damages.
	Reming	2006/11/28~12/02	
	Cosme	2008/05/15~19	
	Frank	2008/06/18~23	
	Ondoy	2009/09/24~27	
	Pepeng	2009/09/30~10/10	
	Juan	2010/10/15~20	
	Bebeng	2011/05/06~10	
	Juaning	2011/07/24~28	
	Mina	2011/08/21~29	
	Pedring	2011/09/24~28	
	Sendong	2011/12/14~18	
	Pablo	2012/12/02~09	
	Labuyo	2013/08/09~13	
	Santi	2013/10/08~13	
	Yolanda	2013/11/06~09	
	Glenda	2014/07/13~17	
	Jose	2014/08/02~07	
	Mario	2014/09/17~21	
Monsoon	2012-Habagat	2012/08/03~08	7-day Rainfall Amount was 1,177mm in total between 2012/08/02~08 (Science Garden Sta., PAGASA)
Earthquake	Bohol EQ	2013/10/15	Epicentral Earthquake of Mw7.2

ANNEX-2.2 Existing Risk Maps and Risk Assessment Results

〈 Hazard Maps introduced by Project NOAH 〉

URL(*)	http://noah.dost.gov.ph/#/		
Type of Disaster	Target Area	Outline	Others
Flood Hazard Map	Basically Nationwide. (But scattered)	Hazard Maps prepared by UP-DREAM Floods in 5-yr, 25-yr, 100-yr return periods for 18 major river basins	Intensities of Hazard are classified into 3 Categories: LOW (yellow): up to 0.5m inundation MEDIUM (orange): 0.5~1.5m HIGH (red): more than 1.5m
Landslide Hazard Map	Available for most of the LGUs	Landslide Hazards： showing unstable slopes and landslide extent Unstable Slopes： likely to collapse during heavy rainfall or strong earthquake Alluvia Fan Hazards： most likely to experience floods and debris flow	Classification of Hazards Red: No Dwelling Zone Orange: Build only with slope protection and intervention and continuous monitoring Yellow: Build only with continuous monitoring
Storm Surge Advisory	Available for most of the LGUs	Indication of Inundation Depth in case PSWS is issued as Advisory 1 ~ 4 In addition, actual inundation depths in Yolanda are also illustrated.	Classification of Hazard; LOW (yellow): up to 0.5m inundation MEDIUM (orange): 0.5~1.5m HIGH (red): more than 1.5m

(*) As of February 2016

〈 Hazard Maps introduced by PAGASA〉

Type	Target Area	Scale	Outline	URL(*)
Flood Risk Analysis	Metro Manila	Unknown	1/5, 1/10, 1/25, 1/50, 1/100, 1/200-year return periods Classification of Inundation: 0.1-0.5, 0.5-1.0, 1.0-2.0, 2.0-3.0, 3.0-4.0, and more than 4m	https://kidlat.pagasa.dost.gov.ph
Tropical Cyclone Severe Winds Floor Area	Metro Manila	Unknown	Classification of Collapse Ratio of Structures: 0.2%, 0.5%, 1%, 2% 5% under AEP Condition	https://kidlat.pagasa.dost.gov.ph
Tropical Cyclone Severe Winds Hazard Maps	Metro Manila	Unknown	Classification of Collapse Ratio of Structures: 0.2%, 0.5%, 1%, 2% 5% under AEP Condition	https://kidlat.pagasa.dost.gov.ph
Tropical Cyclone Severe Winds Damage Cost Area	Metro Manila	Unknown	Classification of Collapse Ratio of Structures: 0.2%, 0.5%, 1%, 2% 5% under AEP Condition	https://kidlat.pagasa.dost.gov.ph

(*)As of February 2016

Type	Target Area	Scale	Outline	URL(*)
Flood Hazard Map	Abra	1/ 10,000	Classification of Flood Hazard: 4 types as follows: High, Moderate, Low, Flash Flood Hazard Area	https://kidlat.pagasa.dost.gov.ph
	Antique			
	Baguio City, Benguet			
	La Trinidad, Benguet			
	Bohol			
	Bulacan			
	Cagayan			
	Cavite			
	Northern Cacite			
	Ilocos Sur			
	Iloilo			
	Isabela			
	Laguna			
	Calamba C., Laguna			
	Leyte			
	Pampanga			
	Rizal			
	Surigao del Norte			
	Surigao del Sur			
	Zambales			
	Albay	1: 15,000	Classification of Flood Hazard Area: 3 types as follows: High, Low, Moderate	https://kidlat.pagasa.dost.gov.ph
	Aurora			
	Marinduque			
	Quezon			
	Palawan	1: 50,000	Classification of Flood Hazard Area: 4 types as follows: Flashflood Prone, and High / Moderate / Low Susceptibility	https://kidlat.pagasa.dost.gov.ph
	Gen. Nakar, Quezon			
	Infanta, Quezon			
	Real, Quezon			
	Del Carmen, SurigaoDL			
	Pilar, SurigaoDL			
	San Benito, SurigaoDL			
	San Isidro, SurigaoDL			
	Siargao, Surigao DL			

(*)As of February 2016

〈 Hazard Maps introduced by DENR-MGB 〉

URL(*)	http://gdis.denr.gov.ph/mgbpublic/		
Type	Target Area	Outline	Others
Landslide and Flood Susceptibility Map (1:50,000)	Cover most of the nationwide	Prepared utilizing GIS Techniques based on Topographical and Geological Data with Historical Disaster Information	Classification; • High susceptibility to landslide: Red • Moderate susceptibility to landslide: Green • Low susceptibility to landslide: Yellow • High susceptibility to flooding: Purple • Low to Moderate susceptibility to flooding: Beige
Detailed Landslide and Flood Susceptibility Map (1:10,000)	Preparation for Prioritized Area recognized by MGB (already cover about 50% of the whole of the Philippines)	Prepared utilizing GIS Techniques based on Topographical and Geological Data with Historical Disaster Information Indication of Actual Areas of Landslides, Floods in the Past	Classification; • Very High landslide susceptibility: Brown • High landslide susceptibility: Red • Moderate landslide susceptibility: Green • Low landslide susceptibility: Yellow • Debris flow/ Possible accumulation zone: Hatched • Very high flood susceptibility: Dark Blue • High flood susceptibility: Blue • Moderate flood susceptibility: Purple • Low flood susceptibility: Grey

(*)As of February 2016

〈 Topographic and LiDAR Data implemented by UP-DREAM 〉

y: Conducted / Implemented

Region / Area	LiDAR	Ground Survey	Flood Hazard Map
1. Agno River	y	y	y
2. Cagayan River	y	y	y
3. Pampanga River	y	y	y
4A. Infanta River	y	y	y
4A. Lucena River	y	y	y
4B. Mag-asawang Tubig	y	y	y
5. Bicol River	y	y	y
6. Jalaur River	y	y	y
6. Panay River	y	y	y
7. Ilog-Hilabangan River	y	y	y
10. Iligan Mandulog Rivers	y	y	y
10. Agus Rivers	y	y	
10. CDO and Iponan Rivers	y	y	y
11. Davao River	y	y	y
11. Tagum River	y	y	y
13. Agusan	y	y	y
12. & ARMM Mindanao River	y	y	
12. Buayan-Malungon River	y	y	y
7. Bohol River	y		
11. Compostela Valley River	y	y	
3. Angat River		y	
7. Boracay		y	
11. Hijo River		y	
6. Iloilo River		y	

〈 Hazard Maps introduced by PHIVOLCS 〉

URL(*)	http://121.58.211.38/index.php?option=com_content&view=article&id=379&Itemid=500023			
Type	Target	Scale	Outline-1	Outline-2
Philippine Fault Zone Maps	Northern Luzon	1: 50,000	1 sheet	Indicating Active Faults classified into; Solid line: Trace certain Dashed line: trace approximate Dotted line: Trace concealed Hachures: indicate downthrown area (Thin Hatched): Probable trace of active fault (Version 2010)
	Central Luzon	1: 50,000	7 sheets	
	Infanta	1: 50,000	1 sheet	
	Guinayangan	1: 50,000	1 sheet	
	Bondoc Peninsula	1: 50,000	7 sheets	
	Masbate Island	1: 50,000	4 sheets	
	Leyte Island	1: 50,000	12 sheets	
	Eastern Mindanao	1: 50,000	21 sheet	
Active Faults and Trenches	All Regions	Unknown	Region I, CAR, Region II, Region III, NCR, Region IV A, Region IV B, Region V, Region VI, Region VII, Region VIII, Region IX, Region X, Region XI, Region XII, Region XIII, ARMM	Active Fault Solid line: Trace is certain Dashed line: trace is approximate Approximate offshore projection Transform fault Convergence Zone Trench Collision Zone (Version 2008)
Earthquake-induced Landslide Hazard Map	All Regions	Unknown	Region I, CAR, Region II, Region III, NCR, Region IV A, Region IV B, Region V, Region VI, Region VII, Region VIII, Region IX, Region X, Region XI, Region XII, Region XIII, ARMM	Classification by 5 Categories as follows; 0.04%G, MMI: VI, PEIS: VI 0.07%G, MMI: VII, PEIS: VII 0.15%G, MMI: VIII, PEIS: VIII 0.3 %G, MMI: IX, PEIS: VIII 100% (Not Susceptible) (Version 2008)
Liquefaction Susceptibility Map	Nationwide	Unknown	Areas susceptible to liquefaction	
	Metro Manila		Areas of high hazard Areas of moderate hazard Areas of low or no hazard (Version 2010)	

(*)As of February 2016

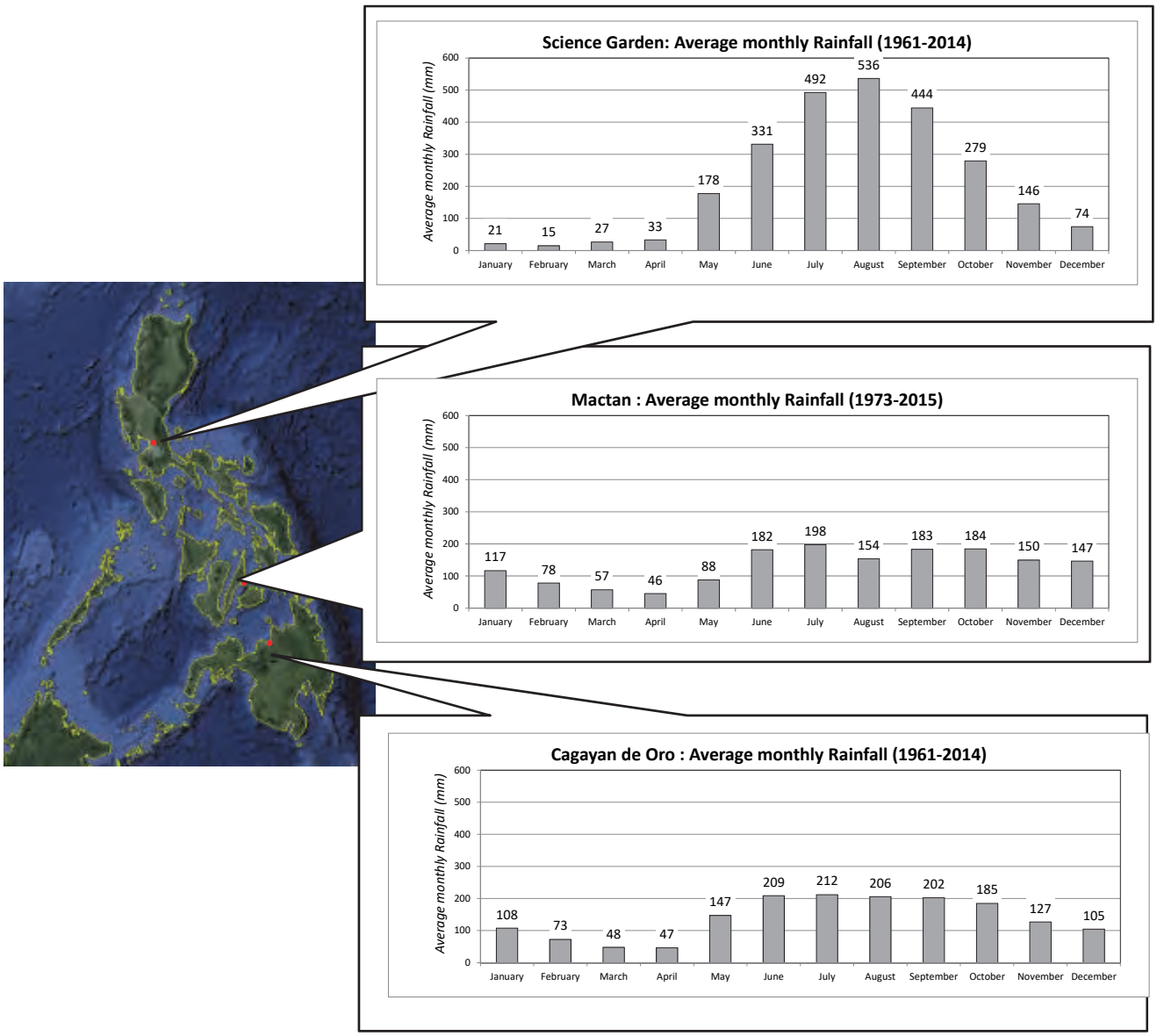
Type	Target	Scale	Outline-1	Outline-2
Tsunami Prone Areas	Region I	1: 50,000	Ilocos Norte, Ilocos Sur, La Union, Pangasinan	Based on Expected Earthquakes in each target area, Tsunami Heights were estimated and indicated in the Maps (Version 2007)
	Region II		Batanes, Cagayan, Isabela	
	Region III		Aurora, Bataan, Zambales	
	Region IV A		Batangas, Cavite, Quezon	
	Region IV B		Mindro Island, Palawan	
	Region V		Albay, Camarines Norte, Camarines Sur, Catanduanes, Sorsogon	
	Region VI		Aklan, Antique, Guimaras, Iloilo, Negros Occidental	
	Region VII		Bohol, Negros Oriental, Siquijor	
	Region VIII		Eastern Samar, Northern Samar, Leyte Island	
	Region IX		Zamboanga City, Zamboanga del Norte, Zamboanga del Sur, Zamboanga Sibugay	
	Region X		Camiguin, Lanao del Norte	
	Region XI		Davao del Sur, Davao Oriental	
	Region XII		Sarangani, South Cotabato, Sultan Kudarat	
	Region XIII		Surigao del Norte, Surigao del Sur	
	ARMM		Basilan, Lanao del Sur, Maguindanao, Sulu, Tawi Tawi	
Earthquake Risk Maps	Metro Manila	As of April 2015, No information on the web	Total Floor Area in Collapsed Damage State	In case of Magnitude 6.5 West Valley Fault Earthquake, Damage Risks were shown (Version 2014)
			Total Floor Area in Complete Damage State with no Collapse	
			Estimated Economic Loss	
			Estimated Number of Fatalities	
			Total Floor Area in Collapsed Damage State	In case of Magnitude 7.2 West Valley Fault Earthquake, Damage Risks were shown on the Maps (Version 2014)
			Total Floor Area in Complete Damage State with no Collapse	
			Estimated Economic Loss	
			Estimated Number of Fatalities	

ANNEX-2.3 Tendencies of Rainfall Patterns

The study team used the daily rainfall data of the following three stations to understand the tendencies of rainfall patterns and effects of El Niño and La Niña.

Table AN-2.3.1 Rainfall Stations used by this Study

No.	Zone	Station	Data Availability
1	Luzon	Science Garden	1961 - 2014
2	Visayas	Mactan	1973 – 2015
3	Mindanao	Cagayan de Oro Lumbia Airport	1961 – 2014



Source: Google Earth

Figure AN-2.3.1 Location of Rainfall Stations

(1) Luzon（Science Garden）

In order to check the trends of rainfall since 1961, total annual rainfall and maximal daily rainfall were shown in Figures AN 2-3.2 and AN 2-3.3. The data in 1976 was removed due to insufficient available data.

The following tendencies were observed.

- Although the total annual rainfall alternates between low and high amounts, it has recently shown an upward trend.
- Annual maximum daily rainfall has also had an increasing tendency even though a tremendous maximum daily rainfall in 2009, due to Typhoon Ondoy, was removed from this analysis.

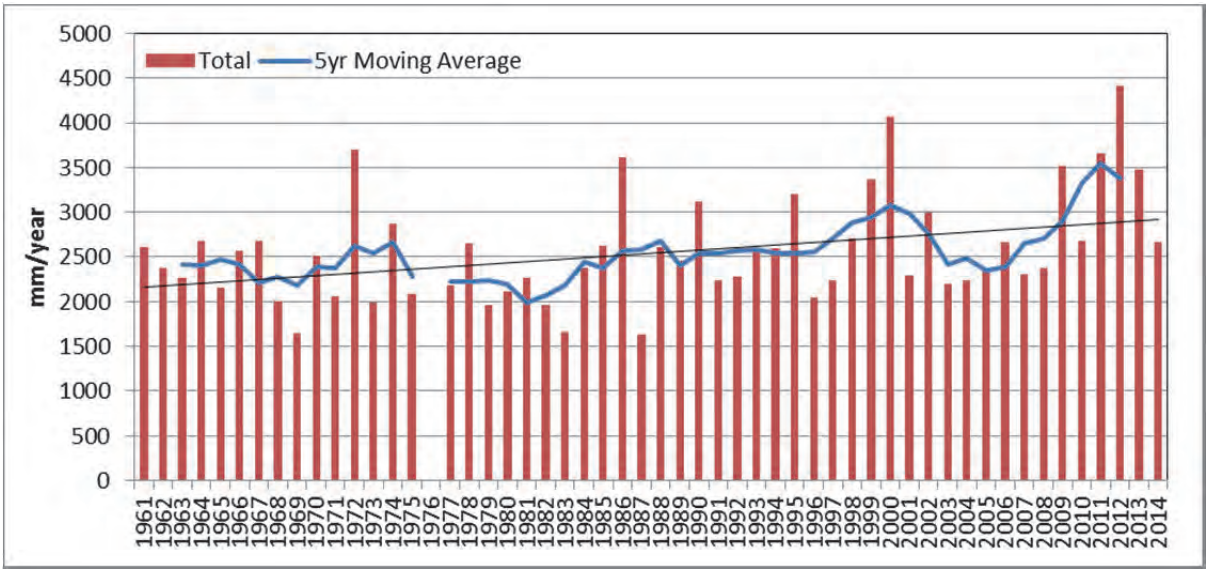


Figure AN-2.3.2 Total annual rainfall l(Science Garden)

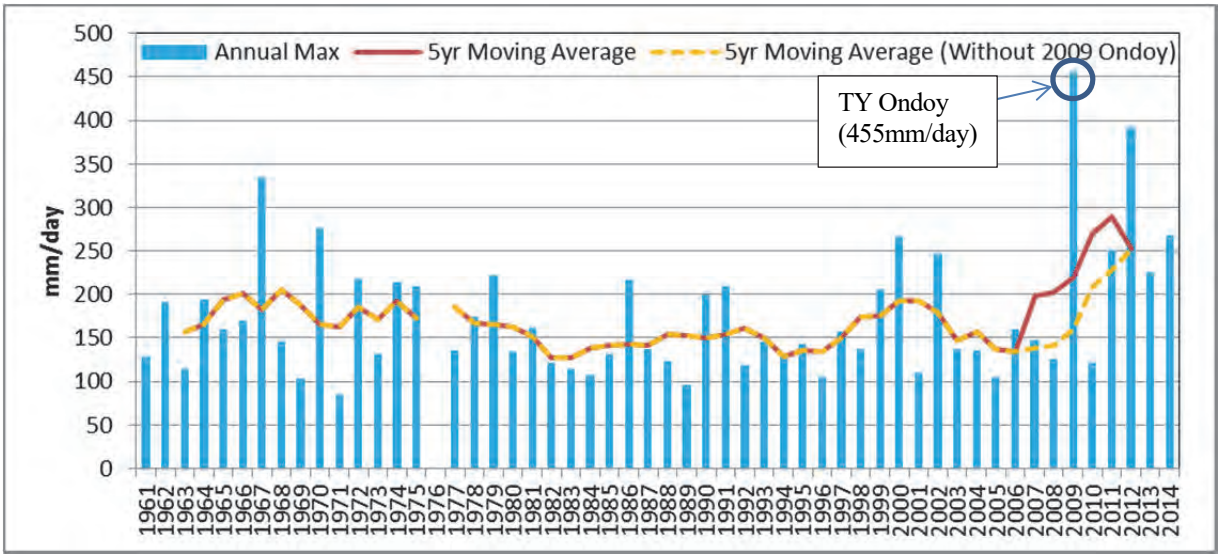


Figure AN-2.3.3 Maximal daily rainfall (Science Garden)

(2) Visayas（Mactan）

The graphs of total annual rainfall and maximal daily rainfall were shown in Figures AN 2-3.4 and AN 2-3.5.

- Although the total annual rainfall generally alternates between low and high amounts, it is increasing as a long-term trend.
- It is recognized that annual maximum daily rainfall has a lightly increasing tendency.

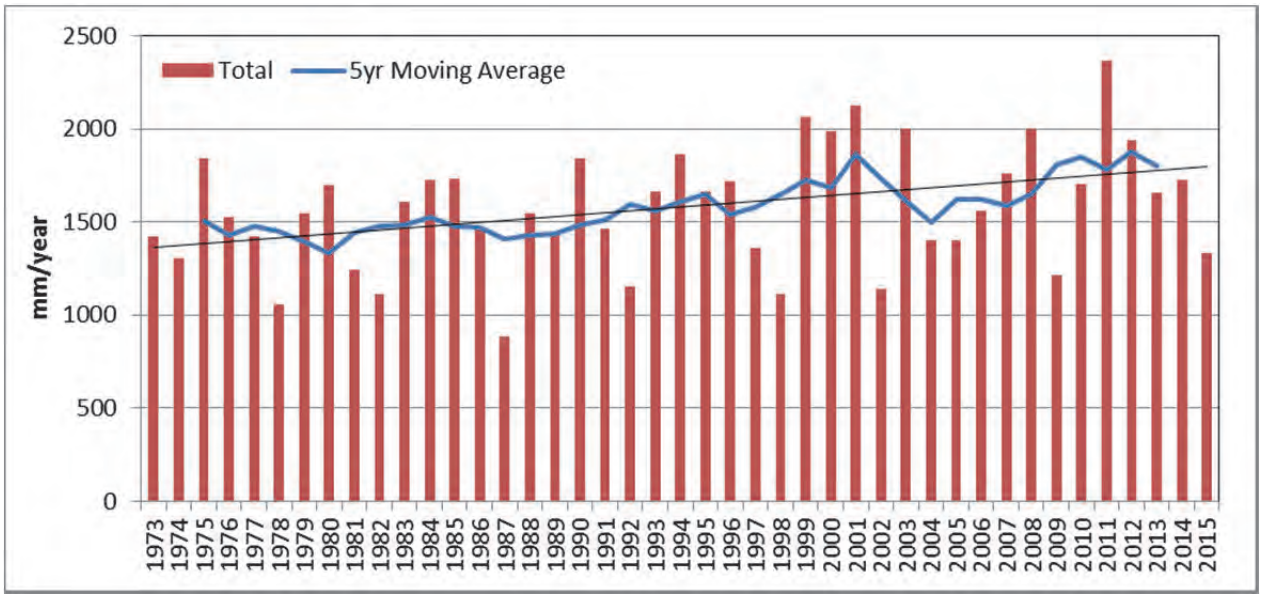


Figure AN-2.3.4 Total annual rainfall (Mactan)

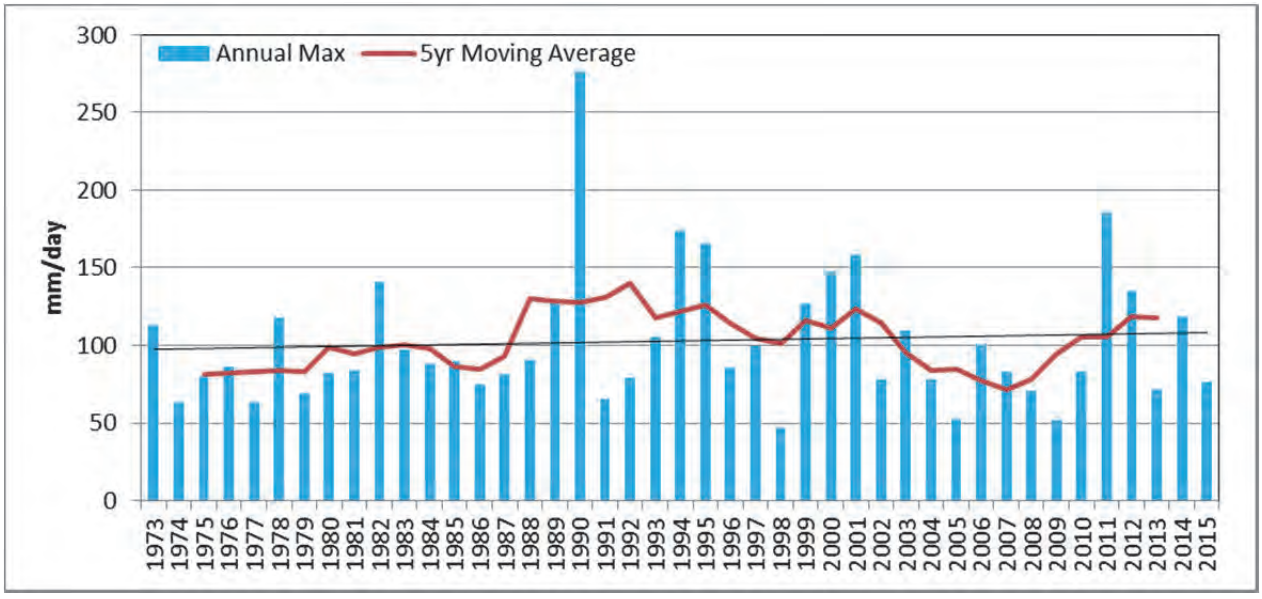


Figure AN-2.3.5 Maximal daily rainfall (Mactan)

(3) Mindanao（Cagayan De Oro）

The graphs of total annual rainfall and maximal daily rainfall were shown in Figures AN 2-3.6 and AN 2-3.7. The data for the year 2008 was removed due to insufficient available data.

- Although the total annual rainfall alternates between low and high amounts, it is increasing as a long-term trend. In particular, the average of annual rainfall amounts after 2009 has drastically increased.
- Annual maximum daily rainfall also has a slightly increasing tendency as a long-term trend.

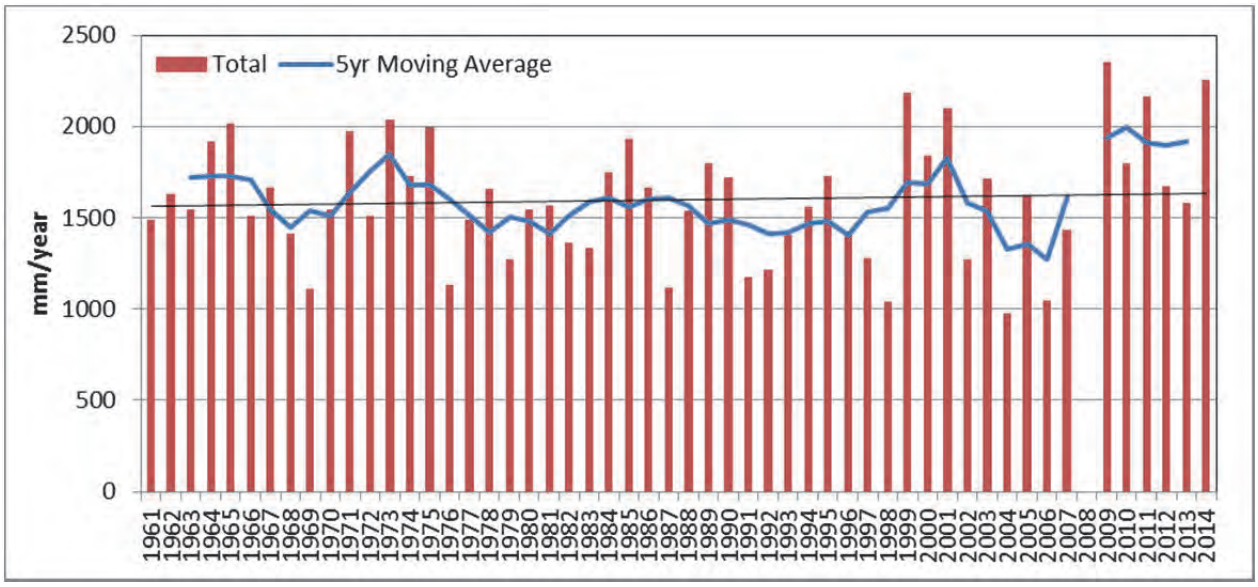


Figure AN-2.3.6　Total annual rainfall（Cagayan de Oro、Lumbia Airport）

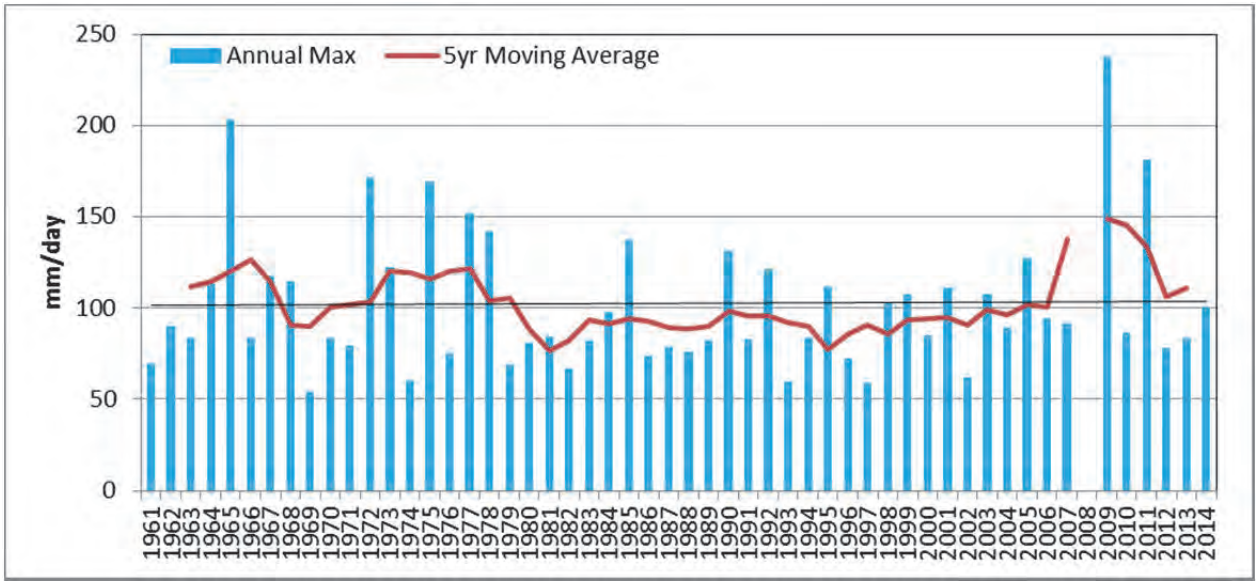


Figure AN-2.3.7　Maximal Daily Rainfall（Cagayan de Oro、Lumbia Airport）

(4) Relationship between Rainfall and El Niño / La Niña

As confirmed in previous sections, observed rainfalls at three stations have increasing and/or intensifying trends. These phenomena can be related to El Niño or La Niña. In this connection, the relationship or influence of El Niño or La Niña was studied. According to the Japan Meteorological Agency (JMA), the definitions of El Niño and La Niña are as follows:

> The definition of El Niño (La Niña) is such that the 5-month running mean sea surface temperature (SST) deviation for NINO.3 (5°S-5°N,150°W-90°W) continues 0.5°Cc(-0.5°C) or higher (lower) for 6 consecutive months or longer. The NINO.3 SST deviation is defined as deviation from the latest sliding 30 year. The SST data set is COBE-SST, made by JMA.
>
> Winter, spring, summer, and autumn are defined as December to February, March to May, June to August, and September to November, respectively.
>
> (http://ds.data.jma.go.jp/tcc/tcc/products/elnino/ensoevents.html)

In addition, the occurrences of El Niño and La Niña in the past are enumerated in Table AN-2.3.2.

Table AN-2.3.2 Occurrences of El Niño and La Niña

El Nino	La Nina
	Summer 1949~ Summer 1950
Spring 1951 ~ Winter 51/52	
Spring 53 ~ Autumn 53	Spring 54 ~ Winter 55/56
Spring 57 ~ Spring 58	
Summer 63 ~ Winter 63/64	Spring 64 ~ Winter 64/65
Spring 65 ~ Winter 65/66	Autumn 67 ~ Spring 68
Autumn 68~ Winter 69/70	Spring 70 ~ Winter 71/72
Spring 72 ~ Spring 73	Summer 73 ~ Spring 74
	Spring 75 ~ Spring 76
Summer 76 ~ Spring 77	
Spring 82 ~ Summer 83	Summer 84 ~ Autumn 85
Autumn 86 ~ Winter 87/88	Spring 88~ Spring 89
Spring 91 ~ Summer 92	Summer 95 ~ Winter 95/96
Spring 97~Spring 98	Summer 98 ~ Spring 2000
Summer 2002 ~ Winter 02/03	Autumn 2005 ~ Spring 06
	Spring 07 ~ Spring 08
Summer 2009 ~ Spring 10	Summer 10 ~ Spring 11
Summer 2014~	

Source: JMA (http://www.data.jma.go.jp/gmd/cpd/data/elnino/learning/faq/elnino_table.html)

The relationships between El Niño / La Niña and total annual rainfall and maximal daily rainfall are shown in the following figures. Some findings are shown as follows.

- Total annual rainfall and maximum daily rainfall appear to be lower at the time of or about 1 year after the occurrence of El Niño.
- Total annual rainfall and maximum daily rainfall tend to increase about 2 years after the occurence of La Niña.

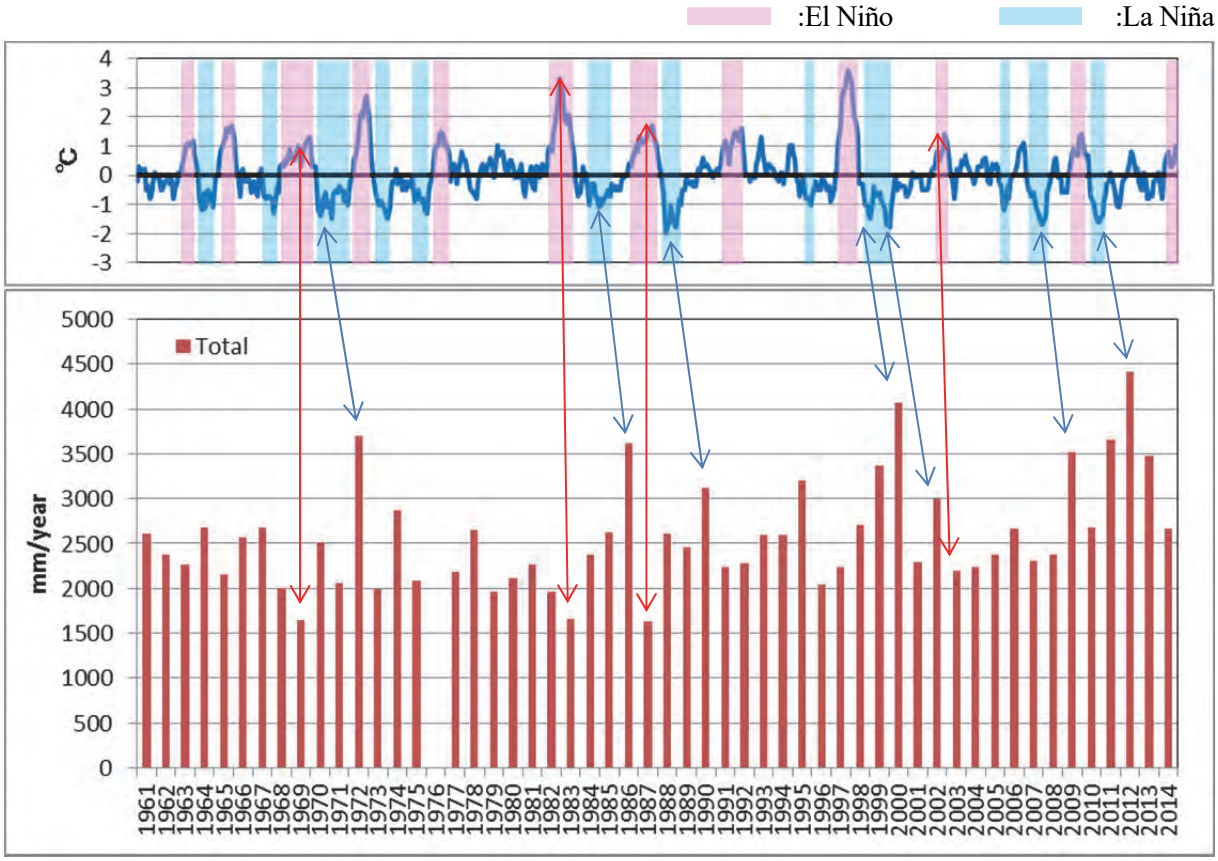


Figure AN-2.3.8 Relation between Annual Rainfall and El Niño / La Niña (Science Garden)

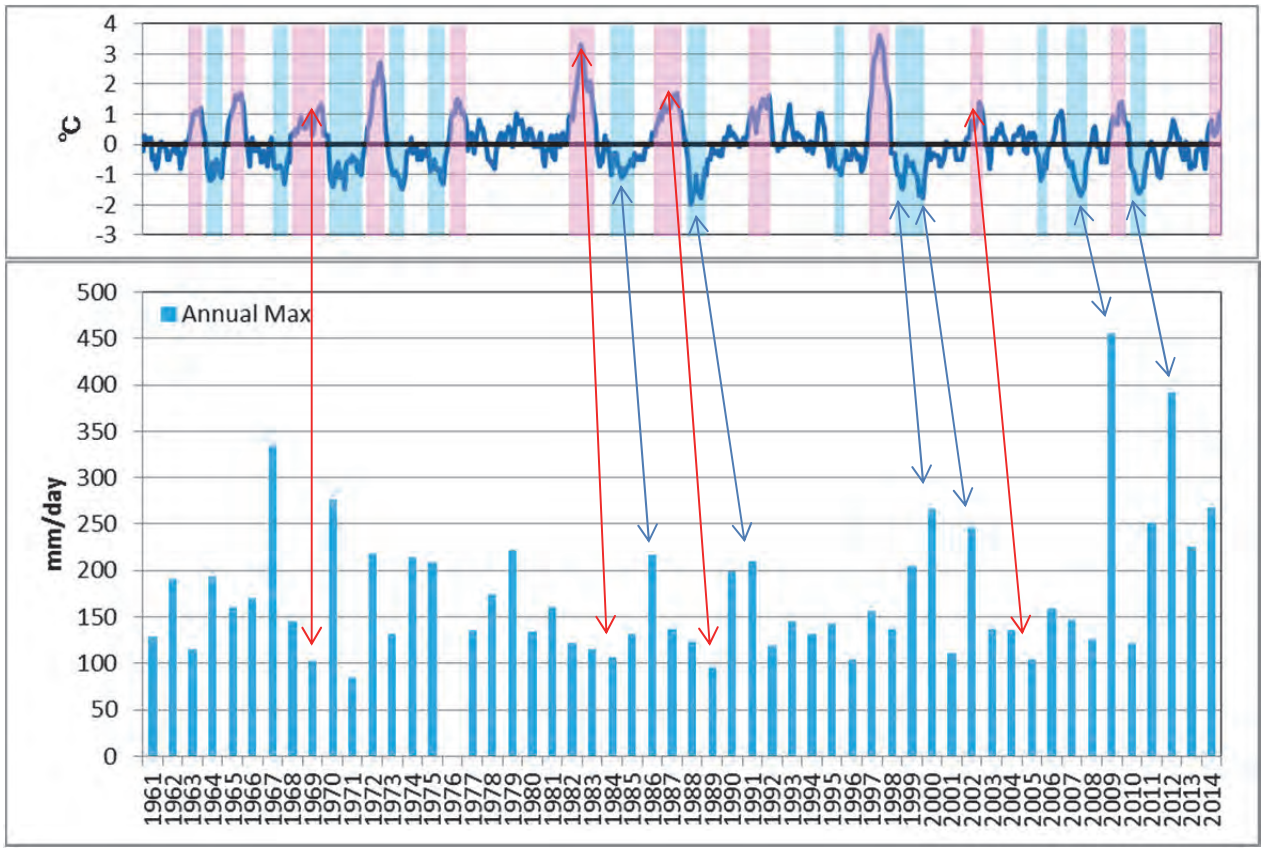


Figure AN-2.3.9 Relation between Max. Daily Rainfall and El Niño / La Niña (Science Garden)

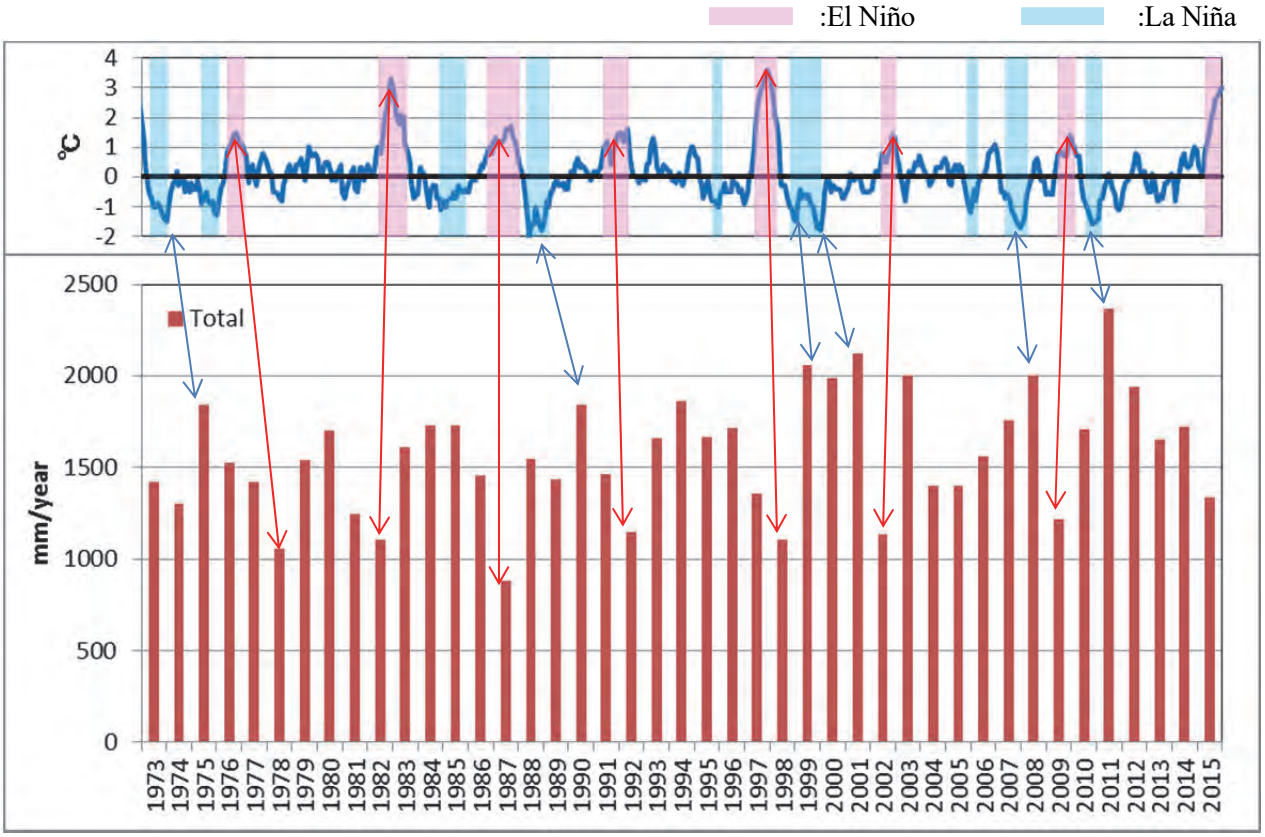


Figure AN-2.3.10 Relation between Annual Rainfall and El Niño / La Niña (Mactan)

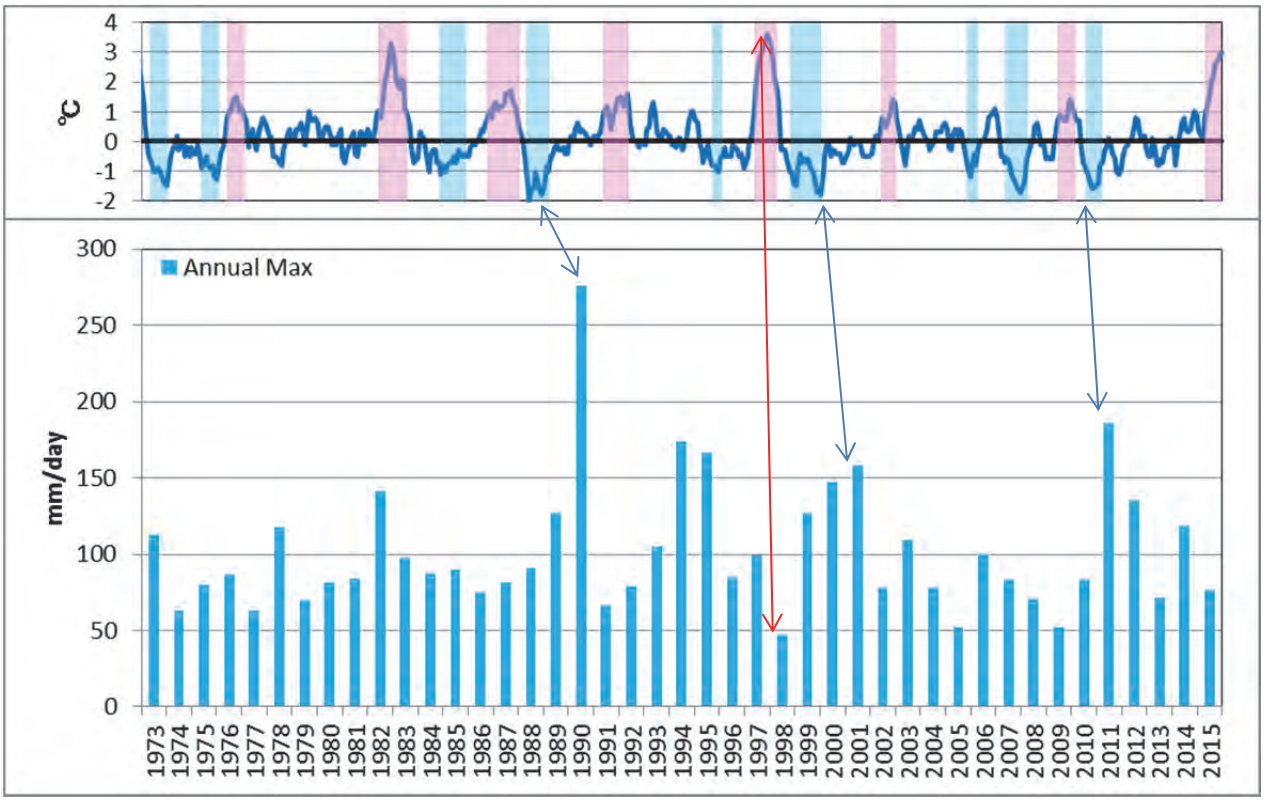


Figure AN-2.3.11 Relation between Max. Daily Rainfall and El Niño / La Niña (Mactan)

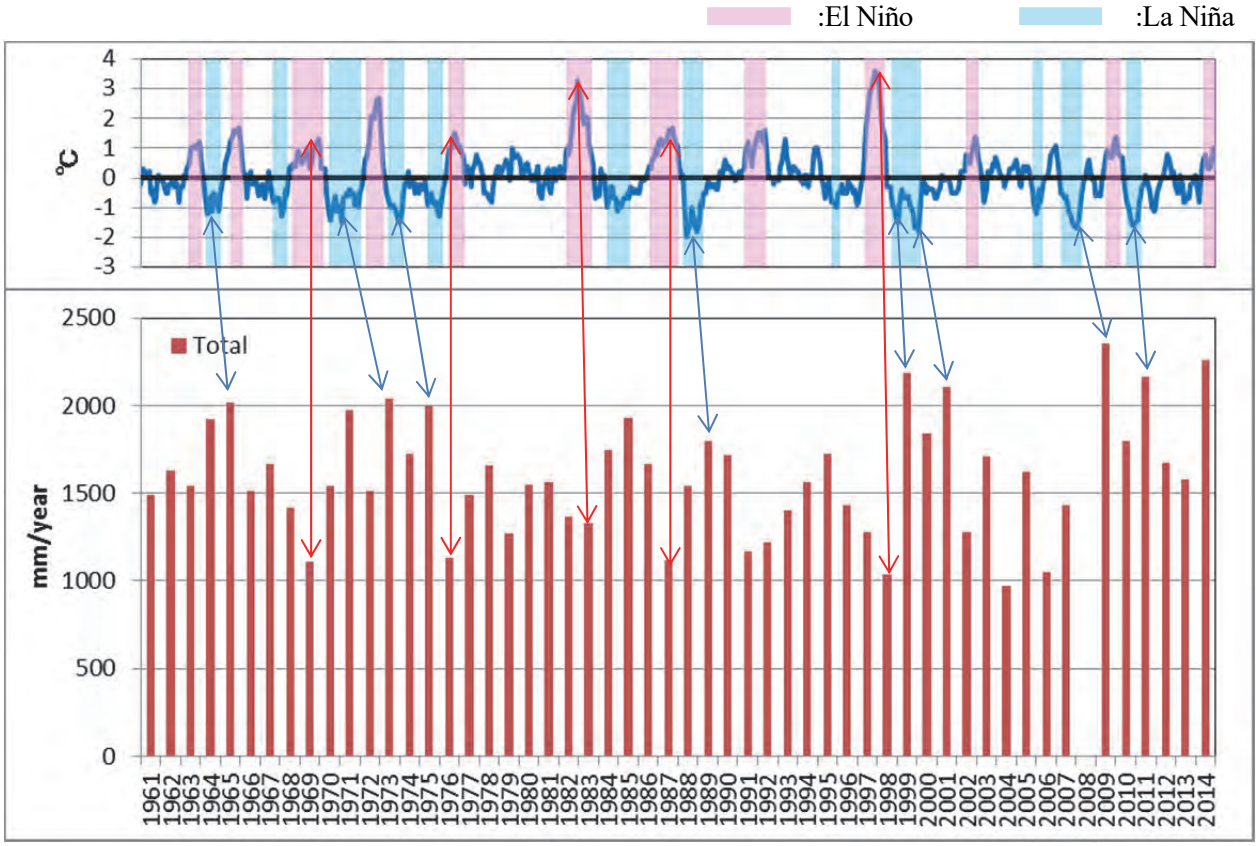


Figure AN-2.3.12 Relation between Annual Rainfall and El Niño / La Niña (CDO)

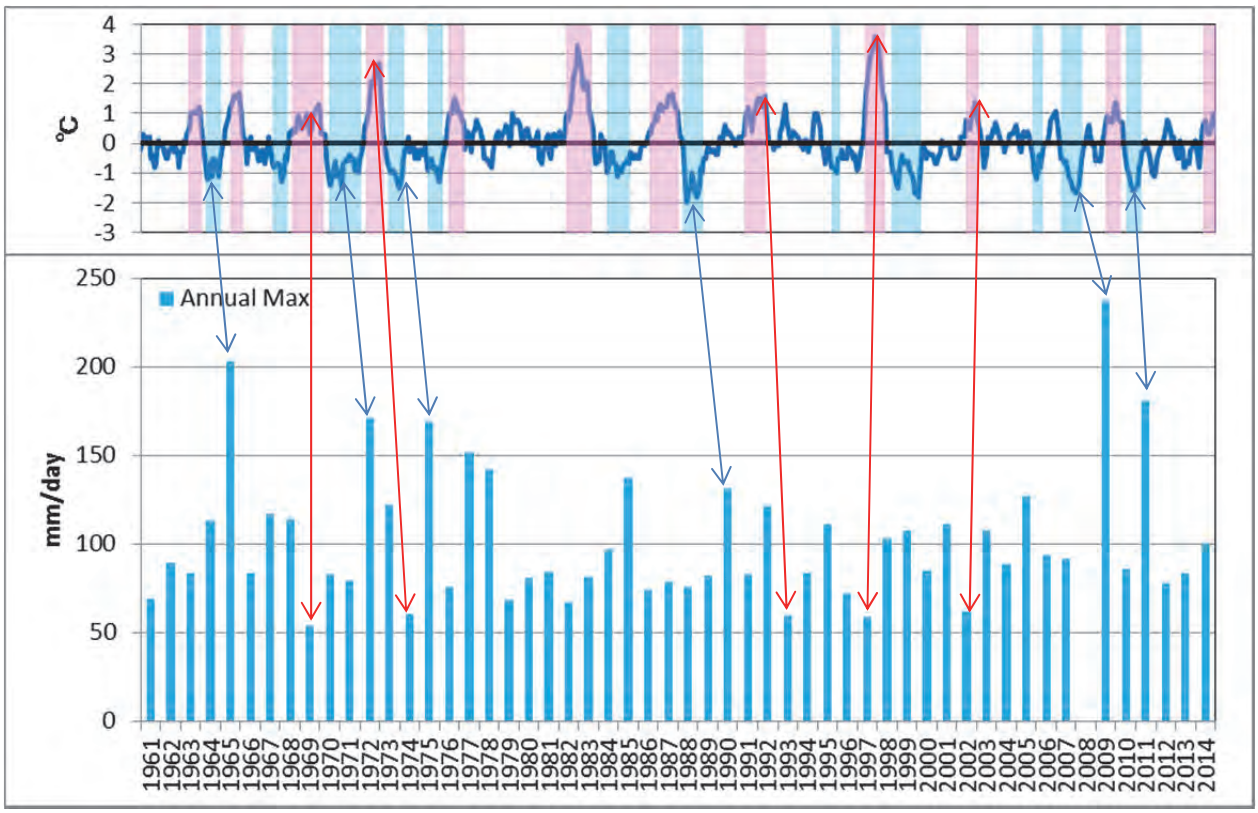


Figure AN-2.3.13 Relationship between Max. Daily Rainfall and El Niño / La Niña (CDO)

ANNEX-3.1 List of Manuals Prepared by Project-ENCA

	Title	Date of Publication
1	Technical Standards and Guidelines for Planning and Design Vol I : Flood Control	Mar, 2002
2	Technical Standards and Guidelines for Planning and Design Vol II : Urban Drainage	Mar, 2002
3	Technical Standards and Guidelines for Planning and Design Vol III : Sabo(Erosion and Sediment Movement Control) Works	Mar, 2002
4	Technical Standards and Guidelines for Planning and Design Vol IV : Natural Slope Failure Countermeasures	Mar, 2002
5	Technical Standards and Guidelines for Planning and Design Discharge Rating Curves	Mar, 2002
6	Manual on Investigation of Damaged Structures	Mar, 2002
7	Profile of Damaged Flood Control Structures	Dec, 2002
8	Profile of Damaged Flood Control Structures (2nd Edition)	Mar, 2003
9	Manual on Flood Control Planning	Mar, 2003
10	Specific Discharge Curve Rainfall Intensity Duration Curve Isohyet of Probable 1-day Rainfall	Mar, 2003
11	Manual on Runoff Computation with HEC-HMS	Mar, 2003
12	Manual on Non-Uniform Flow Computation with HEC-RAS	Mar, 2003
13	Typical Design Drawings - Flood Control Structures	Mar, 2003
14	Manual on Design of Flood Control Structures	Mar, 2003
15	Manual on Construction Supervision of Flood Control Projects	Dec. 2004
16	Manual on Maintenance of Flood Control and Drainage Structures	Apr. 2005
17	Technical Standards and Guidelines for Design of Flood Control Structures	Jun. 2010

ANNEX 3.2 Floods control projects in major river basins

River Basin		Current Statuses for Flood Control				Issues
		F/P M/P (Year / Donor / Protection Level)	F/S (Year / Donor / Protection Level)	D/D (Year / Donor / Protection Level)	Implementation (Year / Donor / Protection Level)	
Major	Cagayan	1982/MPWH, OECF 1987/JICA (25-year but 100-yr for Framework Plan)	FFWS: F/S: 1977/JICA 2002/JICA (25-yr) 2010/JICA (Erosion Protection)	Magat Dam: -1984/NIA FRIMP-CTI: 2014/DPWH, JICA (25-yr)	Magat Dam: 1984/NIA Dam FFWS(2): 1994/ OECF, NIA FRIMP-CTI:2015~/DPWH, JICA(Dike: 25-yr)	In FRIMP (JICA Loan), Only Revetment works for erosion will be implemented around Tuguegarao City and Suburbs.
Major	Mindanao	1974/OTCA 1980/MPW 1982/MPWH(25-yr) 2012/DPWH (Local Consultant) (25-yr)	1980/MPW 2012/DPWH(Local Consultant) (25-yr)	2016/DPWH(Local Consultant), (Scheduled) (25-yr)	Installation of Hydro-Meteorological Monitoring Equipment by NPGA	In lower stretches, no flood control works have been implemented due to expansive swampy areas. In case Bangsamoro autonomous government is established, flood control works for Cotabato City are imperative because The City is the most important capital for Region. The Mindanao River Flood Control is one of the most important project in DPWH M/P, F/S, D/D conducted by Local Consultant shall be reviewed.
Major	Agusan	1982/MPWH,OECF (Lower: 100-yr, Middle & Upper: 25-yr) Upper Agusan: 1984/MPWH 1980/MPW	1980/MPW	Lower Agusan: 1983/MPWH, OECF	Lower Agusan: 1989-99/MPWH, OECF (30-yr) Lower Agusan(II): 1997-2004/DPWH, JBIC (30-yr) NPGA	PAGASA: Hoping that JICA will provide assistance in putting equipment in Agusan and Cotabato River Basins as these are the two biggest River Basins in Mindanao
Major	Pampanga	FFWS: M/P: 1970,1972/ OTCA 1982/MPWH,OECF (100-yr for Flood Control Plan, but 20-yr for Short-term plan) IWRM : 2011/JICA (5~20-yr)	1982/JICA	1989/DPWH, OECF（20-yr）	Angat Dam: 1968/NPC, ADB FFWS: 1973/JICA Grant-Aid Pantabangan Dam: 1976/NIA, IBRD Improving FFWS:1981/JICAGrant-Aid Dam FFWS: 1982/ OECF, NPC, NIA Phase-I: 1991~2001 /DPWH, JBIC (20-yr) Phase-II: 2000's /DPWH, JICA (20-yr) Phase-III: 2005~2010 /DPWH, JICA (20-yr) Flood Control along Downstream Stretch of the Pampanga River by Korean Government	Flood Control works have been done along only lower portions Constructions of retarding basins and river training works in middle-upper stretches have not been implemented. The works of Phase-II and Candaba Flood Control Project are one prioritised projects of DPWH (U-PMO and FCSEC)
Major	Agno	1982/MPWH,OECF 1991/JICA Framework Plan: Agno River incl. Tarlac (100-yr), Agno Tributaries (50-yr), Long Term Plan(Target Year: 2010: Agno River incl. Tarlac and Agno Tributaries (25-yr), Priority Project: Upper Agno River and Pantal-Sinocalan River (10-yr)	F/S: 1977/JICA 1991/JICA (10-yr)	1994/DPWH,OECF(10-yr)	Ambuklao Dam: -1957/NPC Binga Dam: -1960/NPC FFWS: 1982/ OECF, PAGASA Dam FFWS(2): 1994/ OECF, NPC Phase-I: 1995~2003/DPWH, JBIC (10-yr) Phase-II: 1998~/DPWH, JBIC (10-yr) Phase-IIB: 2001~/DPWH, JBIC (10-yr)	No Flood Control works in upper stretches (Phase-II) has been implemented.
Major	Abra			PAGASA：The Abra telemetry system bid process is on-going.		DPWH intends to formulate M/P and F/S.
Major	Pasig- Laguna Bay	1979/MPWTC/OECF 1983/MPWH, IBRD 1990/JICA(100-yr, Short-term Plan: 30-yr) Drainage: 2004/JICA 2012/WB	Hydraulic Control of Laguna de Bay: 1970/UNDP, ADB MCGS, Mangahan Floodway: 1975/DPWH, USAID All Rivers 1990/JICA(30-yr, (100-yr: including Marikina Dam)) Mangahan Floodway to Marikina Br. Phase-IV: 2015/DPWH(GOP) (100-yr: including Marikina Dam)) Upper Marikina (Dam / Retarding Basin) 2015-2017/WB ((100-yr))	North Laguna: 1993/DPWH, OECF KAMANAVA:2001/DPWH, JBIC Phase-I:2002/JBIC (Delpan Br. ~ Marikina Br.) Phase-III: 2013/JICA (Revetment of Pasig River Napindan Channel to MCGS) Phase-V: 2015/DPWH (GOP): Marikina Br. ~ San Mateo Bridge Integrated flood forecasting and early warning system: 2015-2017/WB	Metro Manila Pumping Stations: 1973/OECF (10-yr) Napindan Hydraulic Control Structure: 1985/MPWH, ADB Pumping Station(II): 1988/OECF Mangahan Floodway: 1988/DPWH, OECF Drainage Improvement: 1991/DPWH, JICA EFCOS (FFWS): 1993/DPWH, OECF Manila Drainage: 1998/DPWH, OECF Improvement of EFCOS (FFWS): 2002/JICA Grant Aide West Mangahan: 2007/DPWH, JBIC (Lake Dike: 40-yr, Drainage: 5-yr) KAMANAVA: 2009/DPWH, JBIC (River 30-yr, Drainage: 10-yr) Pgase-II: 2012/DPWH, JBIC (Delpan Br. ~ Napindan Channel) Early Warning and Response System: 2012/ KOICA Phase-III: 2013~On going/ DPWH, JICA (Revetment of Pasig River, Napindan Channel to MCGS) Resilience Project	Under WB Fund, DPWH has planned to undertake F/S and D/D of Marikina Dam and Retarding Basins in Upper Marikina River. DPWH also requested JICA the Implementation of Pasig-Marikina Phase-IV Project (Rosario Weir ~ Sto. Nino).

River Basin		Current Statuses for Flood Control				Issues
		F/P M/P (Year / Donor / Protection Level)	F/S (Year / Donor / Protection Level)	D/D (Year / Donor / Protection Level)	Implementation (Year / Donor / Protection Level)	
Major	Bicol	1974/JICA 1975/AIT 1982/MPWH, OECF(50-yr) 1983/MPWH 1991/DPWH, ADB 2003/NEDA,WB	F/S: 1977/JICA		FFWS: 1986/ OECF, PAGASA NPGA	Due to perennial floods, agricultural areas with poor areas have been affected. It is supposed that flood control projects are implemented under WB.
Major	Abulug					DPWH intends to formulate M/P and F/S.
Major	Tagum-Libuganon			PAGASA: JICS has funding for installation of equipment for Tagum and in South Cotabato	FFWS-PAGASA	DPWH intends to formulate M/P and F/S.
Major	Ilog-Hilabangan	1982/MPWH, OECF 1991/JICA (100-yr (Urgent: 25-yr))	Hilabangan, Binalbagan and Pacuan-Hinoba-an Hydro Power: 1996-/NPC, KFW 2010/JICA: (Kabankalan : 25-yr)			Water Resource Development in Upper Areas is also important and prioritised. Flood control will be included as one of activities of Integrated Water Resources Management. Flood Control works along priority stretches are one of priority works of DPWH.
Major	Panay	1982/MPWH, OECF 1985/JICA 1st Stage: 10-yr (by 1995), 2nd Stage: 25-yr (by 2015) 3rd Stage:100-yr (by 2030)	2002/JETRO (25-yr)			Urgent flood protection works of 100 kms of main river course from rivermouth are required since floods cause inundation more than 5 meters in depth. Flood Control works along priority stretches are one of priority works of DPWH.
Major	Tagoloan	1982/MPWH, OECF(25-yr)	2010/JICA	FRIMP-CTI: 2014/DPWH, JICA (25-yr)	FRIMP-CTI:2015~/DPWH, JICA (25-yr) FFWS- NPGA	
Major	Agus				Early Warning and Monitoring System: 2008/ KOICA	DPWH intends to formulate M/P and F/S.
Major	Davao					DPWH intends to formulate M/P and F/S.
Major	Cagayan De Oro	2014/JICA 25-yr (50-yr after completion of Dam)	2014/JICA 25-yr (50-yr after completion of Dam)	2016~/DPWH, JICA: 25-yr (50-yr after completion of Dam)		As a series of FRIMP (JICA Loan), Flood Control Project will be implemented.
Major	Jalaur	1982/MPWH, OECF(25-yr) 1996-/NIA, JICA			Early Warning and Monitoring System: 2008/ KOICA RIMES	DPWH intends to formulate M/P and F/S.
Major	Buayan-Malungun					DPWH intends to formulate M/P and F/S.
Principal	Amnay- Patrick	1982/MPWH, OECF(25-yr) 1984/MPW	1984/MPWH			Floods including sediment disasters have devastated this river basin. Sediment Control Works are needed. However, it is supposed that benefit of sediment control projects is smaller due to small beneficial population (Information in2008).
Principal	Iloilo	1995/JICA(50-yr)	1995/JICA (50-yr)	2000/DPWH, JBIC (50-yr)	2012/DPWH, JICA (20-yr)	The implementation of Stage-2 consisting of upgrading flood protection level of Jaro River (25 to 50-yr) and city drainage improvement has not been started.
Principal	Laoag	1982/MPWH,OECF 1997/JICA (25-yr)	1979/JICA 1997/JICA (25-yr)	Phase-I : -1987/NIA, OECF (Irrigation Project) 2001/DPWH, JBIC (25-yr)	1987/NIA, OECF (Irrigation Project) 2001~2009/DPWH, JBIC (25-yr)	In 2015, heavy flood occurred and river facilities constructed by JICA Loan Project were damaged.
Principal	Cavite Canas	2009/JICA 2016/JICA Long Term: 50yr Short Term:25-yr	2009/JICA 2016/JICA (25-yr)			
Principal	Cavite Ilang-Ilang	2009/JICA 2016/JICA Long Term: 50-yr, Short Term: 25-yr)	2009/JICA 2016/JICA (25-yr)	Only Retarding Basins: FRIMP-CTI(#SA1): (25-yr) 2016/DPWH(GOP) (25-yr)		
Principal	Cavite Imus	2009/JICA 2016/JICA Long Term: 50-yr, Short Term: 25-yr)	2009/JICA 2016/JICA (25-yr)	Only Retarding Basins: FRIMP-CTI: 2014/DPWH, JICA (25-yr)	Only Retarding Basins: FRIMP-CTI:2015~/DPWH, JICA (25-yr)	
City	Cebu City	1995/JICA (50-yr)	1995/JICA			
City	Ormoc City	1995/JICA (50-yr)	1995/JICA (50-yr)	Phase-I: 1997/JICA (50-yr) Phase-II: 1998/JICA (50-yr) Rehabilitation: 2007/JICA	Phase-I: 1999/JICA (50-yr) Phase-II: 2001/JICA (25-yr) Rehabilitation: 2007/JICA	

ANNEX 3.3 Historical Flood Control Activities in the Philippines in the Past