Project for Strengthening Institutional and Policy Framework on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Integration [ASEAN]

Final Report

February 2018

Japan International Cooperation Agency

Institute for Global Environmental Strategy
CTI Engineering International Co., Ltd.

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List of Abbreviations and Acronyms

A		
AADMER	:	ASEAN Agreement on Disaster Management and Emergency Response
ADCP	:	Acoustic Doppler Current Profiler (Lao PDR)
ADPC	:	Asian Disaster Preparedness Center
AHA Center	:	ASEAN Coordination Centre for Humanitarian Assistance on disaster management
AR4	:	Intergovernmental Panel on Climate Change Fourth Assessment Report
AR5	:	Intergovernmental Panel on Climate Change Fifth Assessment Report
ASEAN	:	Association of South East Asian Nations
ASTER	:	Advanced Spaceborne Thermal Emission and Reflection Radiometer
B		
BAPPENAS	:	Badan Perencanaan Pembangunan Nasional/National Development Planning Agency (Indonesia)
BCA	:	Building and Construction Authority (Singapore)
BDMD	:	Brunei Darussalam Meteorological Department
BKT	:	Banjir Kanal Timur/ East Floodway (Indonesia)
BMA	:	Bangkok Metropolitan Administration (Thailand)
BMKG	:	Badan Meteorologi, Klimatologi, Dan Geofisika/Indonesian Agency for Meteorology, Climatology and Geophysics
BNPB	:	Badan Nasional Penanggulangan Bencana/National Disaster Management Agency (Indonesia)
BPBD	:	Badan Penanggulangan Bencana Daerah/Regional Disaster Management Agencies (Indonesia)
BPIW	:	Badan Pengembangan Infrastruktur dan Wilayah/Regional Infrastructure Development Agency (Indonesia)
C		
CC	:	Climate Change
CCA	:	Climate Change Adaptation
CCAP	:	Climate Change Adaptation Project (Lao PDR)
CCC	:	Climate Change Commission (Philippines)
CCDM	:	Commune Committee for Disaster Management (Cambodia)
CCCO	:	Climate Change Coordination Office (Thailand)
CCMP	:	Climate Change Master Plan (Thailand)
CCNDPC	:	Central Committee for Natural Disaster Prevention and Control (Vietnam)
CCPD	:	Climate Change Programme Department (Singapore)
CCSP	:	Climate Change Strategic Plan (Cambodia)
CDMC	:	Central Disaster Management Centre (Thailand)
D		
DCC	:	Department of Climate Change (Cambodia)
DCDM	:	District Level: District Committee for Disaster Management (Brunei) / District Committee for Disaster Management (Cambodia)
DDMCC	:	Department of Disaster Management and Climate Change (LaoPDR)
DDMRC	:	District Disaster Management and Relief Committee (Malaysia, Myanmar)
DDPM	:	Department of Disaster Mitigation and Prevention (Thailand)
DDR	:	Disaster Risk Reduction
DEM	:	Digital elevation model
DENR	:	Department of Environment and Natural Resources (Philippines)
DGCC	:	Directorate General of Climate Change (Indonesia)
DGWR	:	Directorate General of Water Resources (Indonesia)
DHI	:	Danish Hydraulic Institute

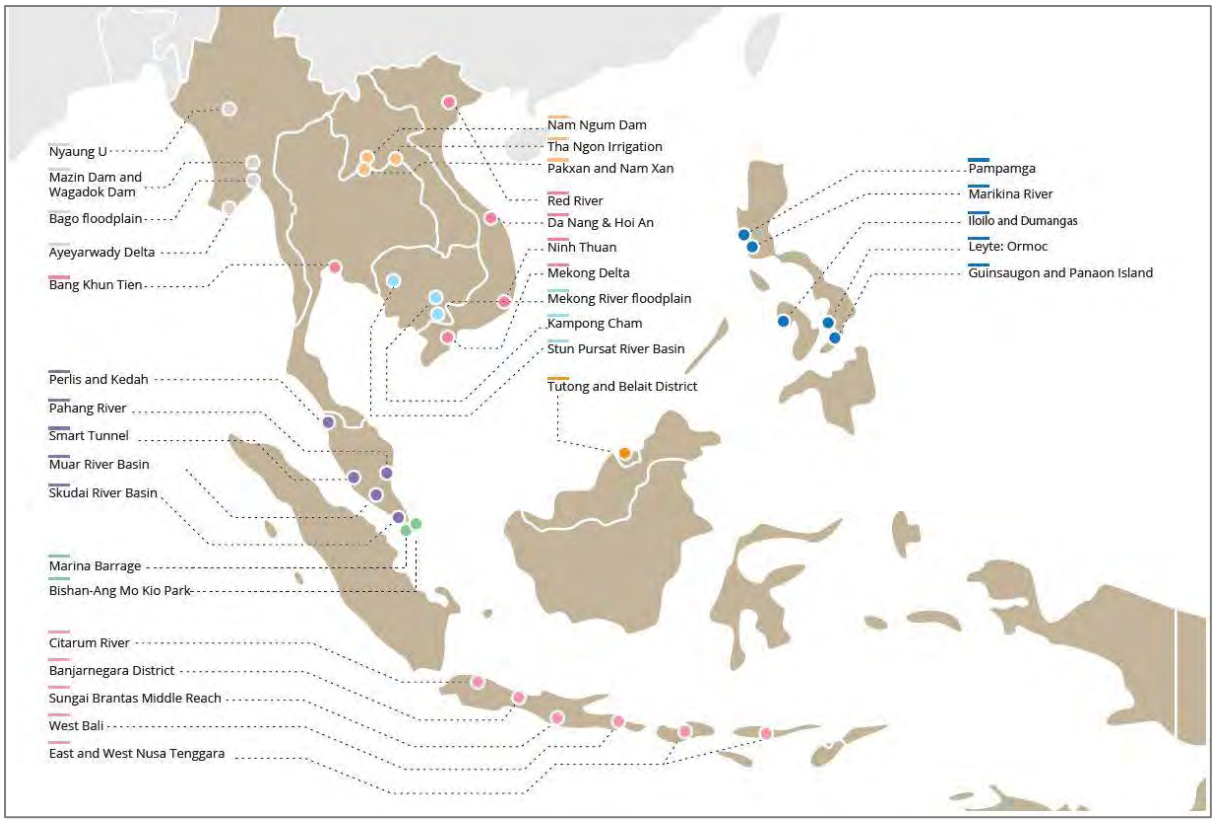
DHRW	:	Department of Hydrology and River Works (Cambodia)
DID	:	Department of Irrigation and Drainage (Malaysia)
DLA	:	Department of Legal Affair (Vietnam)
DLR	:	German Aerospace Center
DMC	:	Disaster Management Centre (Vietnam)
DMD	:	Disaster Management Division (Lao PDR)
DMH	:	Department of Meteorology and Hydrology (Lao PDR, Myanmar)
DMHCC	:	Department of Meteorology, Hydrology and Climate Change (Vietnam)
DMR	:	Department of Mineral Resources (Thailand)
DMRC	:	Disaster Management and Relief Committee (Malaysia)
DMSC	:	Department of Medical Sciences (Indonesia)
DNDPC	:	Department of Natural Disaster Prevention and Control (Vietnam)
DOF	:	Department of Finance (Philippines)
DOM	:	Department of Meteorology (Cambodia)
DOST	:	Department of Science and Technology (Philippines)
DPWH	:	Department of Public Works and Highways (Philippines)
DRM	:	Disaster Risk Management
DRR	:	Disaster Risk Reduction
DSW	:	Department of Social Welfare (Lao PDR)
DWIR	:	Directorate of Water Resources and Improvement of River System (Myanmar)
DWR	:	Department of Water Resources (Lao PDR, Thailand)
DWR	:	Directorate of Water Resources (Viet Nam)
DWRM	:	Department of Water Resources Management (Vietnam)
E		
EADS	:	European Aeronautic Defense and Space Company
ECD	:	Environment Conservation Department (Myanmar)
EIDPMO	:	Energy and Industry Department at the Prime Minister's Office (Brunei)
F		
FAO	:	Food and Agriculture Organization
G		
GCMs	:	Global Climate Models
H		
HDB	:	Housing and Development Board (Singapore)
HLURB	:	Housing and Land Use Regulatory Board (Philippines)
HWL	:	High water level
I		
ICCTF	:	Indonesia Climate Change Trust Fund (Indonesia)
IMCCC	:	Inter-Ministerial Committee on Climate Change (Singapore)
IMCSD	:	Inter-Ministerial Committee on Sustainable Development (Singapore)
IMHEN	:	Institute of Meteorology, Hydrology and Environment（Viet Nam）
INC	:	Initial National Communication
INDC	:	Intended Nationally Determined Contribution
IPCC	:	Intergovernmental Panel on Climate Change
IWA	:	Inland Waterways Administration (Vietnam)
IWUMD	:	Irrigation and Water Utilization Management Department (Myanmar)
J		
JKR	:	Jabatan Kerja Raya, Public Works Department (Malaysia)

JMG	:	Jabatan Mineral dan Geosains, Minerals and Geoscience Department (Malaysia)
JPS (DID)	:	Department of Irrigation and Drainage (Malaysia)
K		
KLHK	:	Kementerian Lingkungan Hidup dan Kehutanan (Indonesia)
KOICA	:	Korean International Cooperation Agency
KWABBN	:	Kumpulan Wang Amanah Bantuan Bencana Negara (Malaysia)
L		
LDRRMF	:	Local Disaster Risk Reduction and Management Fund (Philippines)
LDRRMP	:	Local Disaster Risk Reduction and Management Plan (Philippines)
LMB	:	Land Management Bureau (Philippines)
LGUs	:	Local Government Units
LRM	:	Landslide Risk Management
M		
MADA	:	Agricultural Development Authority (Malaysia)
MAF	:	Ministry of Agriculture and Forestry (Lao PDR)
MAFF	:	Ministry of Agriculture, Forestry and Fisheries (Cambodia)
MAPDRR	:	Myanmar Action Plan on Disaster Risk Reduction
MARD	:	Ministry of Agriculture and Rural Development (Vietnam)
MCCA	:	Myanmar Climate Change Alliance
MCCSAP	:	Myanmar Climate Change Strategy and Action Plan
MDPA	:	Myanmar Disaster Preparedness Agency
MMD	:	Malaysian Meteorological Department
MGB	:	Mines and Geosciences Bureau (Philippines)
MLSW	:	Ministry of Labour and Social Welfare (Lao PDR)
MMDA	:	Metropolitan Manila Development Authority (Philippines)
MOA	:	Ministry of Agriculture (Indonesia, Lao PDR)
MOAC	:	Ministry of Agriculture and Cooperatives (Thailand)
MOALI	:	Ministry of Agriculture and Irrigation (Myanmar)
MOE	:	Ministry of Environment (Cambodia)
MOEF	:	Ministry of Environment and Forestry (Indonesia)
MOF	:	Ministry of Finance (Vietnam)
MONRE	:	Ministry of Natural Resources and Environment (Lao PDR, Thailand, Vietnam)
MONREC	:	Ministry of Natural Resources and Environmental Conservation (Myanmar)
MOP	:	Ministry of Planning (Cambodia)
MOT	:	Ministry of Transport (Vietnam)
MOTC	:	Ministry of Transport and Communications (Myanmar)
MOWRAM	:	Ministry of Water Resources and Meteorology (Cambodia)
MPI	:	Ministers of Planning and Investment (Lao PDR, Vietnam)
MPWT	:	Ministry of Public Works and Transport (Cambodia, Lao PDR)
MRC	:	Mekong River Commission
MSS	:	Meteorological Service of Singapore
MSWRR	:	Ministry of Social Welfare, Relief and Resettlement (Myanmar)
MTC	:	Ministry of Transportation and Communications (Myanmar)
N		
NADMA	:	National Disaster Management Agency (Malaysia)
NAHRIM	:	National Hydraulic Research Institute Malaysia
NAMRIA	:	National Mapping and Resources Information Authority (Philippines)
NAPA	:	National Adaptation Programme for Action
NCCAP	:	National Climate Change Action Plan (Philippines)

NCCC	:	National Committee on Climate Change (Thailand, Vietnam)
NCCC	:	National Climate Change Committee (Cambodia)
NCCC	:	National Committee on Climate Change (Vietnam)
NCCC	:	National Steering Committee on Climate Change (Malaysia)
NCCS	:	National Climate Change Strategy (Singapore)
NCCS	:	National Climate Change Secretariat (Singapore)
NCDM	:	National Committee for Disaster Management (Cambodia)
NCDM	:	National Committee on Disaster Management (Brunei)
NCSD	:	National Council for Sustainable Development (Cambodia)
NDC	:	National Disaster Council (Brunei)
NDCH	:	National Disaster Command Headquarters (Thailand)
NDMC	:	National Disaster Management Centre (Brunei)
NDMC	:	National Natural Disaster Management Committee (Myanmar)
NDMO	:	National Disaster Management Office (Lao PDR)
NDMRC	:	National Disaster Management and Relief Committee (Malaysia)
NDPCC	:	National Disaster Prevention and Control Committee (Lao PDR)
NDPCC	:	National Disaster Preparedness Central Committee (Myanmar)
NDPMC	:	National Disaster Prevention and Mitigation Committee (Thailand)
NDPMP	:	National Disaster Prevention and Mitigation Plan (Thailand)
NDRRMC	:	National Disaster Risk Reduction and Management Council (Philippines)
NDRRMF	:	National Disaster Risk Reduction and Management Framework (Philippines)
NDRRMF	:	National Disaster Risk Reduction and Management Fund (Philippines)
NDRRMP	:	National Disaster Risk Reduction and Management Plan (Philippines)
NEA	:	National Environment Agency (Singapore)
NESDB	:	National Economic and Social Development Board (Thailand)
NESDP	:	National Economic and Social Development Plan (Thailand)
NHMS	:	National Hydro-Meteorological Service (Vietnam)
NIA	:	National Irrigation Administration (Philippines)
NIES	:	National Institute for Environmental Studies (Japan)
NMPCC	:	National Master Plan on Climate Change (Thailand)
NOAA	:	National Oceanic and Atmospheric Administration (USA)
NOAH	:	Nationwide Operational Assessment of Hazards (Philippines)
NPCC	:	National Policy on Climate Change (Malaysia)
NPDRR	:	National Platform for Disaster Risk Reduction (Malaysia)
NRE	:	Ministry of Natural Resources and Environment (Malaysia)
NSC	:	National Security Council (Malaysia)
NSCC	:	National Strategy on Climate Change (Lao PDR, Vietnam)
NSCCC	:	National Steering Committee on Climate Change (Lao PDR)
NSD	:	National Security Division (Malaysia)
NSDP	:	National Strategic Development Plan (Cambodia)
NSEDP	:	National Socio-Economic Development Plan (Lao PDR, Indonesia)
NSFCC	:	National Strategic Framework on Climate Change (Philippines)
NSNDPRM	:	National Strategy for Natural Disaster Prevention, Response and Mitigation (Vietnam)
NSPDRM	:	National Strategic Plan on Disaster Risk Reduction (Lao PDR)
NTP-RCC	:	National Target Programme to Respond to Climate Change (Vietnam)
NWRB	:	National Water Resources Board (Philippines)
O		
OCD	:	Office of the Civil Defence (Philippines)
ONEP	:	Office of Natural Resources and Environmental Policy Planning (Thailand)
P		
PAGASA	:	Philippine Atmospheric Geophysical and Astronomical Services Administration (Philippines)

PASPI	:	Environmental Management and Climate Change Division (Malaysia)
PCDM	:	Provincial Committee for Disaster Management (Cambodia)
PDP	:	Philippine Development Plan
PHIVOLCS	:	Philippine Institute of Volcanology and Seismology
PMO	:	Prime Minister's Office (Brunei)
PSF	:	People's Survival Fund (Philippines)
PU	:	Kementerian Pekerjaan Umum dan Permahan Rakyat/Ministry of Public Works (Indonesia)
PUB	:	Public Utilities Board (Singapore)
PVMBG	:	Pusat Vulkanologi dan Mitigasi Bencana Geologi/Center for Volcanology and Geological Hazard Mitigation (Indonesia)
PWD	:	Public Works Department (Brunei)
R		
RAN-API	:	National Action Plan on Climate Change Adaptation (Indonesia)
RAN-GRK	:	National Action Plan for GHG Emission Reduction (Indonesia)
RBCO	:	River Basin Control Office (Philippines)
RBM	:	River Basin Management
RENAS PB	:	National Disaster Management Plan (Indonesia)
RID	:	Royal Irrigation Department (Thailand)
RIMES	:	Regional Integrated Multi-Hazard Early Warning System for Africa and Asia
RKN	:	National Development Plan (Brunei)
RM	:	River Management
RPJMN	:	National Medium-Term Development Plan (Indonesia)
RPJPN	:	National Long-Term Development Plan (Indonesia)
RRD	:	Relief and Resettlement Department (Myanmar)
S		
SCCCC	:	Stakeholders Consultative Committee on Climate Change (Brunei)
SCDF	:	Singapore Civil Defence Force
SEDP	:	Socio-economic Development Plan (Vietnam)
SIWRP	:	Southern Institute for Water Resources Planning (Vietnam)
SNAP	:	Strategic National Action Plan for Disaster Risk Reduction (Brunei)
SNAP	:	Philippine Strategic National Action Plan for Disaster Risk Reduction
SNAPDRR	:	Strategic National Action Plan for Disaster Risk Reduction (Cambodia)
SRM	:	Storm/Storm Surge Risk Management
T		
TGO	:	Greenhouse Gas Management Organisation (Thailand)
TMD	:	Thai Meteorological Department
U		
UNDP	:	United Nations Development Programme
UNFCCC	:	United Nations Framework Convention on Climate Change
UP	:	University of the Philippines
V		
VAST	:	Viet Nam Academy of Science and Technology (Viet Nam)
W		
WFP	:	World Food Program
WREA	:	Water Resources and Environment Administration (LaoPDR)
WRM	:	Water Resource Management

Map of Sites Visited



Sites visited by the JICA Project Team

Photos

National Workshop (Myanmar) No.1

National Workshop (Myanmar) No.2

National Workshop (Myanmar) No.3

National Workshop (Viet Nam) No. 1

National Workshop (Viet Nam) No. 2

National Workshop (Viet Nam) No. 3

National Workshop (Philippines) No.1

National Workshop (Philippines) No.2

National Workshop (Philippines) No.3

6th PSC Meeting (Bangkok)

Regional Forum (Bangkok) No.1

Regional Forum (Bangkok) No.2

Regional Forum (Bangkok) No.3

Preparatory meeting of SOLF (Bangkok)

Display at the ACDM Ministerial Meeting (Laos)

Banner of SOLF at the BNPB (Indonesia)

All participants of SOLF

Site Visit to AHA Centre for SOLF participants

Summary

1. Background and Project Outline

The Project for Strengthening Institutional and Policy Framework on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Integration (hereinafter, CN20 Project), which complies with the Concept Note (CN) 20 of the 21 Flagship and Priority Projects of the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme Phase 2 (2013-2015), as well as the Priority Programme 3. ADVANCE, A Disaster Resilient and Climate Adaptive ASEAN Community, AADMER Work Programme 2016-2020, has been implemented by a Project Team assigned by the Japan International Cooperation Agency (JICA) from July 2016 to January 2018 with the following aims, specific objectives and expected outputs:

Aims:

i. Strengthen institutional and policy frameworks for DRR and CCA
ii. Enhance the integrated planning for DRR through the implementation of national development plans and action plans that integrate DRR and CCA at all level
iii. Build partnership in linking DRR and CCA at all levels

Specific objectives:

a) Promote the development of umbrella laws and regulations that govern the integration and synchronisation of DRR and CCA in Member States
b) Foster relationships between national ministries and agencies responsible for DRR and CCA
c) Facilitate the establishment of a clear institutional and policy framework on DRR and CCA integration in Member States
d) Strengthen participatory risk assessment, incorporating disaster and climate risks as a basis for decision-making
e) Promote the development of joint funding mechanisms for both DRR and CCA at the national level
f) Support joint training, meetings, and other opportunities for increased interaction and cooperation among disaster and climate change practitioners

Expected outputs:

1. Documentation of good practices in institutional strengthening and policy development on linking DRR and CCA in ASEAN Member States
2. Assessment of the implementation of national action plans on DRR and CCA and the effectiveness of national platforms
3. Senior official-level roundtable discussions on policy and programme interventions to strengthen the connection and coherence of DRR and CCA efforts at all level

Targeted disasters and the assessment framework

Targeted disasters of the CN20 Project are the following three water-related ones:

- Storm and flood
- Rain-induced landslide (including slope failure, debris flow and mudflow)
- Drought

Based on the aims and specific objectives of the Concept Note 20, six assessment categories, which also correspond to the Priorities of Action of the Sendai Framework for Disaster Risk Reduction 2015-2030, were defined and used by the Project Team to assess the status of DRR and CCA integration in each ASEAN Member State as shown in Table 0.1. The six assessment categories are also highlighted in Figure 0.1, which illustrates four phases of DRR activities, namely institutional arrangement (categories 1, 2 and 3), risk assessment (category 4), planning and implementation (category 5) and monitoring and evaluation (category 6, capacity building, applies to all phases), and how climate change impact is incorporated in it and what elements are studied. These elements were extracted from the Sendai Framework and the AADMER Work Programme 2016-2020.

Table 0.1: Assessment categories of DRR and CCA integration

Key words* from the aims and specific objectives of the CN20 Project	Six assessment categories of DRR and CCA integration		Corresponding Priorities for Action of the Sendai Framework for DRR
Umbrella laws and regulations	Institutional and policy development	1. Policies, laws and regulations	Priority 2
Institutional and policy framework			
Relationships between national agencies responsible for DRR and CCA		2. Management system	
Partnership in linking DRR and CCA at all levels			
Joint funding mechanism		3.Financial arrangement	
Participatory risk assessment	4. Risk assessment		Priority 1
Integrated planning of DRR and CCA	5. Planning and implementation		Priority 3
Support joint training and meetings	6. Capacity building		Priority 1-4

* Key words are underlined in the previous page.

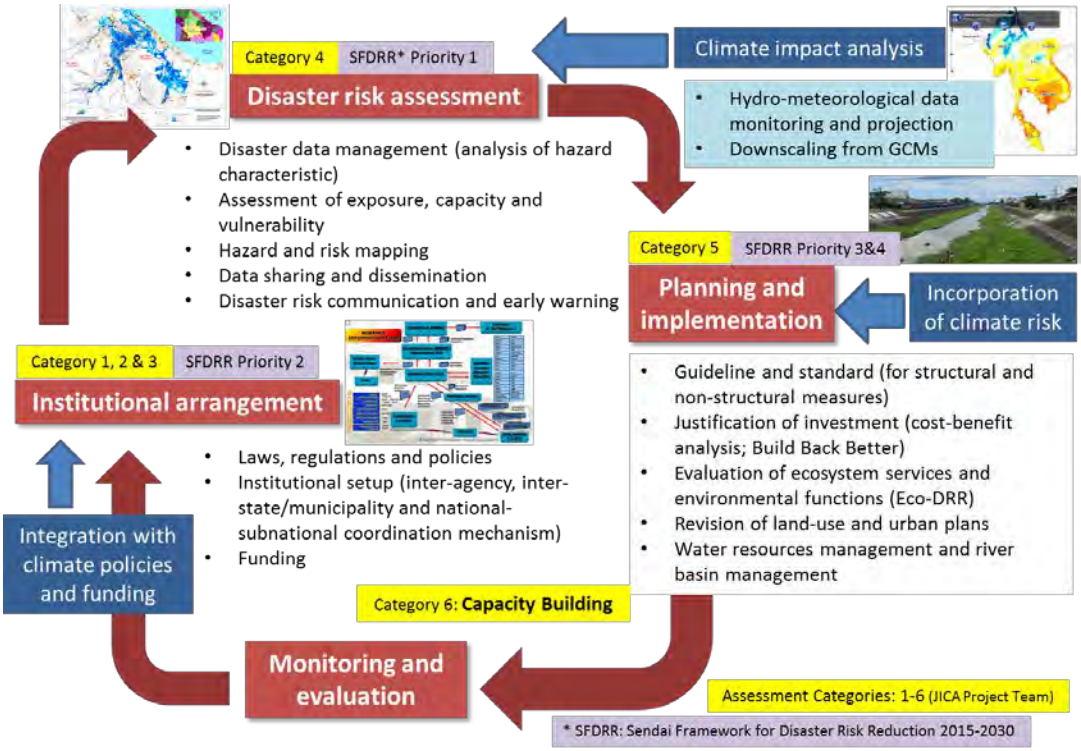


Figure 0.1: Incorporation of climate change impact in DRR activities
Source: JICA Project Team

Implementation schedule

The project period is roughly divided into following two phases:

- First phase (July 2016 – April 2017): Baseline study in ten Member States, for few days to maximum two weeks each, to assess the status of the DRR and CCA integration and to identify good practices
- Second phase (May 2017 – January 2018): Developing a Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration (hereinafter, Work Plan) through organising three National Workshops, a Regional Forum and a Senior Official-Level Forum (SOLF) for the consensus building

In between them, a total of seven Project Steering Committee (PSC) Meetings were held jointly with the Concept Note 18 (CN18) Project for Building Disaster and Climate Resilient Cities in ASEAN, another JICA-supported project, to share the progress and confirm the direction. The progress of the project was also reported at relevant ASEAN meetings including:

- The 30th ASEAN Committee on Disaster Management (ACDM) Meeting and the 4th AADMER Partnership Conference on 4 and 6 April 2017, respectively, in Vientiane, Lao PDR;
- The 8th Meeting of the ACDM Working Group on Prevention and Mitigation (WG P&M) on 7 September 2017 in Bangkok, Thailand;
- The 31st ACDM Meeting and the 5th ASEAN Ministerial Meeting on Disaster Management (AMMDM) on 17 and 19 October 2017, respectively, in Luang Prabang, Lao PDR; and
- The 20th ASEAN-Japan Summit on 13 November 2017 in Manila, the Philippines.

Project management structure

The CN20 Project is managed by the Project Steering Committee (PSC) comprising Co-Chairs of the ACDM Working Group on Prevention and Mitigation (WG P&M) [Co-Chaired by Lao PDR & Thailand], the Disaster Management and Humanitarian Assistance Division of the ASEAN Secretariat, the ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) and the JICA as illustrated in Figure 0.2.

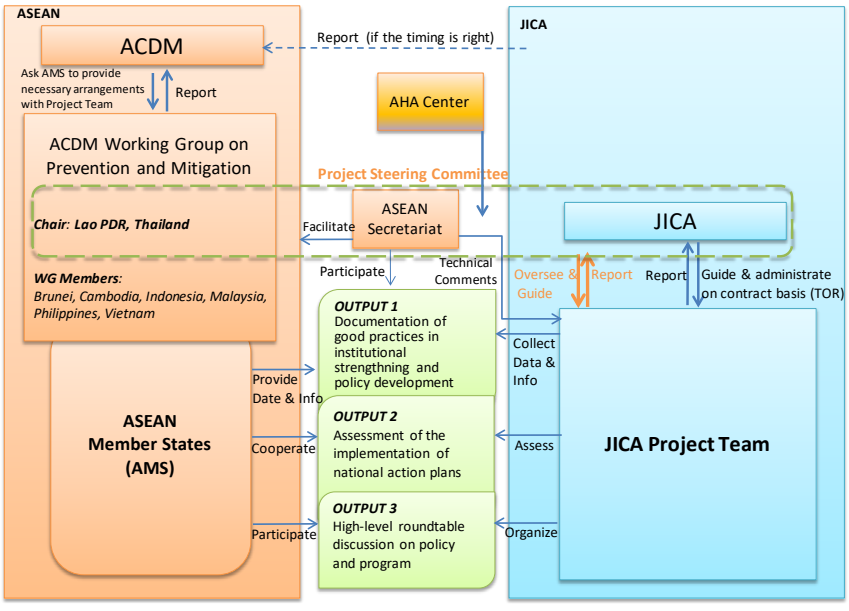


Figure 0.2: Project Management Structure

National project coordinators and their roles

Each ASEAN Member State appointed the ACDM members as the National Project Coordinator (NPC) as shown in Table 0.2 with the following tasks:

Table 0.2: National Project Coordinators

Brunei Darussalam	National Disaster Management Center (NDMC)
Cambodia	National Committee for Disaster Management (NCDM)
Indonesia	National Disaster Management Authority (BNPB)
Lao PDR	National Disaster Management Office (NDMO), Ministry of Labour and Social Welfare
Malaysia	National Disaster Management Agency (NADMA), Prime Minister's Office
Myanmar	Relief and Resettlement Department (RRD), Ministry of Social Welfare, Relief and Resettlement
The Philippines	Office of Civil Defense (OCD), National Disaster Risk Reduction and Management Council (NDRRMC), Department of National Defense
Singapore	Singapore Civil Defence Force (SCDF), Ministry of Home Affairs (MHA)
Thailand	Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior
Viet Nam	Department of Natural Disaster Prevention and Control (DNDPC), Ministry of Agriculture and Rural Development (MARD)

Tasks of the National Project Coordinators:

1) Make necessary appointments with DRR and CCA related ministries and agencies as requested by the Project Team and assist collecting relevant documents;
2) Provide ideas on the direction of the project and the way to conclude it;
3) Convene relevant ministries and agencies to the reporting back session organised by the Project Team after the field study and share the outputs with them;
4) Recommend relevant ministries and agencies to participate in the workshops and forums organised by the Project Team; and
5) Other relevant coordination and arrangements.

Project Team members

The JICA Project Team consists of the following members – two for storm and flood risk management and assessment, two for drought risk management and assessment, one for DRR and CCA related institutional matters, two for secretariat operation in Tokyo and Bangkok respectively, and a team leader:

Table 0.3: Project Team members

Name	Role	Name	Role
Toshizo Maeda	Team leader / DRR	Takehiko Ogawa	Organisations and legal institutions; CCA measures
Takashi Furukawa	Storm and flood risk management/ assessment (hydrology and civil engineering)	Prabhakar Sivapuram	Drought risk management/ assessment (hydrology and agriculture)
Binaya Raj Shivakoti	Storm and flood risk management/assessment (non-structural measures)	Hirokazu Sakai	Drought risk management/ assessment (non-structural measures)
Naoko Genjida	Secretariat operation 1 (Tokyo)	Taeko Takahashi & Makoto Tsukiji	Secretariat operation 2 (Bangkok)

Structure of the report

This report consists of the following five chapters:

1. Background and project outline
2. Status of DRR and CCA integration in ASEAN *(Expected output No. 2)*
3. Good practices of DRR and CCA integration in ASEAN *(Expected output No. 1)*
4. Work Plan for strengthening DRR and CCA integration *(Expected output No. 3)*
5. Conclusion and recommendation

Chapter 2 to 4 correspond to the expected outputs 1 to 3 of the project: Chapter 2 to expected output No. 2; Chapter 3 to expected output No. 1, and Chapter 4 to expected output No. 3.

2. Status of DRR and CCA Integration in ASEAN

In line with the six assessment categories and associated evaluation criteria, status of DRR and CCA integration was assessed in each ASEAN Member State and summarised in Chapter 2. The assessment was based on literature review, interviews with relevant government officials and site inspections by the JICA Project Team, that was conducted for around two weeks in most countries, while lesser, between two and eight days in some countries.

As an overview, institutional arrangement for DRR and CCA in terms of policy formulation and organisational setup from national to subnational levels is well developed in each Member State in general. However, coordination among national disaster management offices (NDMOs), or ACDM members, and other agencies in charge of DRR and CCA is not so strong in many countries. Particularly for subjects that require intensive coordination among relevant agencies and local governments, such as river basin management, water resources management and river management from upstream to downstream, an essential approach to reduce disaster risk in the area, it is still at a development stage in most countries.

The level of risk assessment for water-related disasters is advanced in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam, but climate risk assessment and its incorporation is still limited, such as at selected areas in Malaysia and Viet Nam. Similarly, the level of planning and implementation of DRR and CCA integrated projects vary from country to country. Development of guidelines incorporating disaster and climate risk is observed in Indonesia, Malaysia and the Philippines, but there is room to improve them by enhancing the science-based analysis.

It is inferred from that strengthening coordination among NDMOs and DRR and CCA line agencies for mainstreaming DRR and CCA policies and capacity building for DRR and CCA integrated risk assessment, planning and implementation are the two main areas ASEAN Member States need to improve. In other words, these two areas could be the focus for developing a regional collaborative activity to improve the current situation. Excerpts of the assessment in the six categories are shown below as well as in Annex 1 and the results of the country assessment are summarised in Chapter 2:

1) Laws, regulations and policies

National development plan

- Each Member State has outlined the importance of DRR and CCA directly or indirectly in their respective national development plan. Among them, the Five-Year National Socio-Economic Development Plan VIII (2016-2020) in Lao PDR and the Philippine

Development Plan (2017-2022) in the Philippines clearly indicate DRR and CCA as a main cross-cutting concern.

DRM policy and the responsible agency

- Each Member State has a national DRM policy and a designated DRM organisation based on the law (Cambodia, Indonesia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam), order (Brunei), decree (Lao PDR) and directive (Malaysia).

CCA policy and the responsible agency

- Each Member State has either climate change policy, strategy, programme or plan and a designated agency mostly under the ministry of environment. CCA is mainstreamed in each ministry's action plan in Cambodia and Indonesia.

2) Institutional arrangement

National DRM committee

- Each Member State has a national DRM committee consisting of multiple line ministries and agencies responsible for DRR and CCA.
- Often National Disaster Management Offices (NDMOs), i.e. ACDM members, focus on improving the awareness, preparedness and response to disasters while other line ministries/agencies, which are in charge of flood, storm, landslide and drought risk reduction are responsible for prevention and mitigation measures. Coordination between them is essential for effective DRR, but it is still a challenge in many Member States. Some good practices are: the National Disaster Management Agency (NADMA) of Malaysia coordinates well with the Department of Irrigation and Drainage (DID) and other line agencies and the General Department of Disaster Prevention and Control (GDDPC) under the Ministry of Agriculture and Rural Development (MARD), Viet Nam, coordinates well with DRR-related agencies within the ministry.

National CC committee

- Each Member State also has a national CC committee consisting of multiple line ministries and agencies. The member composition is often similar to the one for the national DRM committee, but their direct coordination is rare. One good practice is in the Philippines where the DRR and CCA focal points signed a cooperation agreement to coordinate their works.

Vertical DRM system

- Each Member State has a vertical DRM system from national, state/provincial, district/municipal to village/community level. Some countries have direct command line of the NDMO to village/community level (e.g. the Office of Civil Defense in the Philippines), while most countries' system consists of subnational committees for disaster management often headed by the leader of the subnational government with participation of relevant agencies and departments.

3) Financial arrangement

Funding for DRM and DRR

- NDMOs' budgets are usually used for strengthening awareness, preparedness and response capacity of the institution at national and local levels. Investment for prevention and mitigation measures are often managed by other relevant line ministries/agencies based on their priorities.

- Funding pool for disaster management is mandated for local governments in the Philippines as the Local DRR and Management Fund (LDRRMF). Thirty percent of the LDRRMF is automatically allocated as Quick Response Fund (QRF) which serves as a stand-by fund for relief and recovery; while the rest is used for pre-disaster measures. In this way, the QRF incentivises local governments to invest in prevention and mitigation.

Funding for CCA

- Some Member States have CCA funds to promote implementation of local actions. For example, the Indonesia Climate Change Trust Fund (ICCTF), the only national trust fund for climate change in Indonesia, promotes land-based mitigation projects (forestation and conservation) and adaptation and resilience projects by providing small-grants; and the People's Survival Fund in the Philippines promotes projects for water resources management, land management, natural ecosystems conservation, forecasting and early warning systems, institutional development for droughts and floods, among others, based on the risk and vulnerability assessment.
- In Cambodia, Thailand and Viet Nam, a systematic qualitative and quantitative analysis of country's climate change-related public expenditures called Climate Public Expenditure and Institutional Review (CPEIR) has been implemented since 2011. By that, total climate change related expenditures are estimated at 6.3 percent and 2.7 percent of the total government expenditures in Cambodia and Thailand, respectively.
- The Vietnam Administration for Forestry has created a Payment for Forest Environment Services (PFES) system which collects service fees from hydropower generators, water suppliers and others. The annual revenue, about USD50 million - 60 million, is used for forest protection by the communities, forest owners, national parks and nature reserves.

4) Risk assessment

Disaster data management

- All Member States record disaster data and some of them disclose it (e.g. Cambodia, Indonesia, the Philippines, Thailand and Viet Nam).

Meteorological data management and downscaling from Global Climate Models (GCMs)

- All Member States have a meteorological data management system and some of them are downscaling from GCMs to provide climate risk information for risk mapping and DRR and CCA planning (e.g. Indonesia, Malaysia, the Philippines, Singapore and Viet Nam). Other countries collect downscaled values from national research institutes or domestic or foreign universities such as Tokyo University, CSIRO (Commonwealth Scientific and Industrial Research Organisation, Australia), NIES (National Institute for Environmental Studies, Japan), and SEA START RC (Southeast Asia START Regional Center, Thailand).

Hazard and risk map

- Most Member States have prepared hazard and risk maps for flood, storm and landslide but mostly the resolutions including the topographic data are insufficient for quantitative risk assessment and associated evacuation planning and designing of effective prevention and mitigation measures.
- Flood risk maps incorporating CC impact are prepared only in some areas in Malaysia and Mekong Delta in Viet Nam.

Quantitative evaluation of the effects of DRR and CCA

- Quantitative evaluation of the effects of DRR and CCA measures on human and economic impacts has not been implemented in any Member States yet.

5) Planning and implementation

Good practices

- There are some good and potential good practices of flood risk management incorporating CC risk in the design. However, as implementation of basic flood risk reduction measures based on a current designed return period is insufficient in many places, continuous implementation of such measures is needed.
- Landslide risk areas are often well-versed for non-structural measures including early warning, evacuation and restricted land-use (e.g. no built zone) to reduce potential risk. Implementation of such measures, as well as structural measures including check dams, is needed in the region.
- Forest conservation including reforestation is actively conducted in most Member States.
- There are some water-saving and drought risk reduction measures implemented in various countries such as storage of flood water for the use in drought period, conservation farming, sprinkler irrigation, formulation of water user association and farmer association, among others.
- Integration of DRR and CCA concepts in a local development plan and a land-use plan guided by the national government is observed in some Member States (e.g. Indonesia, the Philippines).

Guiding tools for DRR and CCA integration

- The Department of Public Works and Highways (DPWH), the Philippines, has developed a guideline and standard for incorporating CC impacts into flood control planning. The Ministry of Public Works and Housing (PU), Indonesia, has developed a similar one and the Department of Irrigation and Drainage (DID), Malaysia, is also developing one.

6) Capacity building

- DRM training is actively conducted in each Member State particularly for local communities and other stakeholders including schools, hospitals and private companies, among others.
- The National Development Planning Agency (BAPPENAS) in Indonesia is providing a two-week training course for integrating DRR and CCA in local development plans for national and local government officials.
- Provision of location-specific weather and rainfall forecast and training of farmers to interpret the usage of the data proved to be effective in increasing the crop yields in some Member States (e.g. Indonesia, Myanmar and the Philippines).

3. Good Practices of DRR and CCA Integration in ASEAN

The Project Team has identified a number of good practices on DRR and CCA integration in the Member States through interviews with government officials and field visits. This selection of good practices reflects the nature of the quick study, which was around two weeks in most countries, while lesser, between two and eight days, in some countries. Selected practices have DRR and CCA synergies and importantly they are transferable, applicable and a good reference for all the Member States. A range of practices were selected for risk reduction of storms, floods, droughts and landslides, which include practices that integrated downscaled climate projections into risk assessments, and

practices coordinating DRR and CCA policies, management strategies and funding systems. While not all practices have fully integrated DRR and CCA, they still have a potential to be promoted in the end due to the high proportion of DRR and CCA benefits they bring compared to business-as-usual practices.

Selected good practices, which could be used as resources for regional collaboration, are sorted in the same six categories as listed in Table 0.4. These are also summarised in a separate report titled "One against disasters: A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN" which is accessible at the project website at: https://www.drrandcca.com/.

Table 0.4: List of selected good practices

Category	Good practices
1. Laws, regulations and policies	• National development plans incorporate DRR and CCA concepts • DRR laws, regulations and policies are enacted with consideration of CCA • CCA laws, regulations and policies are enacted with consideration of DRR • DRR and CCA concepts are incorporated in relevant sectoral laws, regulations and policies
2. Institutional arrangement	• A national DRM committee has been setup for inter-ministerial coordination and it also coordinates with the CCA committee; A national-subnational DRM system has been setup for integrated DRM • A national CCA committee has been setup for inter-ministerial coordination and it also coordinates with the DRM committee • A multi-stakeholder transboundary DRM system has been setup for floods, storms and droughts
3. Financial arrangement	• Funds are allocated for DRR activities with a monitoring and tracking system • Funds are allocated for CCA activities with a monitoring and tracking system • Insurance, microfinance, and payment for ecosystem services are implemented
4. Risk assessment	• Disaster data is recorded and used for science-based analysis • Climate risk is analysed based on hydro-meteorological monitoring and efforts are made to integrate downscaling from Global Climate Models (GCMs) • Hazard maps and risk maps for flood, storm surge, landslide and drought are prepared by assessing the damages of the past disasters, the capacity and vulnerability of local authorities and communities, and the climate risk and they are provided with high resolution for local planning • Disaster and climate risk data including hazard and risk maps are accessible to wide variety of stakeholders • Prediction, forecasting and early warning systems are setup and disaster risks are communicated through traditional media, social media and mobile phone networks
5. Planning and implementation	• Guidelines and standards incorporating disaster and climate risk are developed and used • Land-use and urban plans are prepared by incorporating disaster and climate risk and with an assessment of ecosystem services • Public and private investments are channelled to strengthen resiliency of critical facilities, including schools, hospitals, evacuation facilities, roads and transport, river and coastal dykes, reservoirs and irrigation networks, forests and retardation areas, etc., and they are implemented in a stage-wise

Category	Good practices
	manner • Drought risk reduction measures including water saving and agricultural measures are implemented
6. Capacity building	• DRR and CCA trainings for national and local government officials and other stakeholders are provided • Special training programs are implemented for specific purposes

4. Work Plan for Strengthening DRR and CCA Integration

A Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration (hereinafter, Work Plan) was developed under this project that outlines the objective, scope, timeline, regional activities, targeted outputs and implementation structure toward achieving DRR and CCA integration in ASEAN (Annex 2). The Work Plan was endorsed by the 31st ASEAN Committee on Disaster Management (ACDM) Meeting on 17 October and subsequently reported to the 5th ASEAN Ministerial Meeting on Disaster Management (AMMDM) on 19 October 2017 in Luang Prabang, Lao PDR (Annex 3). It was also reported to the 20th ASEAN-Japan Summit on 13 November 2017 in Manila, the Philippines (Annex 4).

Prior to that, three National Workshops were organised – 31 May in Naypyitaw, Myanmar, 6 July in Hanoi, Viet Nam, and 12 July in Quezon, the Philippines – to discuss the national and regional needs and desired regional activities to realise it. The Project Team provided discussion materials including regional and country assessment on DRR and CCA integration and good practices recommendable for application. The ideas collected in these workshops were consolidated into a draft Work Plan which was further discussed at the Regional Forum held in Bangkok, Thailand on 5-6 September 2017. A refined Work Plan was further discussed at the 8th Meeting of the Working Group on Prevention and Mitigation the following day and then circulated to the ACDM members for endorsement through ad referendum. In this way, it was reported to the 31st ACDM Meeting and the 5th AMMDM mentioned above.

Following that, a Senior Official-Level Forum was held in Jakarta, Indonesia, on 16 November 2017 to prioritise immediate regional collaborative activities. Each ASEAN Member State expressed their possible contribution and expectation to the Work Plan as listed in Table 0.5 and the participants discussed how best to match them to design meaningful regional activities.

Table 0.5: Possible contribution and expectation expressed by the ASEAN Member States

Country	Possible contribution	Expectation
Indonesia	• Draft ministerial regulations: National Action Plan for Climate Change Mitigation and Adaptation and DRR 2017-2030; Master Plan for Integrated Public Works and Housing Infrastructure Development for 20 years • Training for flood control, flood countermeasures, eco-based flood management; landslide management on road structure; disaster resilient technologies; conducted by Education and Training Center Agency • E-monitoring and evaluation & reporting system for DRR and CCA projects • Indonesia Risk Map and Risk Index (GIS-based)	• Raising awareness of DRR design and plans at local level • E-monitoring system can be used for tagging DRR and CCA project more efficiently • M&E with SDGs and Sendai Framework indicators
Lao PDR	• Community-based DRM training; local disaster management plans • National risk profile and hazard mapping • CCA on agriculture; climate change projection and its impact on water and forestry sectors • Integration of DRR and CCA in the 8th National Socio-economic Development Plan 2016-2020 • SDGs and Sendai Framework indicators incorporated in 5-year plans of MoNRE and MoLSW 2016-2020 • Guidelines for mainstreaming DRR into public investment planning and preparing urban master plans	• Training on risk assessment and risk mapping with GIS application • Updating national disaster risk profile and assessment • M&E and reporting system for SDGs and Sendai Framework • Mobilising resources for regional DRR and CCA programme
Malaysia	• Flood management: Hazard and risk maps; flood prediction and early warning system; river basin-based projects • Stormwater management: Urban stormwater management manual • Flood infrastructures: Stormwater Management and Road Tunnel (SMART); multi-purpose dam • Risk assessment tool: NAHRIM Hydroclimate Data Analysis Accelerator; NAHRIM Technical Guide No.1	• Meteorological expertise • Laws and regulations on DRR and CCA • Disaster risk data sharing on transboundary river basin • Training on monitoring and evaluation (M&E) of DRR and CCA projects
Myanmar	• Hazard, risk and vulnerability assessment report • Training module on building local level resilience to climate change in Myanmar • Myanmar Climate Change Strategy and Action Plan 2016-2030 • Myanmar Action Plan on DRR 2017-2020 • Disaster database and mobile application • Environment Quality Guideline 2015	• Training on hazard mapping and risk assessment using GIS • Integration of DRR and CCA laws and regulations • Local level climate change strategy and action plan • Disaster insurance system • Flood risk assessment for dam • Riverbank erosion control • M&E guideline
Philippines	• Pre-disaster risk assessment and hazard mapping; flood forecasting and early warning system; climate change impact analysis • Conduct of drills (training) and forum • Response mechanism (national-subnational coordination) • National building code • Structural and non-structural measures	• Exchange programme • Technical assistance • Forging of cooperation
Singapore	• Coastal protection measures: setting higher minimum reclamation level; building geo-bags and seawalls • Water resources management: diversifying water supply; water conservation programme; water efficiency scheme • Drainage management: Stormwater management system • Flood prevention measures: installing flood barriers; upgrading airport drainage system; reviewing resilience of power stations, transport and telecommunication	

Country	Possible contribution	Expectation
	infrastructure against flooding and temperature changes • Training programmes: ASEAN Strategic Policy Dialogue on Disaster Management; World Cities Summit, etc.	
Thailand	• National Disaster Prevention and Mitigation Plan 2015; Disaster Prevention and Mitigation Act 2007 • Community-based DRM Toolkit	• Risk assessment • Coordination of DRR and CCA agencies • Incorporation of climate risk in long-term DRR plans • M&E system with indicators
Viet Nam	• Application of geo-spatial technology/satellite image to develop flood risk maps; superstorm surge maps for coastal provinces; landslide risk maps for northern mountainous areas; community-based disaster risk assessment and risk mapping using GIS (and digitalising them) • Law on Natural Disaster Prevention and Control 2014 • Natural Disaster Prevention and Control Funds (50/63 provinces established it) • Forest Protection and Development Funds (41/63 provinces established it) • M&E indicators for community-based DRM programmes	• Application of geo-spatial technology to update risk assessment and risk mapping at community level • Sharing of satellite images • Integration of DRR and CCA in local development plans and national strategies and plans • Data sharing via bilateral and multi-lateral agreement

As shown here, every country offered their materials for regional contribution that covered various DRR and CCA aspects, such as risk assessment and risk mapping methodologies, flood and stormwater management measures, how it is mainstreamed in national and local policies, training programmes for integrated planning at national and local levels, monitoring and evaluation (M&E) of policies and projects with indicators linked to the Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction, and so on. In relation to that, expectations expressed by these countries also covered the similar items – they want to enhance their risk assessment and risk mapping capacities, improve awareness at local level, coordinate relevant agencies and their policies more effectively, and implement efficient M&E system to evaluate the impact properly.

As a result, following two collaborative activities focusing on 1) capacity building for planning and implementation with risk assessment and risk mapping, and 2) integration of laws and regulations with coordination with relevant agencies were selected with associated targets and activities in 2018-2020 as listed in Table 0.6:

Table 0.6: Priority Work Plan for 2020

Immediate collaborative activities	Target by 2020	Agreed activities		
		2018	2019	2020
Capacity building for planning and implementation of measures for flood, storm, landslide and drought hazards with focus on spatial approaches for risk assessment and risk mapping at the local level	• Improve hazard and risk assessments by integrating climate change projections • Projecting climate change in terms of rainfall, temperature and sea level rise and downscaling from Global Climate Models (GCMs) • Evaluation of climate change impacts on key sectors of ASEAN countries • Implementation of pilot programs on integration of climate change projections into hazard and risk maps and planning including community based disaster risk management (CBDRM) plans • Developing guideline for hazard and risk mapping integrating climate change projections including for CBDRM • Implement training programs on hazard and risk maps integrating the climate change projections	• Identify institutional mechanism to coordinate activities • Set budget, prepare concept notes for fund raising • Develop platform for sharing the information among stakeholders • Stock taking of current capacities including training needs assessments for hazard and risk mapping and integration of climate change projections • Sharing of knowledge on hazard and risk assessments integrating climate change projections including for CBDRM	• Develop databases required for risk and hazard mapping and downscaling of climate change projections • Develop methodologies for hazard and risk mapping integrating climate change projections • Conduct case studies for developing hazard and risk maps with climate change impacts including application at the CBDRM level • Develop training module for training and advocacy on integrated hazard and risk assessments and mapping, including exposure visits	• Develop guidelines for integrating climate change projections into hazard and risk maps • Guidelines for use of hazard and risk maps in planning including for CBDRM • Pilot projects for demonstration of the methodology and share experiences and for refining the methodology • Organize training programs, including OJT and exposure visits
Integration of DRR and CCA laws and regulations, where applicable, with coordination of relevant agencies for the effective implementation at the national and sectoral level	• Mainstreaming DRR and CCA in laws and regulations, and national socio-economic development plans and local development plans	• Stock taking of current capacities for integrating DRR and CCA into national development laws and regulations • Establish coordination mechanism for integrating DRR and CCA into laws and regulations at national and local level • Review regional examples of laws and regulations • Develop advocacy platform for sharing the information	• Set directions for integrating DRR and CCA into national and local laws and regulations • Training module development for integrating DRR and CCA into development laws and regulations • Prepare model laws and regulations	• Customize model law and regulations to each country contexts • Develop guidelines for integrating CCA and DRR into laws and regulations • Formulate national socioeconomic plans and local development plan, laws and regulations in the priority areas (pilot testing) • Conduct training programs and awareness generation workshops on integrating CCA and DRR into laws and regulations

It was also decided that the Priority Work Plan for 2020 will be implemented immediately in line with the AADMER Work Programme 2016-2020 and with available resources. The Priority Work Plan for 2020 will also be reviewed annually and its continuation beyond 2020 will be discussed along with development of a new AADMER Work Programme. In addition, the Meeting Summary (Annex 5) confirmed the followings:

- The WG P&M will take lead in coordinating the implementation of the Work Plan for 2020 with support from ASEAN Secretariat. The role of Climate Change International Technical and Training Center (CITC), Thailand Greenhouse Gas Management Organization (TGO), Bangkok, Thailand will be explored in hosting the required capacity building activities proposed as a part of this Priority Work Plan for 2020.
- The Co-Chairs of the WG P&M request ACDM members to upload the Meeting Summary and the Priority Work Plan for 2020 to their appropriate websites in their national language.
- The National Project Focal Point appointed in each ACDM member organisation will report the progress of the activities related to DRR and CCA integration in each country annually to the WG P&M until 2020 starting from March 2018.
- The WG P&M will monitor and review the progress in each country and submit a synthesised report to the ACDM Meeting annually starting from October 2018. These reports will be uploaded to the CN20 Project website managed by the WG P&M.

The decision-making flow of the Work Plan is summarised in Figure 0.3.

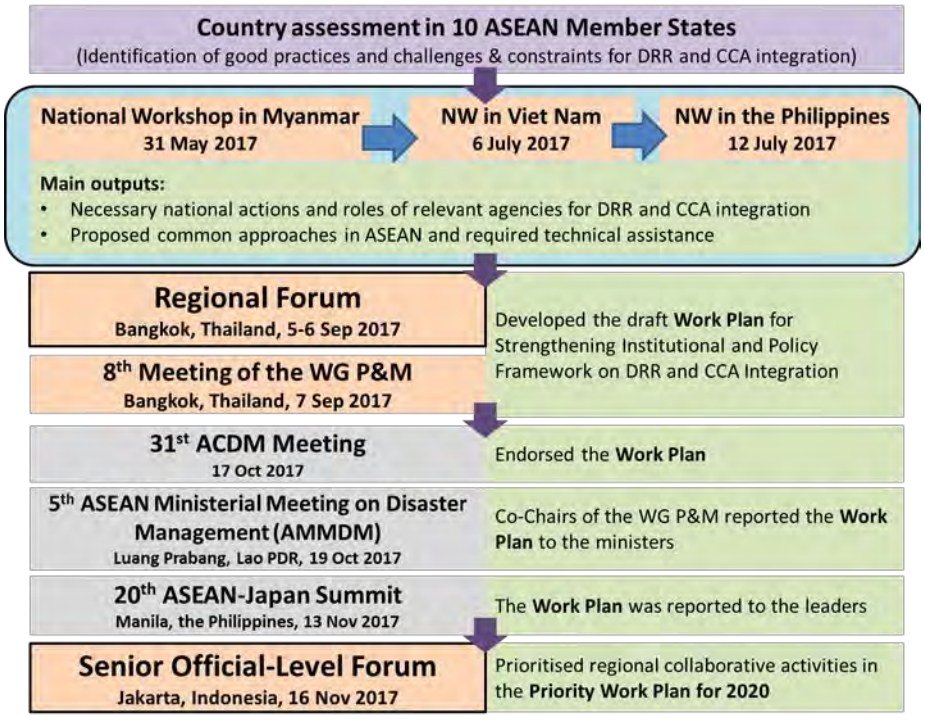


Figure 0.3: Development of the Work Plan through organising the National Workshops and Regional Forums

Key points of the Work Plan are summarised below:

Objective

The objective of the Work Plan is to mainstream DRR and CCA into national and regional activities thereby significantly reduce disaster risks and increase resilience through creating an enabling mechanism for capacity building, knowledge sharing and cross-sectoral collaboration leading to developing suitable policies, good practices, including data sharing platforms, among ASEAN member states.

Scope

The Work Plan focuses on effective integration, or incorporation, of climate change impact in development plans with particular focus on DRR. Suppose there are five components for managing and reducing disaster risk, namely institutional and policy development, risk assessment, planning, implementation and reviewing, like a cycle of plan-do-check-act (PDCA) management method, climate change impact assessment directly affects the risk assessment and planning but also other components as illustrated in Figure 0.4.

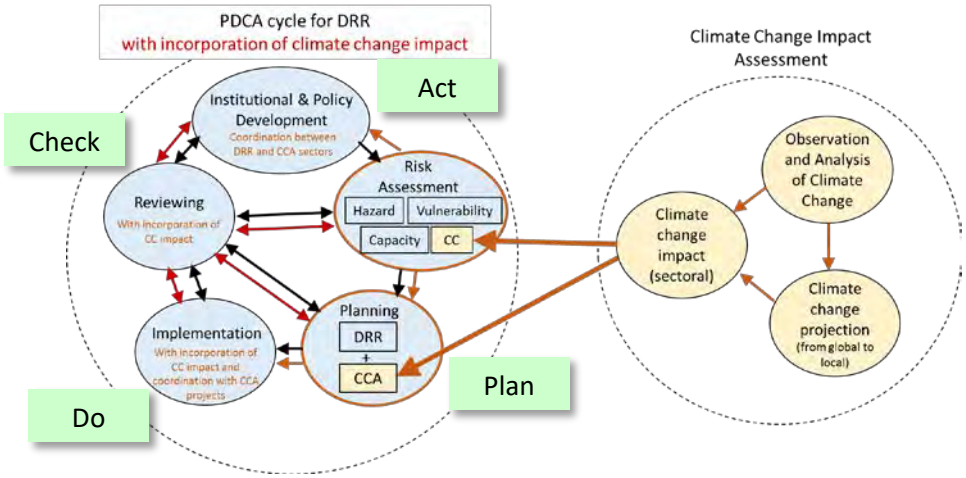


Figure 0.4: Incorporation of climate change impact in a PDCA cycle for DRR

Expected outputs

Through continuous implementation and revision of the PDCA cycle for DRR with improved climate change impact assessment and its incorporation, it is expected that the institutional capacity for DRR, including policy formulation, risk assessment, planning and implementation through coordination of multiple agencies at national and subnational levels, will be strengthened. Targeted outputs of the Work Plan are implementation of such demonstrable actions with engagement of multiple agencies catalysed and facilitated by national disaster management offices (NDMOs) and documentation and arrangement of cross-learning mechanism for their diffusion. By doing so, it is expected that the ACDM develops an autonomous knowledge management and capacity building system for building a disaster resilient and climate adaptive ASEAN in a long run.

Implementation period

The Work Plan will be implemented for three years from the date of its adoption along with the AADMER Work Programme 2016-2020 with annual revision and the Working Group on Prevention and Mitigation (WG P&M), which oversees the Priority Programme No. 3 ADVANCE, decides how to continue it beyond that.

Implementation structure

The WG P&M plays a central role with support from ACDM members. Practically, each ASEAN Member State plans and implements DRR and CCA activities in an integrated manner and the National Project Focal Point appointed by the ACDM National Focal Point in each Member State listed in Annex 6 reports the progress to the WG P&M annually. The WG P&M compiles and reports it to the ACDM Meeting and the ACDM Meeting provides suggestions for improvement. Other development partners and resource institutions may provide capacity building and technical assistance services through WG P&M's coordination. The WG P&M is responsible for the knowledge management, coordination of the stakeholders and overall management as shown in Figure 0.5.

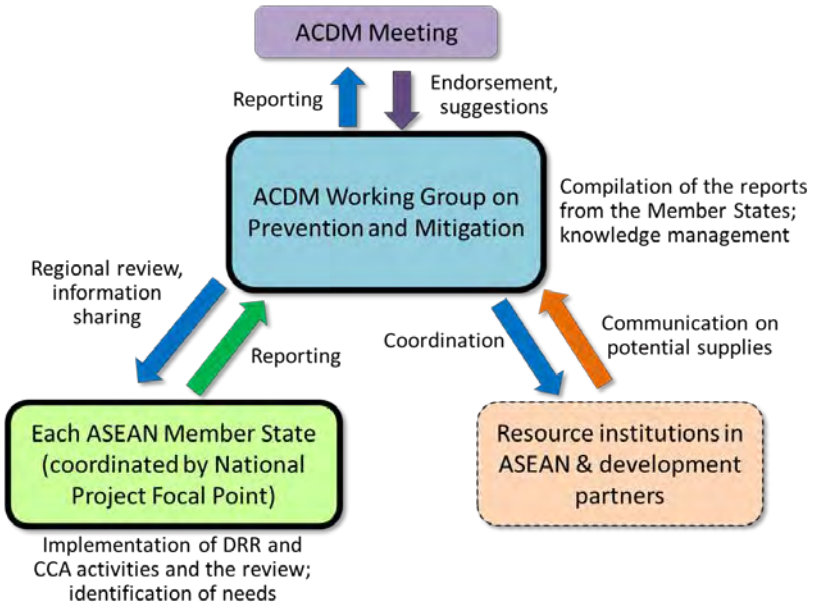


Figure 0.5: Implementation structure of the Work Plan

Detailed activities of the WG P&M and the National Project Focal Points are listed below:

Working Group on Prevention and Mitigation

The WG P&M is responsible for:

- Facilitate coordination of mutual cooperation activities among the Member States by referring to the Focal Point reviews;
- Facilitate collection, processing and dissemination of relevant information and knowledge, including the local knowledge, for DRR-CCA integration from the Member States and report it to the ACDM Meeting;
- Facilitate sharing of technical resources, matching regional needs and develop programmes for DRR and CCA integration with development partners;
- Enable capacity building measures for accessing global and regional finances for DRR and CCA integration activities in ASEAN Member States;
- Facilitate data management, standardisation of data collection, processing and use for robust decision-making, including improved resolution of hydro-met information collection at the local level and feeding into national and regional databases; and

- Facilitate development and adoption of integrated monitoring and evaluation frameworks through development of appropriate guidelines, tools and capacity building measures.

National Project Focal Point

Each National Project Focal Point collects relevant information listed in Table 0.7 from line agencies, that corresponds to the six categories used for assessing the status of DRR and CCA integration. They also review it with the points given and report the progress to the WG P&M annually with particular focuses on:

- Promote management of data necessary for DRR-CCA integration and share the same with relevant agencies with specific focus on the vulnerable sectors, ecosystems and societies;
- Facilitate monitoring and evaluation of DRR and CCA related plans and activities and share among relevant agencies, including the DRR expenditure of line ministries, considering the need for inter-agency coordination;
- Promote capacity building through training programmes and provide related services regionally with specific focus on understanding resilience at the community level;
- Promote bottom-up approaches for DRR and CCA integration, as well as develop guidelines for mainstreaming DRR and CCA at the grass-root level;
- Enable stakeholder engagement for integration of DRR and CCA, including the engagement of the private sector by promoting various forums and networks; and
- Promote consolidation of climate change laws and regulations and put in place appropriate measures for monitoring the progress in the same.

Table 0.7: DRR and CCA activities to be implemented and reported by each ASEAN Member State

Activities		Review points*
1. Institutional and policy development		
1.1 Policies, laws and regulations	National socio-economic development plan	• Monitoring of Current National Socio-economic Development Plan
	DRR and CCA laws and regulations	• Progress of enactment and enforcement of individual DRR and CCA laws and regulations • Progress of enactment of integrated laws and regulations of DRR and CCA
	DRR and CCA related sectoral laws and regulations	• Progress of enactment and enforcement of relevant sectoral laws and regulations
1.2 Management system	National and subnational DRR and CCA management systems	• Progress in risk management system at national and local levels
1.3 Financial arrangement	Regular budgetary arrangements of line ministries for DRR and CCA	• Progress in budget allocation and monitoring of DRR and CCA expenditures
	Special funds for local and community-based DRR and CCA activities	• Progress in creation and operation of national and local DRR and CCA funds
	Payment for ecosystem services (PES) and insurance scheme	• Progress in PES and insurance measures
2. Risk assessment		
2.1 Climate change impact analysis	Observation and analysis of hydro-meteorological data	• Progress in monitoring systems and data sharing and analysis
	Climate change projection	• Progress in projection of climate change impacts on rainfall, sea level rise, etc.
	Standard values of CC impact	• Progress in setting standard values for climate change.
2.2 Hazard and risk mapping	Hazard and risk mapping of flood, storm surge, landslide and drought	• Progress in preparation of hazard maps considering the limitation of information disclosure by each Member State.
3. Planning and implementation**		
3.1 Disaster risk reduction	DRR plans and implemented projects for flood, storm surge, landslide and drought	• Progress in planning, implementation and updating prevention and mitigation measures. • Progress in legally authorized DRR and CCA plans.
3.2 Standard guideline for disaster and climate risk assessment and planning		• Progress in preparation of guidelines.
4. Monitoring and evaluation (by the National Project Focal Point)		
4.1 Data management	Basic disaster, hydro-meteorological, risk, vulnerability and socio-economic data are periodically managed, updated and shared with relevant agencies for synthetic analysis and decision making	
4.2 Reviewing	DRR and CCA related plans and activities are periodically reviewed for close coordination and knowledge sharing among relevant agencies	
4.3 Capacity building and needs assessment	Based on the reviewing results, capacity building needs are identified and corresponding training programmes are arranged using domestic resources; other required external technical assistances and identified resource institutions and agencies possible to provide capacity building services regionally are reported to the WG on P&M	

**Use appropriate SDG target indicators wherever possible while reporting (to be developed later)*

*** Planning and implementation are merged here as the review points for both components are similar.*

Immediate collaborative activities

Following immediate collaborative activities will be implemented under the Work Plan:

- Knowledge sharing and training on:
    - Capacity building for planning and implementation of measures for flood, storm, landslide and drought hazards with focus on spatial approaches for risk assessment and risk mapping at the local level;
    - Integration of DRR and CCA laws and regulations, where applicable, with coordination of relevant agencies for the effective implementation at the national and sectoral level;
    - Building capacity for accessing regional and global funds for integrating DRR and CCA;
    - Measures to share skills, knowledge and data on climate change impacts, implementation of river basin management, countermeasures for climate change impacts including policies; and
    - Developing guidelines and tools with indicators for monitoring and evaluation of programmes, policies and projects on integration of DRR and CCA.

Further challenges

In order to strengthen integration of DRR and CCA further beyond this Work Plan, following activities shall be planned in parallel:

- Linking the activities with the national reporting of the global frameworks including the Sustainable Development Goals (SDGs) and the Sendai Framework for DRR and use their designated indicators
- Strengthening collaboration with regional groups and organisations such as ACDM Working Group on Knowledge and Innovation Management (WG KIM), AHA Centre, ASEAN Working Group on Climate Change (AWGCC) and Climate Change International Technical and Training Center (CITC), among others
- Strengthening human resources development and capacity building for implementation of local and national socio-economic development plans after integrating DRR and CCA with appropriate budget and fund allocation

5. Conclusion and Recommendation

5.1 Status of DRR and CCA Integration in ASEAN

More coordination between DRR and CCA agencies required

The number of water-related disasters as well as the damages caused by that in ASEAN is increasing in last 30-40 years. Assessing the climate risk and incorporating it in national, local and sectoral DRR plans is inevitable to reduce disaster risk. Reflecting that, in the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme 2016-2020, “Advancing ASEAN community that is safe, resilient to disasters, and adaptive to climate change, with youth and good governance at the centre” is set as one of the priority programmes. Having that in mind, as the Project Team studied the status of DRR and CCA integration in institutional and policy framework in ASEAN through carrying out baseline studies and organising a series of consultative meetings and workshops with the stakeholders, one of the identified common constraints in ASEAN is weak inter-ministerial and inter-agency coordination. In terms of policies and plans, often the case CCA concept

is incorporated in DRR plans and policies and the same for the DRR concept in CCA plans and policies. Similarly, national disaster management committees have members from climate change-related agencies and national climate change committees have members from DRR-related agencies. However, policy coordination or joint implementation of programmes and projects through mutual coordination are still rare in most ASEAN Member States.

The ASEAN Committee on Disaster Management (ACDM), a group of national disaster management offices (NDMOs), was assigned as a focal point for cross-sectoral cooperation on resilience building at regional level at the 26th ASEAN Summit in Malaysia in April 2015 as stated in the Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disaster and Climate Change. However, they are not necessarily the designated national focal point for DRR and CCA coordination in each country's institutional context. Often the case, their mandates and focuses are more on disaster management, including preparedness (early warning, education and awareness), response and recovery, but not prevention and mitigation nor coordination with the climate change agencies. In fact, prevention and mitigation of disaster risks in terms of implementation of structural and non-structural measures are generally managed by other ministries and agencies. For example, flood risks are by public works, rivers and irrigation agencies; landslide risks are by construction, roads and forest management agencies; drought risks are by water resources management and agricultural agencies; and climate risk assessment including hydro-meteorological data analysis is by hydro-meteorological and climate change agencies. Literally, ACDM members are supposed to coordinate all these agencies, however, they are not authorised in that way in many cases.

While CN20 Project organised National Workshops in three countries, namely in Myanmar, Viet Nam and the Philippines, it was observed that it provided an important opportunity for those officials from various agencies in charge of disaster management, DRR and CCA to discuss necessary approaches against growing disaster and climate risks directly. In fact, group discussions in the workshop with a mixture of participants lasted about two hours beyond the scheduled one hour in all three countries. Similar comments were heard from the participants of the Regional Forum and the Senior Official-Level Forum – they took advantage of these opportunities to communicate with other agencies prior to and during the forums. In these regional forums, participants were also able to learn each country's status of DRR and CCA integration including the strengths and weaknesses as well as their relative position in the region. From this, it can be inferred that, although DRR and CCA integration is regarded necessary direction in principle, in reality, the first step, coordination of relevant agencies, is still a challenge in many countries. Yet, it was also recognised that there is a potential to improve the situation by setting up a regional programme that allows officials from relevant agencies to share their approaches and experiences and learn from each other.

Mutual learning potential among ASEAN Member States

As explained above, there is a potential to improve DRR and CCA integration in ASEAN by facilitating mutual learning. As seen in the assessment of DRR and CCA integration status in each country and the selected good practices in previous sections, some countries are advanced in some aspects and they can be tutors or resource persons for others by sharing their experiences. For example, in terms of **risk assessment** of flood and drought, the Department of Irrigation and Drainage (DID) in Malaysia and the Southern Institute for Water Resources Planning (SIWRP) under the Ministry of Agriculture and Rural Development (MARD), Viet Nam, are advanced by incorporating climate risk in it. Their hydro-meteorological assessment is supported by the works of other technical agencies – the National Hydraulic Research Institute of Malaysia (NAHRIM) in Malaysia and the

Institute of Meteorology, Hydrology and Climate Change (IMHEN) and the National Hydro-Meteorological Service (NHMS) in Viet Nam, respectively. As a set, these agencies can provide useful knowledge with others. Similarly, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) in the Philippines has a potential to provide similar level of services and the Department of Mineral Resources (DMR) under the Ministry of Natural Resources and Environment (MONRE), Thailand, can provide detailed landslide risk assessment and risk maps.

When focusing on **application of these disaster and climate risk in local development plans**, approaches in the Philippines and Indonesia are also good references for others. In the Philippines, local governments need to prepare a Comprehensive Land-Use Plan (CLUP) by incorporating disaster and climate risk that needs to be approved by the Housing and Land Use Regulatory Board (HLURB). Similarly, the National Development Planning Agency (BAPPENAS), the Ministry of Agrarian and Spatial Planning, and the Ministry of Home Affairs oversee local development plans in Indonesia. Similar application at pilot project sites is also seen in other countries: for example, in Saravane, Sekong and Attapue Provinces in Lao PDR, Ayeyarwady, Bago and Yangon in Myanmar, and Ho Chi Minh City, Da Nang City and Can Tho City in Viet Nam.

In terms of **developing guidelines for planning and designing** by incorporating disaster and climate risk, the Ministry of Public Works and Housing (PU) in Indonesia, the Department of Irrigation and Draining (DID) in Malaysia, and the Department of Public Works and Highways (DPWH) in the Philippines are advanced and they have also implemented some pilot projects. These three countries are also advanced in terms of **river basin management**: for example, River Basin Organizations (*Balai Besar*) and Public Corporations (*Jasa Tirta*) are set up for major river basins for water resources management and coordinated operation of dams in Indonesia; master plans are formulated for major 18 river basin by the River Basin Control Office (RBCO) in the Philippines; and the DID is overseeing river management from upstream to downstream in Malaysia. As for water resources management and flood and drainage management systems, the Public Utility Board (PUB), Singapore's National Water Agency, also possesses useful experiences.

When focusing on **funding** for DRR and CCA activities, a prominent case is the Local DRR and Management Fund in the Philippines that mandates local governments to set aside 5% of their estimated revenue for quick response and pre-disaster preparedness and post-disaster recovery activities that resulted in proactive investment in DRR interventions. Similarly, the Natural Disaster Prevention and Control Fund was established in 50 provinces out of 63 in Viet Nam and also the Forest Protection and Development Fund was established in 41 provinces that supports forest management and reforestation activities. Funds for supporting development of local CCA plans and implementation of them were also developed in the Philippines and Indonesia: the People's Survival Fund (PSF) and the Indonesia Climate Change Trust Fund (ICCTF), respectively. In terms of **monitoring and evaluation** of climate-related expenditures, a programme called the Climate Public Expenditure and Institutional Review (CPEIR) is implemented in Cambodia, Thailand and Viet Nam and the Climate Change Expenditure Tagging (CCET) in the Philippines. In Indonesia, e-monitoring system is implemented to evaluate the outputs of DRR and CCA projects.

Institutional arrangements for DRR and CCA integration were already described above: most countries have relevant laws, regulations and policies and associated institutional setup from national to local levels. Degree of coordination among those agencies varies from country to country as stated as well. As seen here, these practices are all good references for others and also potential seeds for designing a regional mutual-learning programme.

Development of a Work Plan

Having these constraints and potentials in mind, three National Workshops, a Regional Forum and a Senior Official-Level Forum were organised to develop a regional action plan to push this agenda forward. Through that, issues, challenges and needs for DRR and CCA integration at local and national levels were discussed and necessary actions were consolidated in five regional activities, which were further narrowed down to the following two immediate collaborative activities:

1) Capacity building for planning and implementation of measures for flood, storm, landslide and drought hazards with focus on spatial approaches for risk assessment and risk mapping at the local level; and
2) Integration of DRR and CCA laws and regulations, where applicable, with coordination of relevant agencies for the effective implementation at the national and sectoral level.

In addition to that, it was also agreed that each ACDM member compiles the progress of DRR and CCA integration in each country in various aspects, including institutional and policy development, risk assessment, planning and implementation, and capacity building, through coordination and communication with DRR and CCA line agencies, and reports it to the ACDM Working Group on Prevention and Mitigation (WG P&M) annually.

Obviously, the leading and coordination role of the WG P&M is essential to make these activities meaningful. In terms of the commitment for the implementation, it was endorsed by two layers: the endorsement of the Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration at the 31st ACDM Meeting and its confirmation by the ministers at the 5th ASEAN Ministerial Meeting on Disaster Management (AMMDM) in Lao PDR in October 2017; and its recognition by the leaders at the 20th ASEAN-Japan Summit in the Philippines in November 2017.

Output of the CN20 Project

As listed in the following table, expected outputs of the CN20 Project were all met: 1) good practices on DRR and CCA were documented and it was shared at national workshops and regional forums; 2) status of DRR and CCA integration was assessed in each country and it was reviewed at national workshops and regional forums; 3) Senior Official-Level Forum was organised with participation of various DRR and CCA agencies; and as a result, 4) the Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration was developed for implementation in 2018-2020.

Table 0.8: Output of the CN20 Project

Expected Output	Activity	Output
1. Documentation of good practices in institutional strengthening and policy development on linking DRR and CCA in ASEAN Member States	1.1 National workshop on good practices in integrated plan and policy development, funding mechanisms; and risk assessments for DRR and CCA in the Member States 1.2 Identification of common approaches to strengthen institutional and policy development for DRR and CCA 1.3 Publishing the documented good practices	• Three national workshops and two regional forums were held to share good practices on DRR and CCA integration; • The Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration was developed to implement selected regional collaborative activities for 2020; and • Good practices were compiled and published as a report titled "One Against Disaster and Climate Risks: A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN".
2. Assessment of the implementation of national action plans on DRR and CCA and the effectiveness of national platforms	2.1 National workshop to review the progress of the implementation of the national action plan on DRR and CCA 2.2 Organisation and conduct of a regional forum on the progress and lessons learned by the Member States 2.3 Documentation of the outcomes of national workshops and the regional forum	• Three national workshops and two regional forums were held to share the result of country assessment on DRR and CCA integration and to discuss how to strengthen it; as a result, the Work Plan was developed; • Results of the national workshops and regional forums were uploaded to the project website for information sharing.
3. Senior official-level roundtable discussions on policy and programme interventions to strengthen the connection and coherence of DRR and CCA efforts at all level	3.1 Preparatory meetings for the senior official-level forum, including arrangement with media 3.2 Holding of the senior official-level forum with broadcast media coverage	• Preparatory meeting for the SOLF was held on 6 September 2017 after the Regional Forum and the SOLF was held on 16 November 2017; and • Press release was issued after the SOLF and the Co-Chairs of the WG P&M requested each ACDM member to upload the Meeting Summary of the SOLF to their website with an introduction in their national language together with the Work Plan and links to the Chairman's Statement of the 20th ASEAN-Japan Summit and the project website

5.2 Way Forward

Implementation of the Work Plan

As the Work Plan is laid out with commitments, **the next step is its steady implementation**. A common demand for implementing these activities is knowledge sharing and capacity building. People want to know what, and how, others are doing and learn from others. Facilitating such mutual-learning, as agreed in the Priority Work Plan for 2020, is a big task. For example, developing such a training programme will require a baseline study on demand and supply (i.e. who can offer what), compilation of available resources for training use, identification of resource persons and institutions, developing training programmes and organising it through coordination with the stakeholders and participants, and archiving the results and lessons learned as regional knowledge.

Here, as explained above, good practices identified by the Project Team as well as the possible contributions presented by each country at the Senior Official-Level Forum can be used as potential resources. In addition to that, implementing pilot projects for risk assessment and risk mapping at selected sites as hands-on training is also a useful approach as agreed in the Priority Work Plan for 2020. Dispatching experts from other countries can also be incorporated. For that, it requires selection of pilot project sites, coordination of relevant stakeholders in the targeted areas, and identification of appropriate experts and resource persons.

Roles and responsibilities of the ACDM Working Group on Prevention and Mitigation

For the implementation of these activities, it requires extensive coordination works. The Work Plan needs a dedicated secretariat to design the activities, coordinate relevant stakeholders, and run it. It is the role of the WG P&M, particularly the Co-Chairs, to lead it. However, as seen in Chapter 1, it is unrealistic to expect the WG P&M to undertake all the roles with current institutional setup as they have no dedicated staff or budget for the secretariat service and they are already outstretched for overseeing more than ten ongoing projects implemented by various development partners. Substantial support from the AHA Centre as well as the ASEAN Secretariat cannot be counted on either. Therefore, it is inferred that, with current capacity, the best the WG P&M can deliver are submission of a synthesised regional progress report on DRR and CCA integration annually based on the reports submitted by the ACDM members and playing a catalytic role by sharing it and other information with ACDM members and other partners in expectation of their voluntary interaction.

In order to push it forward, the Priority Work Plan for 2020 needs to be packaged as a concept note including the above-mentioned activities with clearly defined targets and associated roles and responsibilities of the WG P&M and ACDM members, so that it can be communicated with potential development partners for their support. Since integration of DRR and CCA is a well-known concept for addressing disaster and climate risks jointly for efficient use of available resources, it has a potential to attract external support in this way. As listed in the Priority Work Plan for 2020, there are a number of activities required in 2018 to kick-start the two regional activities.

It is expected that, under the leadership of the Co-Chairs, the WG P&M members start discussing how best these activities could be implemented; what can be done with current institutional setup; what available resources can be used for that; and which components need to be packaged for seeking assistance from potential partners. Seeking collaboration with other ASEAN Working Groups, particularly with the ASEAN Working Group on Climate Change which oversee a number CCA projects in the region, is also an area to be explored through the coordination of the ASEAN Secretariat. Since the working group meetings are held twice a year, a realistic target for developing such an implementation plan is by the 9th Meeting of the WG P&M in March-April 2018.

In a long run, in a view of development of the AADMER Work Programme beyond 2020, it is also expected that the WG P&M will strengthen its capacity, in particular the human resources and budget, so that they can implement the Work Plan continuously since strengthening resiliency of the national and local governments and communities through integrating DRR and CCA will require continuous effort. It is also expected that, through these activities, the WG P&M will manage the knowledge accumulated and thereby be a regional knowledge centre, with support of the AHA Centre through its revision of focal areas.

1. Background and Project Outline

1.1 Background and Objectives

The ASEAN Committee on Disaster Management (ACDM) was established in 2003. Following the Sumatra Indian Ocean earthquake in 2004, with the recognition of the need for initiatives to address disasters that exceed national borders, the ASEAN Agreement on Disaster Management and Emergency Response (AADMER), was concluded in 2005 and entered into force in 2009 as a legally-binding disaster-related agreement in ASEAN, which also corresponded to the Hyogo Framework for Action 2005-2015. The AADMER created following five working groups (WG) with appointed Co-Chairs to lead the discussion and coordination for disaster management in various aspects:

Risk Assessment and Awareness	[Cambodia & the Philippines]*
Prevention and Mitigation	**[Lao PDR & Thailand]***
Preparedness and Response	[Malaysia & Singapore]*
Recovery	[Indonesia & Myanmar]*
Knowledge and Innovation Management**	[Indonesia, Malaysia, Singapore and Vietnam]*

** [ ] are the Co-Chairs of the Working Group.*
*** WG on Knowledge and Innovation Management was established in the AADMER Work Programme 2016-2020.*

The AADMER Work Programme 2010-2015 is made up of Phase 1 (2010-2012) and Phase 2 (2013-2015). In Phase 1, the ASEAN Coordination Centre for Humanitarian Assistance on disaster management (AHA Centre) was established in November 2011 as a main operation engine of the AADMER that currently serves as a chief regional body for disaster monitoring and coordinate response.

In Phase 2, 21 proposals for flagship and priority projects were selected at the ACDM meeting in 2013 and associated Concept Note (CN) was created for each proposal as shown in Table 1.1.1. Member States were requested to implement them and development partners were invited to support them. Among them, JICA presented a support plan for CN20 for strengthening institutional and policy framework on disaster risk reduction (DRR) and climate change adaptation (CCA) integration, together with CN18 on building disaster and climate resilient cities in ASEAN, both under the responsibility of the WG on Prevention and Mitigation. Subsequently, both plans were agreed by ASEAN which led to the implementation of this project.

Table 1.1.1: Flagship and Priority Projects under AADMER Work Programme Phase 2 (2013-2015)

1.	Strengthening the Capacity of AHA Centre to Achieve Operational Excellence in Disaster Monitoring and Emergency Response
2.	Accelerating and Synergising the AADMER Work Programme (ASA) Project
3.	A Disaster Emergency Logistic System for ASEAN (DELSA) - Phase II: Establishment of a Satellite Disaster Emergency Logistic System in ASEAN Member States
4.	Strengthening the Capacity and Role of the ASEAN Emergency Rapid Assessment Team (ASEAN-ERAT)
5.	Enhancing the Conduct of the ASEAN Regional Disaster Emergency Response Simulation Exercises (ARDEX)
6.	ASEAN Disaster Recovery Toolbox (ASEAN-DRT)
7.	Institutionalising AADMER
8.	Regional Risk Assessment
9.	Disaster Monitoring and Response System (DMRS) Enhanced Information Content and Sharing Capabilities for AHA Centre

10.	ASEAN Disaster Knowledge Management (AKM-Hub)
11.	Building the ASEAN Disaster Management Training Institutes Network (ADTRAIN)
12.	AADMER Training Courses
13.	One Voice: Communicating AADMER to Build a Culture of Resilience
14.	Towards a Regional Risk Pool: Establishing the ASEAN Disaster Risk Insurance Programme (ADRIP)
15.	ASEAN Safe Schools Initiative (ASSI) Phase 2
16.	Hospital Networking for Resilience Initiative
17.	Strengthening Community Resilience through DRR and CCA
18.	**Building Disaster and Climate Resilient Cities in ASEAN**
19.	Promoting Science-Based Risk Management
20.	**Strengthening Institutional and Policy Framework on DRR and CCA Integration**
21.	Establishment of an Integrated Information and Communication Technology (ICT) Back-up System to Strengthen and Safeguard the Operation of AHA Centre – Phase 3

The aims of the CN20 Project are:

i. Strengthen institutional and policy frameworks for DRR and CCA
ii. Enhance the integrated planning for DRR through the implementation of national development plans and action plans that integrate DRR and CCA at all level
iii. Build partnership in linking DRR and CCA at all levels

The specific objectives are:

a) Promote the development of umbrella laws and regulations that govern the integration and synchronisation of DRR and CCA in Member States
b) Foster relationships between national ministries and agencies responsible for DRR and CCA
c) Facilitate the establishment of a clear institutional and policy framework on DRR and CCA integration in Member States
d) Strengthen participatory risk assessment, incorporating disaster and climate risks as a basis for decision-making
e) Promote the development of joint funding mechanisms for both DRR and CCA at the national level
f) Support joint training, meetings, and other opportunities for increased interaction and cooperation among disaster and climate change practitioners

The 1st Project Steering Committee (PSC) Meeting held in December 2015 agreed to focus on following three outputs* which were laid out in the original CN20 with the associated activities:

Table 1.1.2: Scope of the CN20 Project

Expected Output	Activity
1. Documentation of good practices in institutional strengthening and policy development on linking DRR and CCA in ASEAN Member States	1.1 National workshop on good practices in integrated plan and policy development, funding mechanisms; and risk assessments for DRR and CCA in the Member States
	1.2 Identification of common approaches to strengthen institutional and policy development for DRR and CCA
	1.3 Publishing the documented good practices
2. Assessment of the implementation of national action plans on DRR and	2.1 National workshop to review the progress of the implementation of the national action plan on DRR and CCA

CCA and the effectiveness of national platforms	2.2 Organisation and conduct of a regional forum on the progress and lessons learned by the Member States
	2.3 Documentation of the outcomes of national workshops and the regional forum
3. Senior official-level roundtable discussions on policy and programme interventions to strengthen the connection and coherence of DRR and CCA efforts at all level	3.1 Preparatory meetings for the senior official-level forum, including arrangement with media
	3.2 Holding of the senior official-level forum with broadcast media coverage

** Another output, "National disaster and climate risk information, coordination and knowledge management system", listed in the CN20 was excluded from the project scope.*

The AADMER Work Programme 2016-2020 and the roles and responsibilities of the ACDM Working Group on Prevention and Mitigation

The AADMER Work Programme 2016-2020, which was developed in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, was launched during the 28th ACDM Meeting in April 2016 in Indonesia. It consists of the following eight Priority Programmes with assigned Working Groups consisting of Co-Chairs and members:

Table 1.1.3: Priority Programmes of the AADMER Work Programme 2016-2020 and the responsible Working Groups and their Co-Chairs and Members

Priority Programmes	Responsible Working Group	ASEAN Member States*										AHA Cen.
		Bd	Ca	In	La	Ma	My	Ph	Si	Th	Vn	
1. AWARE: Risk Aware ASEAN Community	WG on Risk Assessment and Awareness		■	□	□		□	■			□	●
2. BUILD SAFETY: Building Safe ASEAN Infrastructures and Essential Services	**WG on Prevention and Mitigation**	□	□	◇	■	□		□		■	□	
3. ADVANCE: A Disaster Resilient and Climate Adaptive ASEAN Community												
4. PROTECT: Protecting Economic and Social Gains of ASEAN Community Integration through Risk Transfer and Social Protection												
5. RESPOND AS ONE: Transforming Mechanisms for ASEAN's Leadership in Response	WG on Preparedness and Response	□		□	□	■		□	■	□		●
6. EQUIP: Enhanced Capacities for One ASEAN One Response												●
7. RECOVERY: ASEAN Resilient Recovery	WG on Recovery	□		■	□		■	□		□		●
8. LEAD: ASEAN Leadership for Excellence and Innovation in Disaster Management	WG on Knowledge and Innovation Management		□	■	□	□	□		■	□	■	●

* Bd: Brunei Darussalam; Ca: Cambodia; In: Indonesia; La: Lao PDR; Ma: Malaysia; My: Myanmar; Ph: the Philippines; Si: Singapore; Th: Thailand; Vn: Viet Nam

■: Co-Chairs of the Working Group □: Members of the Working Group ◇: Indonesia joined the Working Group on Prevention and Mitigation later on. ●: It indicates AHA Centre is designated as an implementation agency of several activities of the corresponding Priority Programme.

Among them, the Working Group on Prevention and Mitigation, co-chaired by Lao PDR and Thailand, oversees the implementation of three Priority Programmes including No. 3 ADVANCE: A Disaster Resilient and Climate Adaptive ASEAN Community. The CN20 of the AADMER Work Programme Phase 2 (2013-2015) corresponds to one of the components of the Priority Programme 3,

"Strengthened institutional capacity and policy frameworks for effective implementation of DRR and CCA". As listed in Table 1.1.4, targeted outputs and key activities of the component are similar to the ones of the CN20. In this regard, the CN20 is succeeded in the AADMER Work Programme 2016-2020.

Table 1.1.4: Relevant targeted outputs and key activities under the AADMER Work Programme 2016-2020

"Strengthening Institutional capacity and policy frameworks for effective implementation of DRR and CCA actions", the Priority Programme 3. ADVANCE, A Disaster Resilient and Climate Adaptive ASEAN Community

Outputs	Key Activities	Implementation agency
1.1. **Documentation of good practices** in strengthening institutional capacity and policy development on DRR and CCA in ASEAN Member States	1.1.1. Conduct **national workshops on good practices** in integrated plan and policy development, funding mechanisms, and risk assessments for DRR and CCA in the Member States	NDMOs
	1.1.2. Conduct regular **regional documentation and dissemination of good practices** and innovation of approaches in building community resilience	WG P&M
	1.1.3. Come up with a regular **publication** of ASEAN: One Against Disaster and Climate Risks	
1.2. **Capacity building** programme on DRR and CCA, to strengthen institutional capacity and policy development	1.2.1. Stocktake and map training institutes among ASEAN Member States who can form **the ASEAN Training Centres on DRR and CCA**	WG P&M
	1.2.2. Develop **accreditation of civil society organisations/private sector/training institute** who can provide training for NDMOs on DRR and CCA	
	1.2.3. **Launch the ASEAN Training Programme for DRR and CCA** implementers from government, civil society, private sector and other sectors to boost a roster of certified ASEAN experts or professionals on DRR and CCA	
	1.2.4. Establish **a financing mechanism** to support continuing education for DRR and CCA implementers	
	1.2.5. Develop **peer-to-peer support programme** among ASEAN Member States to strengthen institutional and policy development related to DRR and CCA	
1.3. Established ASEAN **cross-sectoral collaboration** on DRR and CCA	1.3.1. Identify government agencies relevant to DRR and CCA at national level	NDMOs
	1.3.2. Establish mechanism to facilitate **inter-agency, multi-stakeholder collaboration** on DRR and CCA at the national level	WG P&M
	1.3.3. Establish **a regional mechanism** to gather relevant ASEAN sectoral bodies engaged in DRR and climate change, including environment, agriculture, and food security, among others	
	1.3.4. Conduct **a regular dialogue** among the agencies and sectors to develop recommendations on the policy and implementation of DRR and CCA at the national and regional level	

** Bold letters are highlighted by the CN20 Project Team.*

As shown in Table 1.1.4, designated implementation agency of the key activities are mostly the WG P&M and partially national disaster management offices (NDMOs). According to the terms of references written in the AADMER Work Programme 2016-2020, the Working Groups are responsible for:

1) Initiating, leading, and implementing the activities that fall under their respective strategic components and priority programmes;
2) Providing strategic directions in the implementation of the AADMER Work Programme activities and be aware of related initiatives in their respective territories, within the region as well as globally in order to start possible opportunities for collaboration;

3) Conducting regular monitoring, review and evaluation of the implementation of their respective strategic components and related building blocks and drivers; and
4) At the outset of the implementation, the WG P&M will agree on a set of indicators, design a methodology and system (i.e. who will do what, what are the sources of verification) for monitoring and evaluation with the assistance of ASEAN Secretariat as well as other technical experts.

The Working Groups meet on a self-financing basis in principle and they work closely with partners to implement the key activities. For instance, the WG P&M has collaboration projects with following partners covering various themes under the three Priority Programmes:

- ASEAN-Japan Partnership
- APEC Climate Center (APCC)
- Asian Development Bank (ADB)/Government of Canada
- Food and Agriculture Organisation of the United Nations (FAO)
- United Nations Economic and Social Commission for Asia and the Pacific (ESCAP)
- AADMER Partnership Group (APG)
- ASEAN Safe Schools Initiative (ASSI)
- International Federation of Red Cross and Red Crescent (IFRC) /Thai Red Cross
- Embassy of Switzerland, SDC/HA
- European Commission, Directorate-General for European Civil Protection and Humanitarian Aid Operations (ECHO)
- Mercy Malaysia
- Habitat for Humanity

Reflecting that, main tasks of the WG P&M, particularly the Co-Chairs, are overseeing of these projects and coordination of the partners with the assistance of ASEAN Secretariat. Considering the fact that the number of officials assigned for the WG P&M in each Member State is limited and the number of requests to attend related meetings and activities, in addition to similar requests from other Working Groups' activities, generally they are overstretched for "overseeing" these projects.

The ASEAN Secretariat assists in providing policy support and coordination among the implementing entities as well as ASEAN's partners, ensuring policy coherence with regional and global frameworks on disaster risk management and sustainable development. However, considering the number of the Working Groups and associated projects, as well as the associated coordination with the ASEAN Member States and partners and secretariat works for organising the ACDM Meetings, the ASEAN Ministerial Meeting on Disaster Management and other WG meetings, their support for individual project implementation is limited.

In addition, notably, involvement of the AHA Centre in the activities of the Priority Programme 2-4 overseen by the WG P&M is also limited compared to other WGs' Priority Programmes as shown in Table 0.3. In principle, main roles of the AHA Centre are facilitation of cooperation and coordination among the ASEAN Member States and to endeavour to fulfil a wider range of functions covering the whole spectrum of disaster management, as mandated by AADMER, given available resources (AADMER Work Programme 2016-2020). However, the AHA Centre's current main focuses are Disaster Monitoring & Analysis and Emergency Preparedness and Response, not prevention and mitigation, as seen in their organisational structure as well as the focus areas in the AADMER Work Programme 2016-2020 shown in Table 0.3. In other words, Priority Programme 2-4 cannot expect much support from the AHA Centre.

Hence, leading role of the Co-Chairs of the WG P&M is essential for the implementation of the CN20 Project. However, again, it needs to be noted that they are overseeing many other projects concurrently – a general constraint for projects under the Priority Programme 2-4.

The Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disaster and Climate Change

In relation to the 21 Flagship and Priority Projects under the AADMER Work Programme Phase 2, the Heads of States/Governments of the ASEAN adopted the Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disaster and Climate Change at the 26th ASEAN Summit in Kuala Lumpur, Malaysia on April 27, 2015. The Declaration recognises that "exposure of ASEAN's peoples and communities to various natural hazards is rapidly rising, vulnerability to extreme weather events and climate change is spiralling, and this "new normal" leads to growing frequency and severity of disasters" and realises "the urgent need to … simultaneously address the interlocking issues of disaster risk reduction, climate change adaptation and sustainable development and to effectively reduce adverse impacts of natural and human-induced disasters and climate change on key development sectors". The Declaration also stressed the importance of:

- … systematically mainstreaming disaster risk management and climate change adaptation in relevant sectoral policies, strategies, plans, programmes, and projects;
- Further institutionalise disaster risk management and climate change adaptation at the national and local levels;
- Encouraging all stakeholders to participate in planning and implementation;
- Accelerate investments in disaster risk prevention and reduction and climate change adaptation … focusing on key development sectors such as health, water management, ecosystems management, economic planning, agriculture, cultural heritage, education, infrastructure and construction, transport and telecommunication, and risk financing and risk transfer;
- Address underlying risk drivers and compounding factors, such as climate change and climate variability, uncontrolled urbanisation, ecosystem degradation, weak governance, limited risk management capacity especially at the local scale, poor management of urban and rural development, consequences of poverty and inequality;
- Foster the understanding of risk in all its dimensions of vulnerability, capacity and exposure … to ensure that policies, plans and priorities for intervention are based on evidence and credible assessment of risk and climate change impact scenarios at the local, national and regional levels;
- Continue sharing and dissemination of risk and climate information to support on going and future efforts on research and development in disaster risk management and climate change adaptation … to further support risk-informed policy development, decision-making and investment programming;
- Strengthen the capacities of national and regional institutions to monitor and reduce risk as well as enhance their adaptive capacities through the promotion of education on climate change and disaster risk management and exchange of innovative practices and learning experiences;
- Allocate resources to strengthen disaster preparedness for effective response and effectively support resilient recovery and rehabilitation;
- … enhance cooperation and collaboration among ASEAN Member States to support the implementation of this Declaration and develop a cross-pillar and cross-sectoral collaborative ASEAN work programme …;

And concluded that the ACDM to be assigned as the focal point for cross-sectoral cooperation on resilience building at regional level. As given here, the objectives of CN20 Project is clearly stated and the ACDM is assigned to facilitate cross-sectoral cooperation in the region.

The Sendai Framework for Disaster Risk Reduction 2015-2030

Since CN20 Project focuses on DRR and CCA integration of the institutional and policy framework, the Sendai Framework for DRR is referred as a guiding framework for the implementation. Among the four Priorities for Action, CN20 focuses on Priority 1 to 3 which have a strong linkage with the institutional and policy framework for reducing disaster risk as well as the integration with CCA policies and plans. Goal and Priorities for Action are listed in Table 1.1.5 as a reference:

Table 1.1.5: Goal and Priorities for Action of the Sendai Framework for Disaster Risk Reduction 2015-2030

Goal: Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience			
Priorities for Action: There is a need for focused action within and across sectors by States at local, national, regional and global levels in the following four priority areas.			
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
Disaster risk management needs to be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment Focus of the CN20 Project	Disaster risk governance at the national, regional and global levels is vital to the management of disaster risk reduction in all sectors and ensuring the coherence of national and local frameworks of laws, regulations and public policies that, by defining roles and responsibilities, guide, encourage and incentivize the public and private sectors to take action and address disaster risk	Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation	Experience indicates that disaster preparedness needs to be strengthened for more effective response and ensure capacities are in place for effective recovery. Disasters have also demonstrated that the recovery, rehabilitation and reconstruction phase, which needs to be prepared ahead of the disaster, is an opportunity to «Build Back Better» through integrating disaster risk reduction measures. Women and persons with disabilities should publicly lead and promote gender-equitable and universally accessible approaches during the response and reconstruction phases

In reference to the Priorities 1 to 3, salient points relevant to evaluation of the level of DRR and CCA integration in each country are listed below which were referred to when developing an assessment framework and review points:

Priority 1: Understanding disaster risk

- Maintaining records of disasters and sharing the disaggregated data and statistics for science-based analysis;

- Disaster risk modelling, assessment and mapping, incorporating climate change scenarios downscaled from Global Climate Models (GCMs), and monitoring the geospatial and meteo-hydrological data using in-situ and remotely-sensed observation systems as well as by mobilising local residents;
- Sharing of and allowing access to such non-sensitive data and information;
- Enhancing multi-hazard early warning systems and disaster risk communication using social media, traditional media and mobile phone networks; and
- Exchanging such cost-effective and easy-to-use risk assessment and communication tools.

Priority 2: Strengthening disaster risk governance to manage disaster risk

- Integration of DRR and CCA in national socio-economic development plans;
- Strengthening inter-ministerial linkage for mainstreaming DRR and CCA in a coordinated manner and assigning an umbrella organisation for the coordination;
- Allocation and mobilisation of financial resources for DRR and CCA and introduce an expenditure tagging and tracking system;
- Strengthening sectoral laws and regulations, including those addressing land-use and urban planning, building codes, and environmental and resource management, by incorporating disaster and climate risk;
- Introducing payment for ecosystems based on economic evaluation of forest environmental services for conservation and rehabilitation of ecosystems;
- An assessment of the technical, financial and administrative DRM capacity of local governments and communities and assigning clear roles and tasks with budget allocation to them within DRM institutions and processes;
- Formulation of comprehensive local land-use plans incorporating disaster and climate risk based on local hazard, risk and vulnerability assessment; and
- In particular to address common transboundary disaster risks such as floods, storms and droughts as well as water resources management and river basin management, regional and sub-regional coordination for more efficient planning supported by creation of common information systems.

Priority 3: Investing in DRR for resilience

- Strengthening disaster-resilient public and private investments in critical facilities, in particular schools, hospitals, shelters, roads and transportation, river and coastal dykes, reservoirs and irrigation networks, among others;
- Strengthening the disaster-resiliency of those facilities by developing new design guidelines and standards incorporating disaster and climate risk with a sense of retrofitting and nurturing maintenance culture and implementing it in a stage-wise manner; and
- Addressing the fundamental land-use policy including urban planning, land degradation assessments and informal housing; Incorporating those aspects in local development plans together with ecosystem management of forests, rivers, coastal flood plains, drylands, wetlands and all other areas prone to droughts and flooding.

Other relevant regional and global frameworks

With regard to the climate change issues, the ASEAN Action Plan on Joint Response to Climate Change and the United Nations Framework Convention for Climate Change (UNFCCC) are the regional and global frameworks respectively. In relation to that, the Paris Agreement was adopted in December 2015 and entered into force in November 2016. All ASEAN Member States have submitted their Intended Nationally Determined Contributions (INDCs) to the UNFCCC Secretariat before the Paris Agreement and subsequently eight ASEAN Member States have submitted the Nationally Determined Contributions (NDCs) as of November 2017. In the INDCs and NDCs, each

country's determined CCA actions and priorities including DRR elements linked to existing strategies and plans are described.

The ASEAN Action Plan on Joint Response to Climate Change was adopted in September 2012 at the 12th ASEAN Ministerial Meeting on the Environment (AMME). In the action plan, sharing information on ongoing and planned efforts in hydrological management and practices that aim to enhance water resources sustainability and adaptation efforts in urban, rural and coastal areas; assessing CC impacts on socio-economic development and environmental protection; promoting regional climate information and data sharing in order to develop ASEAN CC impact scenarios; enhancing climate/meteorological/ oceanographical observatory systems in the ASEAN region; and downscaling global climate models to produce CC impact scenarios at the regional, national and local levels, are stressed.

All ASEAN Member States have also adopted the 2030 Agenda for Sustainable Development at the United Nations Summit in September 2015 which consists of 17 Sustainable Development Goals (SDGs) and 169 targets covering various elements for achieving sustainable development. Among them, directly relevant goals, targets and indicators to the DRR and CCA are listed in Table 1.1.6.

Table 1.1.6: Relevant Sustainable Development Goals (SDGs) and associated targets and indicators

Goal	Target	Indicator
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable	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	11.5.1: Number of deaths, missing persons and persons affected by disaster per 100,000 people 11.5.2: Direct disaster economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services
	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 Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels	11.B.1: Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030a 11.B.2: Number of countries with national and local disaster risk reduction strategies
Goal 13: Take urgent action to combat climate change and its impacts	13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1: Number of countries with national and local disaster risk reduction strategies 13.1.2: Number of deaths, missing persons and persons affected by disaster per 100,000 people
	13.2: Integrate climate change measures into national policies, strategies and planning	13.2.1: Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases

Goal	Target	Indicator
		their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)
	13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	13.3.1: Number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
	13.B: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	13.B.1: Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities

Definition of disaster risk management (DRM) and disaster risk reduction (DRR)

According to the United Nations Office for Disaster Risk Reduction (UNISDR), DRM and DRR are defined as follows:

- Disaster risk management (DRM) is the application of disaster risk reduction (DRR) policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.
- Disaster risk reduction (DRR) is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development.

  Annotation: Disaster risk reduction (DRR) is the policy objective of disaster risk management (DRM), and its goals and objectives are defined in disaster risk reduction (DRR) strategies and plans.

Accordingly, this report uses the term DRR for the policy objective of DRM and the term DRM for the application of DRR policies and strategies.

1.2 Project Outline

The 2nd PSC Meeting in Bangkok in July 2016 decided that the project focuses on the following water-related disasters:

- Storm and flood
- Rain-induced landslide (including slope failure, debris flow and mudflow)
- Drought

Since the targeted disasters are all water-related, the Project Team paid attention to the aspects of water resources management, river management and river basin management in addition to DRM and CCA in each ASEAN Member State. Since the CN20 Project is formulated under the ACDM, the Project Team also focused on the DRR aspect and looked into how such measures are planned and implemented incorporating climate change risk by the line ministries and agencies. Since the CN20 belongs to the ACDM Working Group on Prevention and Mitigation, study focus was given to the corresponding Priority 1-3 of the Sendai Framework for DRR 2015-2030. In addition, since human-induced disaster risk such as uncontrolled urbanisation and depletion of natural ecosystems is rampant in the region, the Project Team also looked into conventional DRR measures including comprehensive land-use plan and conservation and rehabilitation of forest, mangrove and wetland which also have CCA functions.

Assessment categories of DRR and CCA integration

Based on the aims and specific objectives of the Concept Note 20, six assessment categories, which also correspond to the Priorities of Action of the Sendai Framework for Disaster Risk Reduction 2015-2030, were defined and used by the Project Team to assess the status of DRR and CCA integration in each ASEAN Member State as shown in Table 1.2.1. The six assessment categories are also highlighted in Figure 1.2.1, which illustrates four phases of DRR activities, namely institutional arrangement (categories 1, 2 and 3), risk assessment (category 4), planning and implementation (category 5) and monitoring and evaluation (category 6, capacity building, applies to all phases), and how climate change impact is incorporated in it and what elements are studied. These elements were extracted from the Sendai Framework for Disaster Risk Reduction 2015-2030, the AADMER Work Programme 2016-2020, and the Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disaster and Climate Change. Items of each assessment category and their review points are summarised in Table 1.2.2.

Table 1.2.1: Assessment categories of DRR and CCA integration

<table>
<tr><th>Key words* from the aims and specific objectives of the CN20 Project</th><th colspan="2">Six assessment categories of DRR and CCA integration</th><th>Corresponding Priorities for Action of the Sendai Framework for DRR</th></tr>
<tr><td>Umbrella laws and regulations</td><td rowspan="5">Institutional and policy development</td><td>1. Policies, laws and regulations</td><td rowspan="5">Priority 2</td></tr>
<tr><td>Institutional and policy framework</td><td rowspan="3">2. Management system</td></tr>
<tr><td>Relationships between national agencies responsible for DRR and CCA</td></tr>
<tr><td>Partnership in linking DRR and CCA at all levels</td></tr>
<tr><td>Joint funding mechanism</td><td>3.Financial arrangement</td></tr>
<tr><td>Participatory risk assessment</td><td colspan="2">4. Risk assessment</td><td>Priority 1</td></tr>
<tr><td>Integrated planning of DRR and CCA</td><td colspan="2">5. Planning and implementation</td><td>Priority 3</td></tr>
<tr><td>Support joint training and meetings</td><td colspan="2">6. Capacity building</td><td>Priority 1-4</td></tr>
</table>

* Key words are underlined in the aims and specific objectives of the CN20 Project in the previous section.

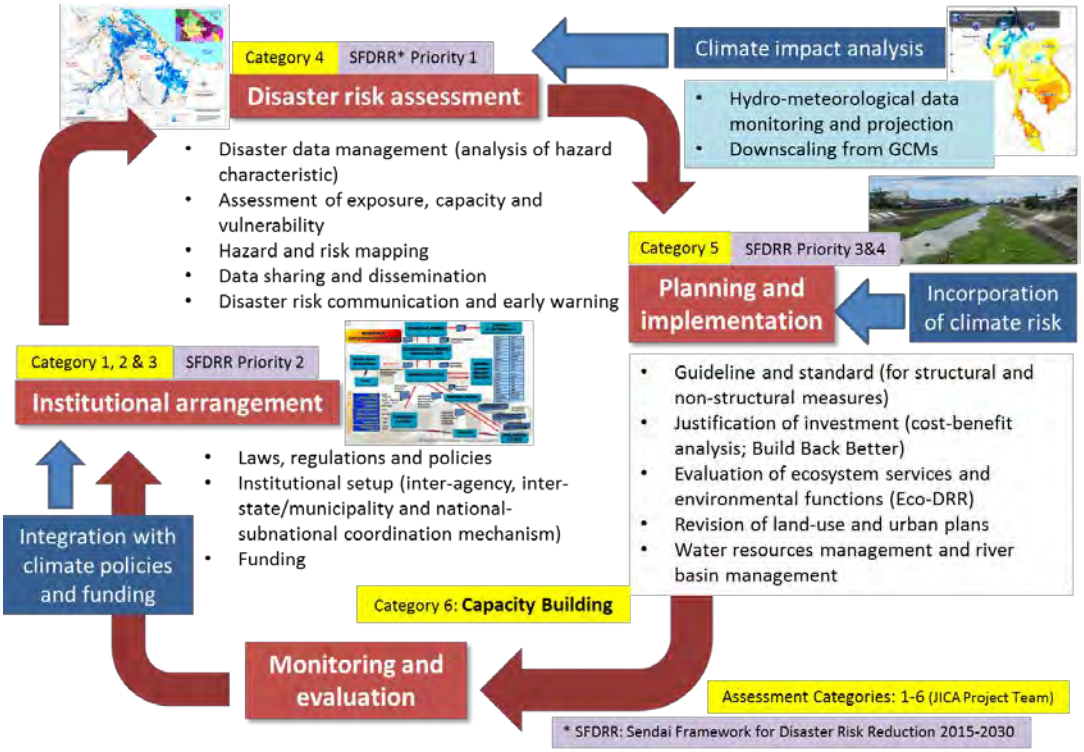


Figure 1.2.1: Incorporation of climate change impact in DRR activities

Source: JICA Project Team

Table 1.2.2: Review points of the assessment categories of DRR and CCA integration

Assessment category	Review points
1. Policies, laws and regulations	
1) National development plan	DRR and CCA concepts are incorporated in the national socio-economic development plan
2) DRR laws, regulations and policies	DRR laws, regulations and policies are enforced with consideration of CCA; DRR is mainstreamed in each ministry's policies
3) CCA laws, regulations and policies	CCA laws, regulations and policies are enforced with consideration of DRR; CCA is mainstreamed in each ministry's policies
4) Relevant sectoral laws, regulations and policies	DRR and CCA concepts are incorporated in relevant sectoral laws, regulations and policies including local land-use and urban plans, building codes, water resources and river basin management, forestry management, etc.
2. Management system	
1) National disaster risk management system	A national disaster risk management committee has been setup for inter-ministerial coordination and it also coordinates with the CCA committee; A national-subnational disaster risk management system has been setup for integrated disaster risk management;
2) National CCA system	A national CCA committee has been setup for inter-ministerial coordination and it also coordinates with the disaster risk management committee
3) Transboundary disaster risk management	A multi-stakeholder transboundary disaster risk management system has been setup for floods, storms and droughts
3. Financial arrangement	

Assessment category	Review points
1) Financial arrangement for DRR	Funds are allocated for DRR activities with a monitoring and tracking system
2) Financial arrangement for CCA	Funds are allocated for CCA activities with a monitoring and tracking system
3) Payment for ecosystem services	Payment for ecosystem services is implemented based on the economic assessment
4. Risk assessment	
1) Disaster database	Disaster data is recorded and used for science-based analysis
2) Hydro-meteorological data management and climate risk analysis	Climate risk is analysed based on hydro- meteorological data monitoring and downscaling from Global Climate Models (GCMs)
3) Hazard and risk mapping	Hazard maps and risk maps for flood, storm surge, landslide and drought are prepared by assessing the damages of the past disasters, the capacity and vulnerability of local authorities and communities, and the climate risk and they are provided with high resolution for local land-use planning
4) Data sharing and dissemination	Disaster and climate risk data including hazard and risk maps are accessible
5) Early warning system and disaster risk communication	Early warning system is set up and disaster risks are communicated through traditional media, social media and mobile phone networks
5. Planning and implementation	
1) Guideline and standard	Guidelines and standards incorporating disaster and climate risk are developed and used
2) Land-use and urban planning	Land-use and urban plans are prepared by incorporating disaster and climate risk and with an assessment of ecosystem services
3) Disaster-resilient investment	Public and private investments are channelled to strengthen resiliency of critical facilities, including schools, hospitals, evacuation facilities, roads and transport, river and coastal dykes, reservoirs and irrigation networks, forests and retardation areas, etc., and they are implemented in a stage-wise manner
4) Drought risk reduction	Drought risk reduction measures including water resources management and agricultural measures are implemented
6. Capacity building	
1) DRR and CCA training	DRR and CCA trainings for national and local government officials and other stakeholders are provided
2) Sector-wise training	Special training programmes are implemented for specific purposes such as a climate school for farmers

Structure of the report

This report consists of the following five chapters:

6. Background and project outline
7. Status of DRR and CCA integration in ASEAN *(Expected output No. 2)*
8. Good practices of DRR and CCA integration in ASEAN *(Expected output No. 1)*
9. Work Plan for strengthening DRR and CCA integration *(Expected output No. 3)*
10. Conclusion and recommendation

Chapter 2 to 4 correspond to the expected outputs 1 to 3 of the project: Chapter 2 to expected output No. 2; Chapter 3 to expected output No. 1, and Chapter 4 to expected output No. 3.

1.3 Management Arrangement

Implementation schedule

The project was implemented according to the schedule given in Table 1.3.1. The project period is roughly divided into following two phases:

- First phase (July 2016 – April 2017): Baseline study in ten Member States, for few days to maximum two weeks each, to assess the status of the DRR and CCA integration and to identify good practices
- Second phase (May 2017 – January 2018): Developing a Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration (hereinafter, Work Plan) through organising National Workshops in three countries, a Regional Forum and a Senior Official-Level Forum (SOLF) for the consensus building

In between them, a total of seven Project Steering Committee (PSC) Meetings were held jointly with the Concept Note 18 (CN18) Project for Building Disaster and Climate Resilient Cities in ASEAN, another JICA-supported project, to share the progress and confirm the direction. The progress of the project was also reported at relevant ASEAN meetings including:

- The 30th ASEAN Committee on Disaster Management (ACDM) Meeting and the 4th AADMER Partnership Conference on 4 and 6 April 2017, respectively, in Vientiane, Lao PDR;
- The 8th Meeting of the ACDM Working Group on Prevention and Mitigation (WG P&M) on 7 September 2017 in Bangkok, Thailand;
- The 31st ACDM Meeting and the 5th ASEAN Ministerial Meeting on Disaster Management (AMMDM) on 17 and 19 October 2017, respectively, in Luang Prabang, Lao PDR; and
- The 20th ASEAN-Japan Summit on 13 November 2017 in Manila, the Philippines.

Table 1.3.1: Project implementation schedule

Activity	Schedule and venue		Remarks
2nd Project Steering Committee (PSC) Meeting	*July 27, 2016, Bangkok, Thailand*		*Inception Report*
1st field survey	Aug 1-12, 30-31, Sep 1-6, Thailand; Aug 15-26, Lao PDR		
2nd field survey	Sep 19-30, Myanmar; Oct 4-18, Cambodia		
3rd field survey	Nov 14-25, Vietnam; Nov 28-Dec 7, Malaysia; Dec 8-9, Singapore; Dec 12-14, Brunei Darussalam		
3rd PSC Meeting	*December 7, 2016, Vientiane, Lao PDR*		*Field survey progress*
4th field survey	Jan 9-20, 2017, Indonesia; Jan 23-Feb 3, the Philippines		
4th PSC Meeting	*March 1, 2017, Bangkok*		*Field survey result* *Draft Progress Report*
30th ACDM Meeting	April 4	Vientiane, Lao PDR	Co-Chairs of the WG P&M reported the progress.
4th AADMER Partnership Conference	April 6		The Project Team reported the progress.
National workshop-1	**May 31, Naypyitaw, Myanmar**		**Discussed desired regional collaborative activities to implement the Work Plan**
National workshop-2	**July 6, Hanoi, Viet Nam**		
National workshop-3	**July 12, Quezon, the Philippines**		
5th PSC Meeting	*July 6, Bangkok, Thailand*		
6th PSC Meeting	*Sep 4*	**Bangkok, Thailand**	*Preparation of the Regional Forum*
Regional Forum	**Sep 5-6**		**Decided immediate collaborative activities of the Work Plan**
Preparatory meeting of SOLF	Sep 6		
8th Meeting of the Working Group on Prevention and Mitigation	Sep 7		Discussed the implementation plan of the Work Plan
31st ACDM Meeting	Oct 17	Luang Prabang, Lao PDR	**The Work Plan was endorsed.**
5th ASEAN Ministerial Meeting on Disaster Management (AMMDM)	Oct 19		Co-Chairs of the WG P&M reported the Work Plan at the 5th AMMDM.
20th ASEAN-Japan Summit	Nov 13	Manila, the Philippines	Work Plan was reported.
7th PSC Meeting	*Nov 15*	**Jakarta, Indonesia**	*Preparation of the Senior Official-Level Forum*
Senior Official-Level Forum	**Nov 16**		**Decided the Work Plan 2018-2020**
8th PSC Meeting	*Dec 21, Bangkok, Thailand*		*Draft Final Report*
	Jan 2018		Final Report submission

Phase 1: Baseline study

Phase 2: Development of the Work Plan

Project management structure

The CN20 Project is managed by the Project Steering Committee (PSC) comprising Co-Chairs of the ASEAN Committee on Disaster Management (ACDM) Working Group on Prevention and Mitigation (WG P&M) [Lao PDR & Thailand], the Disaster Management and Humanitarian Assistance Division of the ASEAN Secretariat, the ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) and the JICA as illustrated in Figure 1.3.1. The JICA Project Team implements the project in cooperation with the National Project Coordinators (NPC) assigned by the ACDM members in each ASEAN Member State and reports it to JICA and PSC members. The Co-Chairs of the ACDM Working Group on Prevention and Mitigation reports it to the ACDM Meeting.

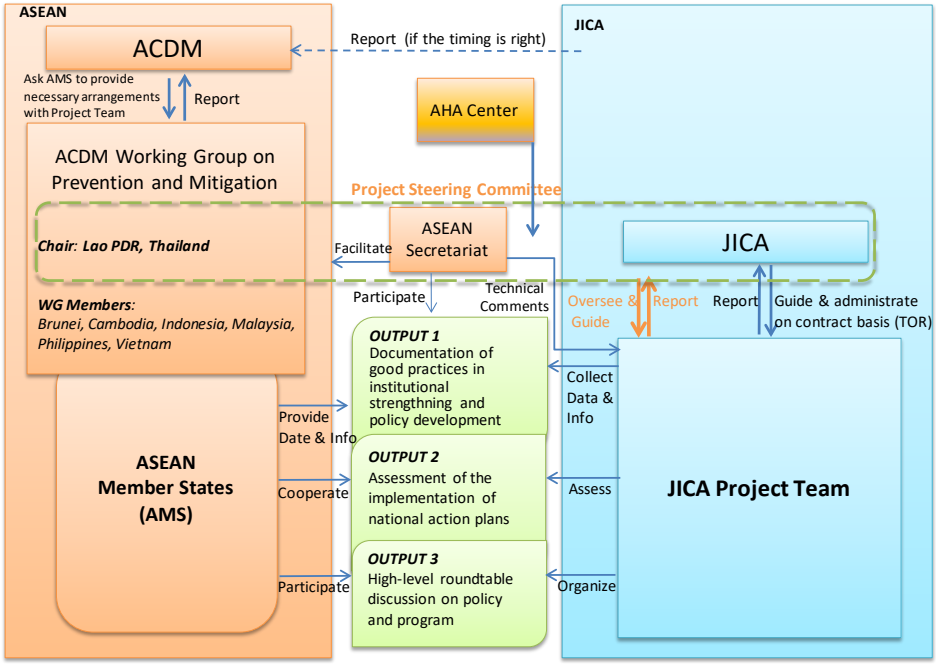


Figure 1.3.1: Project Management Structure

National project coordinators and their roles

The ACDM member of each ASEAN Member State appointed the National Project Coordinator (NPC) as shown in Table 1.3.2 with the following tasks:

Table 1.3.2: National Project Coordinators

Brunei Darussalam	National Disaster Management Center (NDMC)
Cambodia	National Committee for Disaster Management (NCDM)
Indonesia	National Disaster Management Authority (BNPB)
Lao PDR	National Disaster Management Office (NDMO), Ministry of Labour and Social Welfare
Malaysia	National Disaster Management Agency (NADMA), Prime Minister's Office
Myanmar	Relief and Resettlement Department (RRD), Ministry of Social Welfare, Relief and Resettlement
The Philippines	Office of Civil Defense (OCD), National Disaster Risk Reduction and Management Council (NDRRMC), Department of National Defense
Singapore	Singapore Civil Defence Force (SCDF), Ministry of Home Affairs (MHA)
Thailand	Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior
Viet Nam	Department of Natural Disaster Prevention and Control (DNDPC), Ministry of Agriculture and Rural Development (MARD)

Tasks of the National Project Coordinators:

1) Make necessary appointments with DRR- and CCA-related ministries and agencies as requested by the Project Team and assist collecting relevant documents;
2) Provide ideas on the direction of the project and the way to conclude it;
3) Convene relevant ministries and agencies to the reporting back session organised by the Project Team after the field study and share the outputs with them;
4) Recommend relevant ministries and agencies to participate in the workshops and forums organised by the Project Team; and
5) Other relevant coordination and arrangements.

Project Team members

The JICA Project Team consists of the following members – two for storm and flood risk management and assessment, two for drought risk management and assessment, one for DRR and CCA related institutional matters, two for secretariat operation in Tokyo and Bangkok respectively, and a team leader:

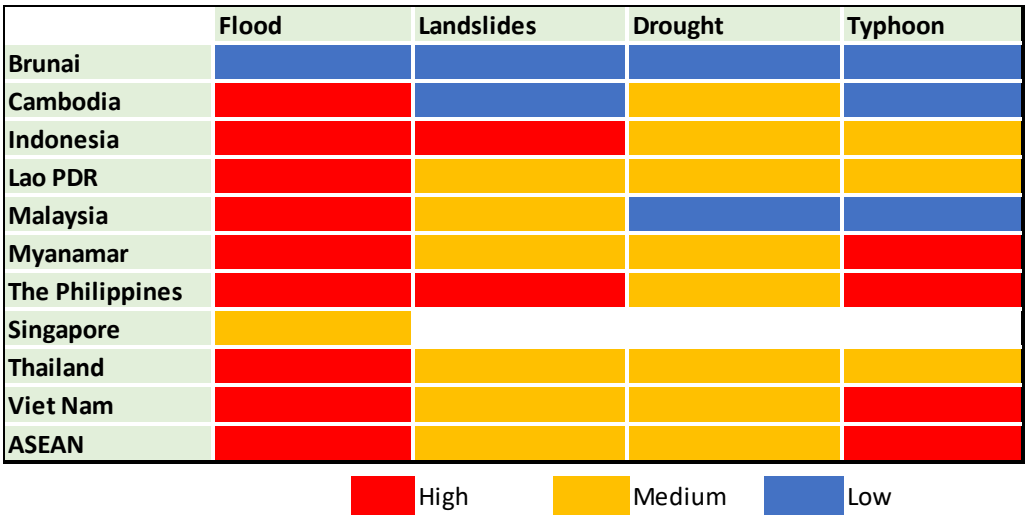
Table 1.3.3: Project Team members

Name	Role	Name	Role
Toshizo Maeda	Team leader / DRR	Takehiko Ogawa	CCA measures; Organisations and legal institutions
Takashi Furukawa	Storm and flood risk management/ assessment (hydrology and civil engineering)	Prabhakar Sivapuram	Drought risk management/ assessment (hydrology and agriculture)
Binaya Raj Shivakoti	Storm and flood risk management/assessment (non-structural measures)	Hirokazu Sakai	Drought risk management/ assessment (non-structural measures)
Naoko Genjida	Secretariat operation 1 (Tokyo)	Taeko Takahashi & Makoto Tsukiji	Secretariat operation 2 (Bangkok)

1.4 Water-related Disasters in ASEAN

There has been significant upsurge in water related disasters in all ASEAN Member States (Table 1.4.1) and most of them could be linked directly or indirectly to the impacts of climate change. Rise in the number and intensity of both fast and slow onset disasters are causing a huge toll on people's lives, damages to infrastructures and houses, economic losses and countries' overall development. While changing pattern of hydro-climatic events (rainfall, typhoons, El Nino, La Nina) is an obvious factor responsible for increased frequency of water-induced disasters, human-induced drivers such as land-use changes, urbanisation and inadequate preparedness are also responsible for increasing susceptibility to disasters and are largely responsible for a large-scale loss and damages.

Table 1.4.1: Disaster matrix by country (1970-2009)



Source: UNISDR. 2010. Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Vulnerability to natural disasters and climate change

Global indices are other source of information on the country level disaster and climate risks (Figure 1.4.1). According to ND-GAIN (University of Notre Dame Global Adaptation Initiative), which is a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience, all ASEAN countries, except Singapore, were classified as high or intermediate climate risk. The WRI (World Risk Index), which highlights the risk of becoming a victim of disaster owing to five natural hazards: Earthquakes, cyclones, floods, droughts, and sea-level rise, positions Myanmar in the global 5th most disaster risk prone country in 2016, while the Philippines (11th), Vietnam (27th), Indonesia (35th), Cambodia (42th), Thailand (43rd), Lao PDR (84th) had intermediate disaster risks. Other three ASEAN countries (Brunei Darussalam, Malaysia, and Singapore) had the least disaster risks. According to GCRI (Global Climate Risk Index), which indicates a level of exposure and vulnerability to extreme events and which are warnings for countries to be prepared for more frequent and/or more severe events in the future, shows majority of ASEAN member states (except Brunei Darussalam, Malaysia, Singapore, and Thailand) in 2015 were classified intermediate risks, while no single country had high climate risks. While the results from all three global indices shows high climate and disaster risks in ASEAN, inconsistencies of the results among these indices does suggest a need for common methodology/approach for disaster and climate risk assessment for ASEAN.

	Rank	ND-GAIN (2015)	WRI (2016)	GCRI (2015)
		Indices		
Top Ten High Risk	1	Vanuatu	Mozambique	Central African Republic
	2	Tonga	Dominica	Chad
	3	Philippines	Malawi	Eritrea
	4	Guatemala	India	Burundi
	5	Bangladesh	Myanmar	Sudan
	6	Solomon Islands	The Bahamas	Yemen
	7	Brunei Darussalam	Ghana	Afganistan
	8	Costa Rica	Chile	DRCongo
	9	Cambodia	Pakistan	Papa New Guinea
	10	Papua New Guinea	Micronesia	Mauritina
	11		Philippines	
	18	Viet Nam		
	23			Myanmar
Intermediate Risk	27		Viet Nam	
	35		Indonesia	
	36	Indonesia		
	42	Myanmar	Cambodia	
	47		Thailand	
	52			Cambodia
	60			Lao PDR
	84		Lao PDR	
	85			Philippines
	86	Malaysia		Indonesia
	89	Thailand		
	90			Viet Nam
	100	Lao PDR		
	120		Malaysia	
	121			Brunei Darussalam
	123		Brunei Darussalam (highest)	
	123		Singapore (highest)	
	125			Thailand
	142			Malaysia
Low Risk	159	Singapore		
	170	Malta		
	171	Qatar (highest)		
	178			Singapore
	179			New Zealand
	180			Norway
	181			Denmark (highest)

About Indices:

University of Notre Dame Global Adaptation Initiative (ND-GAIN) is a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience.

World Risk Index (WRI) highlights the risk of becoming a victim of disaster owing to five natural hazards: Earthquakes, cyclones, floods, droughts, and sea-level rise. WRI consists of four components: Exposure (to natural hazards), susceptibility, coping capacities and adaptive capacities.

Global Climate Risk Index (GCRI) indicates a level of exposure and vulnerability to extreme events, which countries should understand as warnings in order to be prepared for more frequent and/or more severe events in the future. Each country's index score has been derived from a country's average ranking in four indicating categories, according to the following weighting: death toll, 1/6; deaths per 100 000 inhabitants, 1/3; absolute losses in PPP, 1/6; losses per GDP unit, 1/3.

Figure 1.4.1: Relative disaster and climate risk of ASEAN member states according to selected global risk indices

Floods and Typhoons

Floods and typhoons are the two most common disasters that have shown an increasing trend in terms of occurrences and scale of the impacts in the region (Figure 1.4.1). 2011 Flood in Thailand, 2008 Cyclone Nargis (Myanmar), or Typhoon Haiyan (Yolanda) in 2013 signify the catastrophic scale of disasters that require significant improvement in countries' disaster risk management (DRM) system. Floods in ASEAN region are triggered by monsoon rainfall, typhoons and storms. There are generally two common types of floods in ASEAN region. First type is inundation type (such as 2011 flood in Thailand or floods in the Mekong Plains in Cambodia) that is characterised by low velocity, but lasting for longer duration (several days). Second type is flash flood characterised by strong velocity which can lasts in the scale of hours to a few days but has a potential to inflict direct physical damages (such as floods resulting from high intensity rainfall in the event of typhoons or rainstorms). DRM systems are in place from national, provinces, cities/municipalities, districts to villages or communities but member countries are increasingly facing the needs to strengthen their DRM system to cope with changing hydro-meteorological regimes and expansion of hazard prone areas.

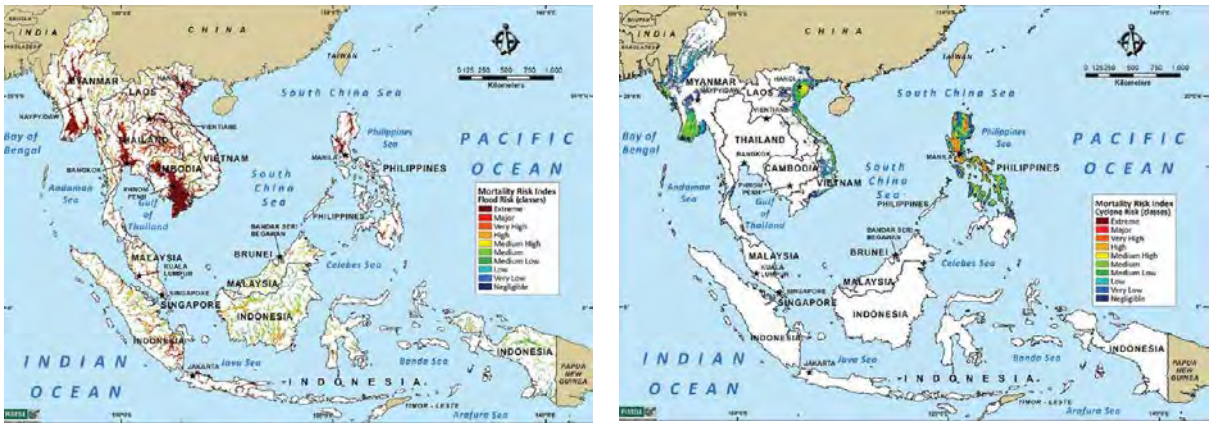


Figure 1.4.2: Flood mortality risk map (left) and cyclone mortality risk map (right) of ASEAN
Source: UNISDR. 2010. Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Landslides

Landslides are another water induced geo-hazard faced by almost all ASEAN Member States (Figure 1.4.2) except Singapore. All sorts of landslide hazards (rock slide, debris flow, mud slide, slope failure, land creeping) are prevalent across the region depending on the type of geological formation and rainfall characteristics. For instance, Banjarnegara Municipality (Kapbupaten) in Central Jawa Province is one of the hot spots for landslide in Indonesia with more than 70% the Municipality categorized as high-risk area. In 2006 Guinsaugon Landslide in Saint Bernard Municipality in Southern Leyte of the Philippines caused by prolong heavy rainfall killed 1,100 persons including 250 school children. There are other minor landslides occurring almost every year such as in Thailand. Repeated occurrences of major and minor landslides suggest high vulnerability of member countries to this hazard. Landslide susceptible areas are mostly located in areas having weak geological formations and sloppy terrains, while disaster events are mainly triggered by continuous and heavy rainfall during monsoon or typhoons. Impacts of landslides are substantial in terms of loss of lives and property, disruption of natural and manmade structures and efforts required in the post-disaster response and recovery.

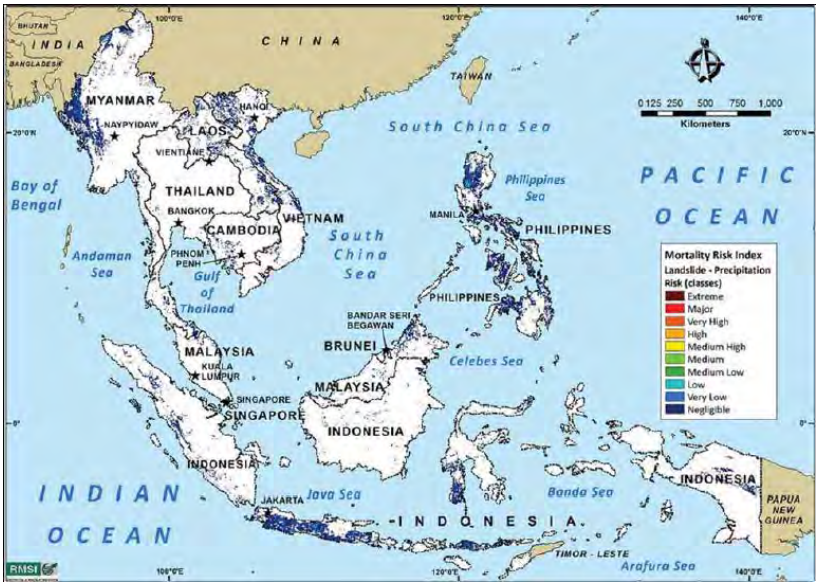


Figure 1.4.3: Landslide mortality risk map of ASEAN

Source: UNISDR. 2010. Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Drought

Except Singapore, all of the Member States are affected by drought (Figure 1.4.3). Majority of the member countries are considered rich in water resources, including Lao PDR where per capital water availability is considered one of the highest (>50000 m^3/person), due to abundant rainfall and availability various water sources (rivers, lakes, dams, groundwater). Historically, impacts of droughts are less severe and confined to specific localities such as Central Dry Zone in Myanmar, Northeast and Southern parts of Thailand, Mindanao region in the Philippines, and Perlis, Kedah, Penang and Sabah in Malaysia. Rather than drought, water stress or shortages is used such as in Malaysia and Singapore. Singapore as an exception, water shortages and occasional water stress are mainly attributed to a management gap caused by land-use changes and resultant rise in water demand (such as expansion of agriculture land, urbanisation) and diminishing water supply caused by loss of water sources and degradation of water catchment areas.

Drought is receiving a renewed attention in all ASEAN Member States mainly due to El Nino. Recent El Nino events such as in 1997/98 and 2014-2016 are the main causal factor for increasing drought incidences in the region. El Nino has become a new marker to differentiate prolonged droughts from occasional water stress or shortages. The important characteristic of El Nino phenomenon is long seasonal droughts as well as frequent dry spells during the cropping season. Impacts of droughts are mostly concentrated to the water supply sector and agriculture. ASEAN Member countries show considerable vulnerability to drought due to a significant contribution of agriculture and allied sectors on employment creation to a large proportion of populations, although share of agriculture to the overall GDP is on the decline.

Figure 1.4.4: Drought frequency SPI map of ASEAN

Source: UNISDR. 2010. Synthesis Report on Ten ASEAN Countries Disaster Risks Assessment

Storm surge and sea water intrusion

Coastal areas in all member countries, except Singapore, Cambodia and land-locked Lao PDR, are experiencing impacts of storm surge. There are mainly two types of storm surges. First type occurs during rainy season and typhoons that causes widespread inundation in coastal cities and other areas. Apart from natural causes, human intervention such as land reclamation, urbanisation and destruction of mangrove forests are responsible for increasing susceptibility to inundation caused by storm surges.

Another type of storm surge occurs during dry periods when river water level near coastal deltas is lower than the average flow. As a result of high tides during the dry period, sea water intrudes further inland contaminating water sources and the water supplies to cities, residents and agriculture fields are severely affected. Impact of storm surge is more severe during El Nino when surface runoff is substantially low. Gulf of Thailand, Mekong Delta (Viet Nam), Ayeyarwady Delta (Myanmar), Pahang River Delta (Malaysia), Semarang City in Central Java, Indonesia are some representative areas affected by storm surges.

Combined impacts of multiple disasters

Depending on the situation, there are also increasing instances of more than one disaster striking the same locality. They could be either co-occurring disasters one triggering another or cyclic nature. In the former case, typhoon is an appropriate candidate example. Along with its high wind force, typhoon can trigger floods and landslides at the same time putting pressure on the response

mechanism of DRM. In case of coastal areas situation could be even worse when combination of storm surge and floods obstruct drainage to the sea.

In case of cyclic nature of disaster, countries are increasingly facing a cycle of flood and drought in a few years. For instance, Champasak Province in Lao PDR has both flood and drought prone areas. Similar case applies in case of Central Java in Indonesia, some coastal areas in Viet Nam, and Mekong River Plains in Cambodia.

Considering above situation and the likely intensification of disasters caused by climate change, ASEAN Member States not only need to strengthen DRR to deal with a specific type of disaster, but also should consider enhancing their capacity to tackle multiple disasters. Similarly, for co-management of floods and droughts, there is a need to strengthen water resources management capacity in terms of water harvesting, such as diverting and storing excess runoff, watershed conservation, regulation of storage dams, and water management of floodplains to utilise beneficial inundation such as in Cambodia Mekong Flood Plains.

2. Country Assessment of DRR and CCA Integration in ASEAN

Assessment of DRR and CCA integration status in ASEAN based on the six categories is summarised in the following section 2.1-10 by each country and the regional overview as well as salient points in each country is briefly summarised in section 2.11. This chapter corresponds to the expected output No. 2 of the CN20 Project. The findings of the chapters 2 and 3 are based on the field survey results conducted from September 2016 - February 2017. These results were subsequently reviewed based on comments from relevant government officials through sharing draft reports and at the relevant occasions including the national workshops and regional forums.

2.1 Brunei Darussalam

2.1.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

The legal framework regarding disaster management in Brunei Darussalam has been historically diverse, extending over a number of legal documents. There is no stand-alone legal document concerning prevention, response and mitigation of natural disasters. Prevention and response to different kinds of natural disasters is dealt with in different legal documents.

Instead, the Disaster Management Order (DMO) 2006 defines the legal basis for disaster management. The DMO 2006 mandated the establishment of the National Disaster Council (NDC) and the National Disaster Management Centre (NDMC). The NDMC supports the NDC as the main strategic policy body in ensuring effective disaster management. The NDMC is involved in every phase of the disaster management of response, recovery, mitigation and preparedness.

Meanwhile, the Environmental Protection and Conservation Order 2010 were promulgated as one of central laws and regulations regarding environmental conservations in Brunei Darussalam. The order stipulates the protection and management of the environment, and the integration of environmental concerns into the government's policies.

The Wawasan Brunei 2035, the long-term vision for Brunei Darussalam, highlights the need for the legislative framework in Brunei Darussalam to be developed to address the cross-sectoral environmental challenges including climate change mitigation and adaptation. Furthermore, the 10th National Development Plan (RKN) 2012-2017 stresses the high quality and sustainable development infrastructure which includes the concept of DRR and CCA.

Brunei Darussalam formulated the Strategic National Action Plan (SNAP) for DRR 2012-2025. The SNAP is Brunei Darussalam's commitment document for all stakeholders in developing projects, programmes and activities in ensuring a disaster resilient country and community. The SNAP is a road map for the reduction of disasters by recognizing disaster risks and increasing the capacity to reduce vulnerability, mapping out significant ongoing initiatives and identifying gaps to safeguard the population.

The assessments on the current DRM and climate change institutional setting of Brunei Darussalam are summarised as below.

- Although there is a comprehensive long-term strategic DRR action plan (SNAP 2012-2025), there is no stand-alone comprehensive legal framework for DRM and climate change. The current legal framework is diverse and a minimum legal order in Brunei Darussalam.

- Although the current 5-year national development plan (RKN 2012-2017) addresses the cross-sectoral climate change adaptation and mitigation, there is no clear-cut indication on mainstreaming as well as integration of DRR and CCA.
- Although there is no comprehensive climate change adaptation strategy across the ministries, there are sector-wise individual climate change policies. While mainstreaming CCA into sector-wise policies has to some extent progressed in the individual policies, the integration of DRR and CCA remains unachieved.

(2) Organisational Structure

In Brunei Darussalam, the National Disaster Management Centre (NDMC) as a coordinating agency assesses, plans and recommends programmes and projects of mitigation and prevention, taking into account aspects of DRR, after assessing damages and losses.

The highest level of the decision-making body is the National Disaster Council (NDC) whose chair is His Royal Highness the Crown Prince, also as the Senior Minister at the Prime Minister's Office. Apart from the creation of the NDC, the NDMC was established as the coordinating agency for national disaster management. The founding of the NDMC provided Brunei with the essential institutional expertise required in the event of disasters.

It is the responsibility of the NDMC to alert the public in the event of the scale of disaster occurring in Brunei. Under the NDMC, representatives from relevant ministries are appointed as the focal-point officers in the event of disasters.

The Energy and Industry Department at the Prime Minister's Office (EIDPMO) is Brunei's designated national focal point for UNFCCC. The EIDPMO coordinates the formulation and implementation of Brunei's obligations and commitments to UNFCC. The Stakeholders Consultative Committee on Climate Change (SCCCC) coordinates the technical and implementation aspects of national obligations and commitments to the UNFCCC. The SCCCC tasks include coordinating the preparation of Brunei's Intended Nationally Determined Contributions (INDC) and Initial National Communications (INC). The SCCCC is composed of representatives from several government departments and agencies, and the University of Brunei Darussalam.

On the other hand, the responsibilities for the implementation of CCAs are scattered in line ministries. Especially, the Public Works Department under the Ministry of Development is responsible for the implementation of major CCA projects.

The assessments on the current DRM and climate change organisational arrangement of Brunei Darussalam are summarised as below.

- The responsibilities for the implementation of CCA activities are scattered in line ministries, while the Public Works Department of the Ministry of Development is responsible for the implementation of major CCA projects.
- In spite of the non-existence of the overall DRM and climate change strategies, the individual sector-wise climate change adaptation plans of some line ministries have been prepared, thereby to some extent mainstreaming DRM and climate change into the sector-wise development plans.
- The NDMC secretariat should be institutionally strengthened in terms of staff and budget, since human resources and financial resources are limited to meet the requirements of the functions as a secretariat to the NDC.
- The vertical coordination of the nation-wide 2-layer administrative levels of the National–District Disaster Management Committee is relatively weak in light of:

- collecting, sharing and feedback the information on disaster management;
- implementing risk identification and assessment;
- carrying out a rapid damage assessment after disasters; and
- monitoring and evaluation on implementing disaster management activities.

- The horizontal coordination between a DRM focal point and line ministries is relatively insufficient.
- The horizontal coordination between a climate change focal point and line ministries is relatively insufficient.
- Opportunities for trainings and knowledge sharing on mainstreaming of DRM and climate change at district level are not ample enough.

(3) Funding Structure

A large portion of the DRM in Brunei Darussalam is currently covered by development funds generated from the regular state budget. Although the DRM budget is primarily allocated for the Ministry of Development, the financial sources for the prevention and mitigation of disasters to be mobilised are scattered among line ministries. There is no fixed funding pool for disaster management, and the National Disaster Management Centre (NDMC) and other line agencies like the Ministry of Development have disaster-related budgets. For the NDMC, the special budget of disaster management titled "National Disaster Management Budget" for the financial year 2015-2016, which is equivalent to BND 3,000 thousand, occupies 15.42 percent of the total budget for the Ministry of Home Affairs (MOHA).

Although Brunei Darussalam currently does not have access to the Adaptation Fund, the only on-going project funded by the internationally provided fund is 'A Comparative Study on Food Reserve Management and Policies in Southeast Asia (2015-2017)' funded by SEARCA (Southeast Asian Regional Centre for Graduate Study and Research in Agriculture).

The assessments on the current funding system for DRM and climate change of Brunei Darussalam are summarised as below.

- A large portion of DRM and climate change response is currently funded with the development fund of the regular state budget. Therefore, the financial sources for DRM and climate change are scattered among line ministries, and those financial sources are not effectively mobilised as priority areas.
- Climate change related projects are not clearly identified or linked to specific climate change objectives under the present state planning and budgeting system. Challenges encountered in the collection of information regarding capital and recurrent expenditures on climate change across ministries and departments underscore the need for a consolidated budget tagging and tracking system.
- The Climate Public Expenditure and Institutional Review (CPEIR) has not been implemented to effectively mobilise the limited financial sources.
- There is no built-in funding and budgetary allocation system that supports pre-disaster or stand-by funds for district governments.

(4) River Basin, River and Forest Management Systems

The Public Works Department (PWD) under the Ministry of Development is responsible for public infrastructure such as roads, water supply and drainage and sewerage, flood mitigation/ management and coastal protection, landslide management, water resources management and building service.

However, River Basin Management (RBM) System has not been developed yet, probably due to the size of the country (5,765km2). River Management (RM) System has not been developed yet.

The PWD manages building houses in the flood prone areas including the easement zones along the rivers and river related structures.

Relating to RBM, forest management in the upland forest and mangrove in the estuary and coastal areas is carried out by the Forestry Department under the Ministry of Primary Resources and Tourism (MPRT). Forest conservation and management in Brunei is being managed well. Forest coverage in Brunei is more than 70 per cent.

2.1.2 Risk assessment

Brunei has started analyzing impacts of climate change by running climate analysis model. Flood hazard maps without climate change have been prepared, but flood hazard maps with climate change have not been prepared yet, but they are expected to be prepared from now on. Disaster database with sharing system are expected to be developed from now on.

(1) Disaster database

National Disaster Management Committee (NDMC) manages historical disaster data. However, NDMC needs more information about disaster damage from the field.

(2) Meteorological data management and downscaling from global climate model

Brunei Darussalam Meteorological Department (BDMD) is the agency responsible for meteorological observation covering temperature, humidity, air pressure, wind, rainfall, cloud and the meteorological data management. The Department also has a S-band doppler weather radar station covering the whole country to monitor rainfall intensity and distribution etc. The Department also conducts monitoring of lightning. BDMD conducts hourly, daily, weekly, monthly and annual weather forecasts. Relating to floods, BDMD conducts color coded flood forecasting and warning system (orange, yellow and red).

In 2014, BDMD had participated with other ASEAN member countries in South East Asia Climate Analysis and Modelling (SEACAM) project using six 150-year PRECIS (Jones, et al., 2004) regional climate model (RCM) experiments driven by several Global Climate Models (GCMs), over a common domain, which encompassed all ASEAN member countries.

Following the SEACAM project, BDMD is currently starting to run simulations on the impacts of climate change for Brunei Darussalam using PRECIS at several levels, at 25km grid resolution, PC based (Linux operating system) for 100-year period. The results will be used to analyse the rate of climate change quantitatively for all important weather elements (e.g. derivative monsoons rain, wind, temperature, humidity, pressure) for the nation, as well as to analyse regional climate changes that affecting the weather and climate in Brunei Darussalam.

BDMD also provides climate data to local institutions such as University of Brunei Darussalam for their research on the climate change.

(3) Hazard and risk map for flood, storm and landslide

In Brunei, floods including flash floods, landslide and strong wind and forest fire can be seen as natural disasters. Among them, flood hazard maps are prepared.

PWD makes flood maps by probable floods through technical assistance by Danish Hydraulic Institute (DHI) (see Figure below). The flood maps don’t include climate change impacts.

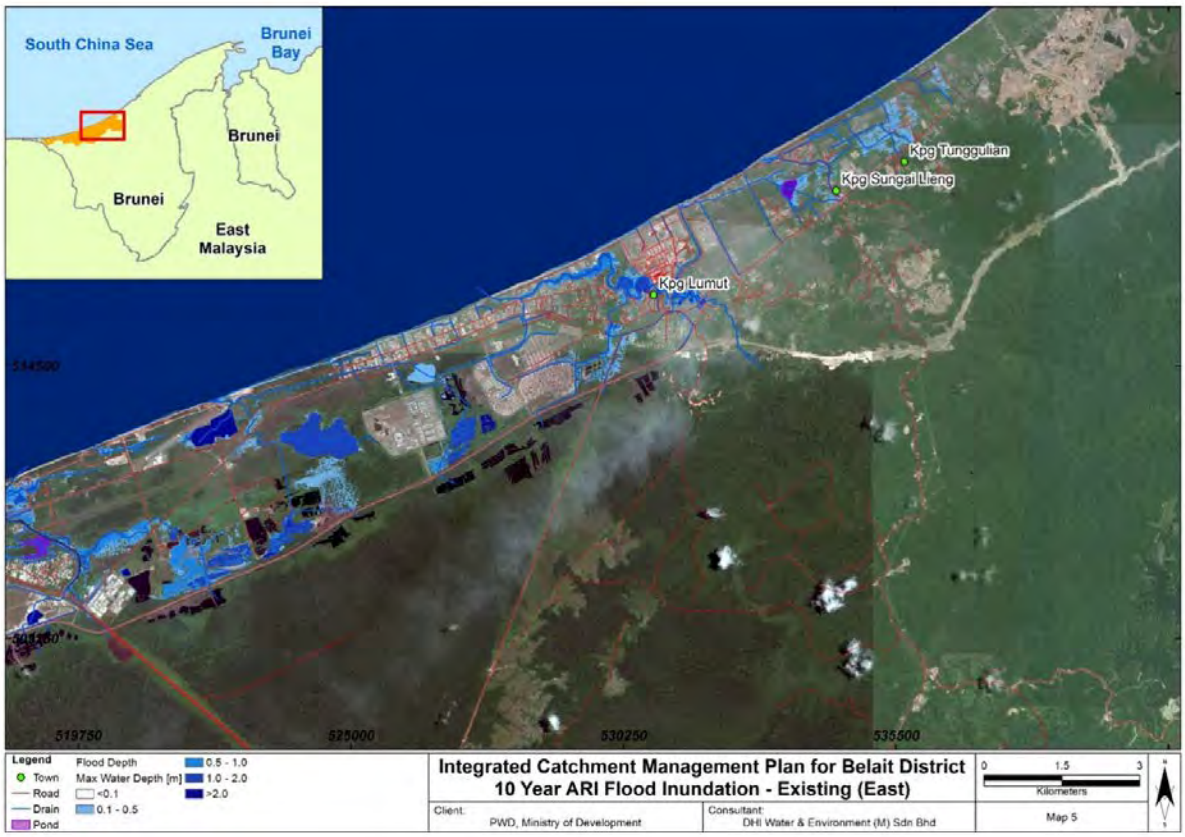


Figure: 2.1.1 Example of Flood Map of Probable Flood in Brunei

Source: PWD and DHI

(4) Risk assessment of drought

Brunei Darussalam has a tropical climate with variable rainfall pattern during the year. The Country has Southwest monsoon season starting from June to October and Northeast monsoon season starting from December to March. It is evident that Brunei Darussalam is affected by severe droughts in the past, 1998 being one of the most severe droughts experienced by the country. Droughts were found to be the cause behind the forest fires that also worsened the haze and air quality problems in the country. Hence, drought has not been seen just as a water scarcity problem but also affecting the forests and air quality. As a result of these incidences, the air and maritime transport operation were severely interrupted, poor visibility had led to closure of the airport; working and school hours were adjusted and shortened; and human work productivity was found to be declined due to an increase in the number of respiratory related cases. As a result of these impacts, the government of Brunei Darussalam is highly aware about the serious implications of climate change on its drought conditions. In the future, it is estimated that the Brunei Darussalam will face drought with implications in terms of drinking water scarcity, forest fires and water for agriculture. Despite these experiences, the historical analysis of rainfall trends in Brunei Darussalam indicated a possible increase in rainfall pattern over the period of 1984-2013 (Hasan, Ratnayake, & Shams, 2016)[1]. The climate change projections using statistical downscaling of GCMs indicated that the country will face decline in rainfall 12.7 mm year until 2076 (Hasan & Shams., 2017)[2]. The country is projected to have less

[1] Hasan, S., Ratnayake, U., & Shams, S. (2016). Evaluation of rainfall and temperature trends in Brunei Darussalam. AIP Conference Proceedings, https://doi.org/10.1063/1.4940282.
[2] Hasan, D., & Shams., U. R. (2017). Prediction of climate change in Brunei Darussalam using

rainfall events with intense rainfall events with implications leading to surface runoff and floods. The climate projections indicate the need to prepare for increase in temperature by 2-3 °C between 2031 and 2060 and by 3-4°C between 2071 and 2100 and increased heat stress resulting in drought events and a higher risk of water scarcity with increasing occurrence of forest fires (Meteorological Service Singapore and Met Office Hadley Centre, 2014) [3].

2.1.3 Planning and implementation

In Brunei, sea water level rise caused by climate change has been taken into account in planning and implementing some of the coastal dikes. In addition, there is a practice of building elevated (piloti type) houses in the flood prone areas around rivers with slow flood velocity, and this will also be effective with climate change impacts.

(1) Flood and storm risk managements

1) Guideline and Standard for DRR and CCA integration against floods, storm and landslide

There are manuals for Urban Drainage Design Manual and Stormwater Management Manual. However, there is no guideline and standard for DRR and CCA integration against flood, storm and landslide. Although it is not a regulation, there is a PWD requirement to build elevated houses in flood prone areas around the rivers.

Elevated House in Flood Prone Area beside the River

It is required to build elevated (piloti type) houses in flood prone areas such as beside rivers. Although, this practice does not include climate change impacts, this practice is effective in case of climate change impacts. Warning and evacuation is combined in case of occurring bigger floods than estimated.

Figure 2.1.2: Elevated house in flood prone area beside the river in Brunei

Photo: JICA Study Team

Tanjong Batu Coastal Protection against erosion

Sand beach at Tanjong Batu is one of the important coasts for breeding of sea turtles, but erosion and undercutting of the coast were the problem. In order to protect the coast, permeable type coastal dikes and breakwaters made by rocks were constructed. The design high water level (HWL) of the coastal dikes includes 40-years sea water level rise of 20cm by climate change. This Project is well planned and implemented with successful results.

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statistical downscaling model. Theoretical and Applied Climatology, 1-18.

[3] Meteorological Service Singapore and Met Office Hadley Centre. (2014). A Regional Climate Modelling Experiment for South East Asia. Singapore: Meteorological Service Singapore and Met Office Hadley Centre.

Figure 2.1.3: Tanjong Batu coastal protection in Brunei

Source: PWD (Satellite Image) Photos: JICA Study Team

(2) Drought

As a result of linkage between drought and forest fires, haze, and air quality problems, the country has implemented a zero-burning policy to mitigate the forest fires. The country has imposed ban on open burning that leads to release of smoke, has put in place monitoring and early detection measures to detect occurrences of fires and assess the extent of fire. Ground firefighting operation centers were opened including installation of air firefighting teams. To alleviate the drought conditions, various non-governmental agencies are evaluating the rainwater harvesting for populated areas including assessing the veracity of roof-top rainwater harvesting measures for Brunei Darussalam considering that there are no regulations for installation of rainwater harvesting in the country. In its intended nationally determined contributions (INDC) submitted to UNFCCC, the country stated the priority for sustaining freshwater flows in its rivers that are lifelines for the country, saving water consumption, and attaining water self-sufficiency. It proposed activities such as enhancing the forest cover through forest protection, slope stabilization and putting in place regulations to protect forests.

2.1.4 Capacity building

The study identifies improving systems and human resource readiness on collection of hydro-climatic information and analysis of historical and recent data linking with climate models (such as GCM and RCM) as one of the important capacity building needs. Improving their DRR and CCA capacity in this aspect would enable development of guiding tools to suggest practical design values to account for CCA such as the design of high water level (HWL) of the coastal dikes along the Sand beach at Tanjung Batu that includes sea water level rise of 20cm, which is about 40-years sea water level rise by climate change. In addition to that The National Committee on Disaster Management (NCDM)

may consider to improve collaboration with multiple stakeholders and expertise among relevant agencies could help strengthening DRR and CCA as well as improving implementation of identified actions. Another identified area for capacity development is strengthening early warning system through knowledge and experience sharing.

2.2 Cambodia

2.2.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

The Law on Disaster Management was enacted in 2015 with the contents of disaster management mechanism, disaster management framework, and governance, rights and obligations, and resources and funds. The Law clearly states the necessity for mainstreaming DRR by incorporating DRR into sector-wise policies.

Other related legal documents include:

- Sub-decree No. 35 ANKR, dated 27 March 1995 on the establishment of National Committees for Disaster Management (NCDM);
- Royal Decree NS/RKT/0202/040, dated 16 February 2002 on the establishment of National Committees for Disaster Management (NCDM);
- Sub-decree No. 30 ANKR.BK, dated 9 April 2002 on the organization and functioning of the National (NCDM) and Sub-national Committees for Disaster Management (PCDM) and (DCDM);
- Sub-decree No. 61 ANKR.BK, dated 29 June 2006 on the establishment of the Commune Committee for Disaster Management (CCDM);
- Direction No. 315 NCDM, dated 21 July 2010 on the establishment of the Village Disaster Management Group (VDMG) for the implementation of CBDRM;
- Resolution No. 115 SSR, dated 4 July 2014 on the establishment of a Coordination Task Force for Preparedness, Emergency Response and Recovery of the National Committee for Disaster Management;
- Royal Decree NS/RKT/1215/1141, dated 24 December 2015 on the organization and functioning of the National Committee for Disaster Management (NCDM); and
- Resolution No. 20 SSR, date 3 March 2016 on appointment of the components of the National Committee for Disaster Management (NCDM)

The Royal Government of Cambodia has been consistently taking steps to mainstream climate change into the existing regulatory frameworks in alignment with the strong guidance provided by national development policies and strategies. Likewise, the National Strategic Development Plan (NSDP) 2014-2018 entrusted the Ministry of Environment with the preparation of the climate change legal framework, which will include updating the institutional arrangements, financing arrangements, and mainstreaming of climate change across sectors.

The existing legal and regulatory framework relevant to Cambodia's climate change response includes:

- Law on Environmental Protection and Natural Resources (1996)
- Sub-Decree on Pollution Control (2005), Sub-Decree on Solid Waste Management (1999), Sub-Decree on Water Pollution Control, and other related legislation
- Sub-Decree on Environmental Assessment Process (1999)

The current legal and regulatory framework on climate change does not include the universal concept for CCA, and it requires a broader 'Environmental Code' on the climate change, thereby enhancing the enabling environment for climate change response.

Cambodia has been recently making remarkable progresses for implementing climate change responses. The overarching development plan for Cambodia, the National Strategic Development Plan (NSDP) 2014-2018, stresses the importance of implementing Cambodia's Climate Change Strategic Plan (CCCSP) 2014-2023, and the NSDP contains indicators to track the outcomes of climate change actions.

The NSDP also includes strategic and operational programmes of each sector, providing strategic directions for the management of natural resources and environment, and the capacity development strategies for CCA and mitigation of the risks caused by natural disasters,

In the area of DRM, the NSDP stresses reducing disaster risk factors by:

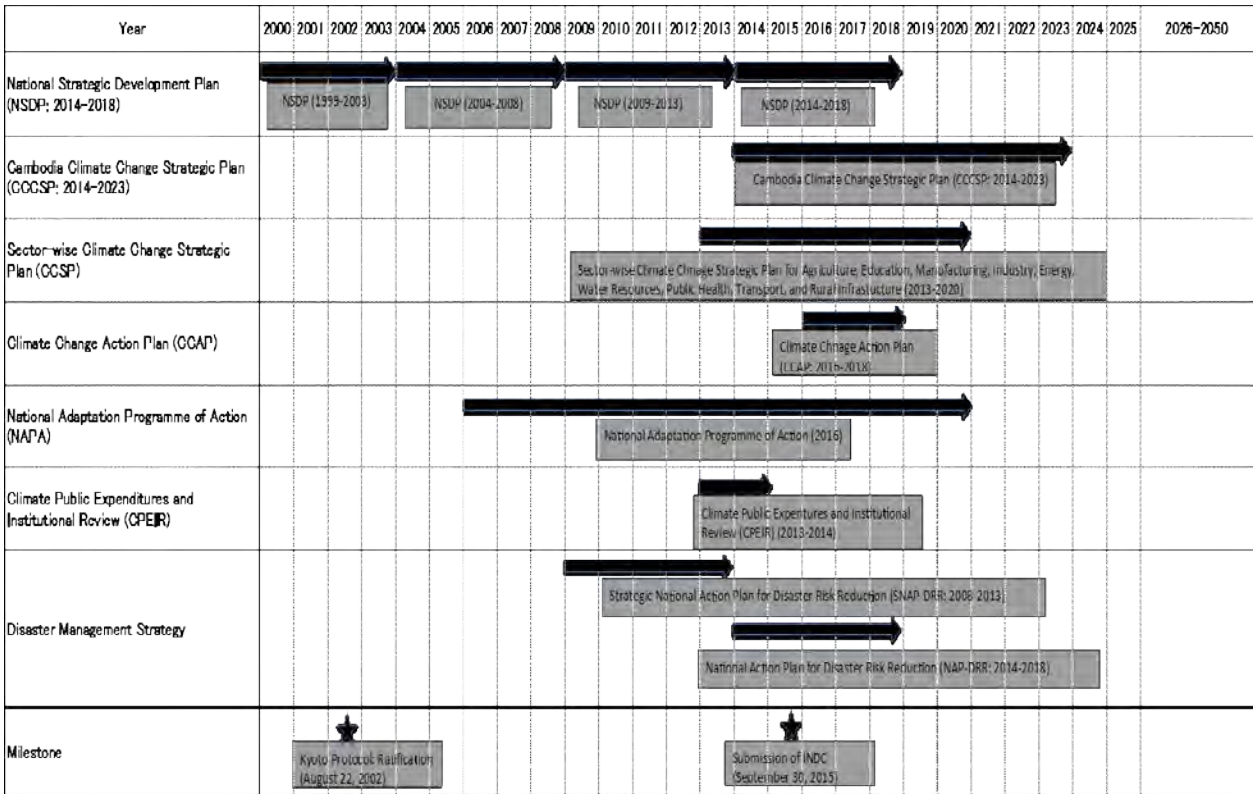
- Mainstreaming the DRR plan related to climate change into the DRR and CCA strategy; and
- Mainstreaming the DRR plan into the health, education, agriculture, forestry and fishery, and rural development sectors.

Under the CCCSP 2014–2023, the line ministries have developed Sectoral Climate Change Strategic Plans and Action Plans. They are all aligned with the CCCSP, and cover all the main sectors relevant to climate change.

The Strategic National Action Plan for Disaster Risk Reduction (SNAP-DRR) 2008-2013 which set out clear priorities and launched by the Royal Government of Cambodia (RGC) in March 2009. Subsequently, the National Action Plan on Disaster Risk Reduction 2014-2018 (NAP-DRR) was updated and promulgated on January 6, 2015. The action plan in its specific objectives clearly sets out priorities for a) improving common understanding, knowledge and awareness of disaster risk reduction; b) monitoring the implementation of disaster risk reduction initiatives in the country; c) mainstreaming of disaster risk reduction into development plans, policies and projects; d) enhancing cooperation between disaster management and development stakeholders; e) improving efficiency of resource allocation and utilization in disaster reduction; and f) orienting donor support to ensure resourcing towards government priorities. The above priorities and actions thoroughly support integration with sustainable development and climate change adaptation.

The timeframe for strategies and policies on climate change and disaster management of Cambodia is tabulated as below.

Table 2.2.1: Timeframe for Strategies and Policies on DRM and Climate Change (Cambodia)



The assessments on the current DRM and climate change institutional setting of Cambodia are summarised as below.

- While the current legal and regulatory framework on climate change is scattered among dozens of legal documents, there is a movement to consolidate those legal documents into a broader 'environmental code' on climate change, thereby enhancing the enabling environment for climate change response.
- Although there is a stand-alone comprehensive legal framework for DRM, the current legal framework is still diverse with the relevant Royal Decrees and Resolutions.
- Although the current 5-year national development plan (NSDP 2014-2018) addresses the importance of mainstreaming of DRM and climate change in sector-wise development plans, there is no clear-cut indication of the integration of DRR and CCA in the NSDP.
- Although there are sector-wise climate change adaptation plans of major line ministries, thereby to some extent mainstreaming CCA into sector-wise plans, the integration of DRR and CCA remains unachieved.

(2) Organisational Structure

The National Committee for Disaster Management (NCDM) was established in 1995, recognizing that the country's geographic location exposed it to natural disaster and perceiving that a country-wide coordinating body was needed to manage the respective risks. In conformity with the Law on Disaster Management which has was enacted in 2015, NCDM is also recognized as the headquarter of the Royal Government to lead, administer and coordinate all disaster management activities induced by either natural or human-made disasters in the Kingdom of Cambodia.

The NCDM is headed by the prime minister as president and it comprises of 37 memberships from all line ministries and concerned agencies. The day-to-day operations of NCDM are governed by the Secretariat General.

Major areas identified as specific responsibilities of the NCDM include:

- Issue the policies, strategic plans, plans of action, regulations, programmes and projects for disaster management;
- Issue guidelines for implementation of disaster management, promote public awareness, prevention, mitigation, preparedness, emergency response and recovery for safety and resilience;
- Recommend the Royal Government to take action on every case that will cause disaster and disaster occurrence;
- Coordinate the implementation of disaster risk reduction, mainstreaming of climate change, sustainable development, and gender issues by collaboration with line ministries in developing and strengthening the institutions, mechanisms and disaster management at all levels, in particular, at local community level to ensure better response during emergencies;
- Mobilize resources for implementation of policies, strategic plans, plans of action, relevant programmes and projects of disaster risk reduction;
- Strengthen collaboration and cooperation with development partners, public sector, private sector and civil society for the benefits of disaster reduction;
- Strengthen and expand collaboration at the regional and international levels in disaster reduction;
- Manage the information and communication associated with disaster risk reduction activities;
- Raise proposal to the Royal Government on the requirement, reserve, budget, resource and assistance for emergency response and recovery;
- Implement other tasks assigned by the Royal Government; and
- Convene a meeting at least once a year upon the invitation of the President.

The NCDM Secretariat General, which is the focal point of disaster management in Cambodia, was set up to lead and coordinate disaster management affairs and to provide support to the NCDM. As part of the decentralization process, disaster management institutions such as Provincial Committee for Disaster Management (PCDM), District Committee for Disaster Management (DCDM) and Commune Committee for Disaster Management (CCDM) have been set up to lead disaster management at their respective levels. Village Disaster Management Group (VDMG) is also in place as the lowest level body for disaster management.

Cambodia ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and the Kyoto Protocol in 2002. In 2006, the Royal Government of Cambodia established the National Climate Change Committee (NCCC), a cross-sectoral body with the mandate to prepare, coordinate and monitor the implementation of policies, strategies, programmes related to climate change. With an amendment in 2014, the NCCC has been functioning since its establishment as the inter-ministerial mechanism for coordination of climate change response in Cambodia.

The functions of the NCCC have recently been taken over by the National Council for Sustainable Development (NCSD) since its establishment in 2015. The NCSD comprises high-level representatives (Secretaries and Under-Secretaries of State) of the concerned government ministries and agencies, with the Prime Minister as its Honorary Chair and the Minister of

Environment as its Chair. The Council membership has increased compared to the NCCC, covering a greater number of ministries and agencies, including provincial governors.

The NCSD has the General Secretariat (GSSD) as its office at the Ministry of Environment. The GSSD has made efforts to improve the coordination of climate change activities in Cambodia and has provided ample support in developing Cambodia Climate Change Strategic Plain (CCCSP) 2014-2023, as well as sectoral climate change action plans.

The GSSD has major functions and duties as follows:

- To coordinate and perform daily operations in accordance with instructions and decisions of the NCSD;
- To develop NCSD's work plans to submit to the NCSD for review and approval;
- To lead and coordinate implementation of the work plans approved by NCSD;
- To coordinate and support the implementation of legal instruments, policy, strategic plans, action plans and projects related to sustainable development and conduct review, monitoring and evaluation and reporting regularly; and
- To mobilise and manage resources for the implementation of the legal instruments, policy, strategic plans, action plans, programmes and projects related to sustainable development.

The Department of Climate Change (DCC) of the Ministry of Environment (MOE) plays a main role in the General Secretariat of the GSSD. In addition, the NCSD is technically supported by the Climate Change Technical Team with representation from all the member agencies of the NCSD.

In order to address the climate change issues in Cambodia, the Cambodia Climate Change Alliance (CCCA) was formed with an aim to create the enabling conditions for Cambodia's response to climate change. The CCCA is a comprehensive approach to address climate change in Cambodia. The CCCA programme was designed to be fully in line with the national institutional framework for the coordination of the climate change response. The CCCA Phase 1 (2010-2014) was funded by EU, UNDP, SIDA and DANIDA. The overall objective of CCCA was to strengthen the capacity of the NCCC to fulfill its mandate to address climate change and to enable line ministries to implement priority climate change actions. The CCCA Phase 2 (2014-2019) is currently funded by EU, UNDP and SIDA, and it is implemented by the MOE and the GSSD under the coordination of the Department of Climate Change (DCC).

The assessments on the current DRM and climate change organisational arrangement of Cambodia are summarised as below.

- Under the Cambodia Climate Change Alliance (CCCA) as an umbrella organisation, the sector-wise climate change adaptation of major line ministries have been well prepared, thereby mainstreaming CCA into development plans of line ministries.
- The NCDM secretariat should be institutionally strengthened in terms of staff and budget, since the current human resources and financial resources are not sufficient to meet the requirements of the functions as a secretariat.
- With regard to institutional coordination, there are following challenges on the pre-existing system concerning both horizontal and vertical coordination between the disaster management institutions.
    - The Inter-Ministerial Disaster Management Group formed by NCDM and its five sectoral working groups did not frequently hold meetings, and communication between the key ministries and institutions at national level was not sufficient to achieve a comprehensive disaster risk reduction and management framework.

- The channels for NCDM coordination and communication with the Sub-National Committees and the line agencies and departments have been limited. This challenge has been compounded by the absence of standard operating procedures and system-wide protocols for managing disaster situations.
- The coordination and communication between the provincial, district, commune and village committees for disaster management has not been sufficient.

- The vertical coordination of the nation-wide 5-layer administrative levels of the National–Provincial–District–Commune-Disaster Management Committees and Village Disaster Management Group is relatively weak in light of:
  - collecting, sharing and feedback the information on disaster management;
  - preparing and updating a disaster preparedness plan;
  - implementing risk identification and assessment;
  - carrying out a rapid damage assessment after disasters;
  - applying standard operation procedures;
  - mobilising financial resources; and
  - monitoring and evaluation on implementing disaster management activities.
- Horizontal coordination between a DRM focal point and line ministries is insufficient.
- Horizontal coordination between a climate change focal point and line ministries is insufficient.

(3) Funding Structure

While the financial sources for the prevention and mitigation of disasters to be mobilized are scattered among line ministries, Cambodia Climate Change Alliance (CCCA) is a comprehensive approach to address climate change and disaster risks in Cambodia. It is a multi-donor initiative funded by EU, SIDA, DANIDA and UNDP. The CCCA is anchored in the National Climate Change Committee (NCCC), a mandated Government coordinating and policy support entity for all aspects of climate change. According to the Climate Public Expenditure and Institutional Review (CPEIR) database of Cambodia, the climate change spending related to the prevention and mitigation of disasters occupied 6.32 percent of the total government expenditure for the financial year 2012-2013

Under this mechanism, the CCCA Trust Fund has been established within the CCCA as a unified engagement point for development partners and a multi-donor financial facility to provide resources for climate change capacity building at national and local government levels. UNDP acts as the Trust Fund manager.

Apart from the CCCA, the Royal Government of Cambodia does not sufficiently have access to the Adaptation Fund except for some agricultural projects. The table below provides a list of climate change adaptation projects recently and currently funded by the international funds.

Table 2.2.2: List of Funding Sources for Climate Change Adaptation Projects (Cambodia)

Project Name	Funding Source	Duration
GIZ-Climate Finance Readiness Programme	German Federal Ministry for Economic Cooperation and Development and co-financed by USAID	2015-2018
Cambodia Climate Change Alliance Phase II	EU, UNDP and SIDA	2014-2019
Cambodia Community Based Adaptation Programme	UNDP	2010-2015
Promoting Climate Resilient Water Management and Agricultural Practices in Rural Cambodia	UNDP	2013-2015
Capacity Building in Knowledge Management for Rio Conventions	UNDP	2015-2018
Strengthening climate information and early warning	UNDP	2015-2019

Project Name	Funding Source	Duration
systems in Cambodia		
Integrating Gender Considerations in CCA	ADB	2016-2018
Monitoring, Reporting and Evaluation of Adaptation Investments	ADB	2016-2018
Rural Roads Improvement Project II (RRIP II)	ADB	2014-2019

Source: Asia Pacific Adaptation Network 2016

The assessments on the current funding system for DRM and climate change of Cambodia are summarised as below.

- There is a wide range of options to mobilize DRM and climate change finance from various international funding sources. Although the Royal Government of Cambodia has been making considerable efforts, there is room for opportunities to increase the utilization of these funding sources.
- The Climate Public Expenditure and Institutional Review (CPEIR) has been implemented to effectively mobilise the limited financial sources.
- There is no built-in funding system as well as budgetary allocations that support pre-disaster or stand-by funds for local government units.
- The budget management through the Climate Change Expenditure Tagging (CCET) has not yet been introduced.

(4) River Basin, River and Forest Management Systems

Based on the Water Resources Management Law in 2007, the Ministry of Water Resources and Meteorology (MOWRAM) is the responsible agency for managing river basins and surface and groundwater resources. As for the river basin management, the National River Basin Management Committee chaired by the Minister of MOWRAM was established. However, it is still unknown whether river basin management offices will be established, since Cambodia has already established the "Tonle Sap Authority, which is one of the river basin management authorities and the Cambodian National Mekong River Committee (CNMC). Actually, the current stage is the initial stage of establishing RBM system in the country.

MOWRAM is the responsible agency for River Management (RM). Permission is necessary from MOWRAM for constructing any riverine structures.

The Ministry of Agriculture, Forestry and Fisheries (MAFF) is in charge of forest management especially through community forest management. Protected forest is under the responsibility of Ministry of Environment. There is a problem of decreasing forest coverage in Cambodia from 73% in 1973, 59% in 2006 and 47 per cent in 2014.

2.2.2 Risk assessment

Cambodia has various natural disasters such as flood, drought, lightning, storm/typhoon, forest fire, river bank collapse/landslide etc. Disaster database is well-developed. Downscaling from GCM has been conducted in research level. Flood hazard and risk maps have not been prepared by the Cambodian side. Flood hazard and risk maps in the Cambodia's Mekong Delta have been prepared by the Mekong River Commission (MRC) without and with climate change.

Drought intensity map without climate change for the whole country is prepared.

(1) Disaster database

With assistance from the United Nations Development Programme (UNDP), the National Committee for Disaster Management (NCDM) has developed the disaster database system, which is opened in the

web-page of NCDM (CAMDI Cambodia). In the database, historical disaster data by area and country is available in a table format as well as in graphs and maps, which is very useful for decision making of DRM.

(2) Meteorological data management and downscaling from Global Climate Models

Meteorological observation system:

The Department of Meteorology (DOM) of MOWRAM is in charge of meteorological observation. In 2010, there were 20 synoptic stations located mainly in cities, and 200 manual rain stations. Among the 20 synoptic stations, 9 are automatic stations, but they were out of order in 2010 (source: DOM). Currently, the project of upgrading the meteorological stations is on-going, and total number of automatic weather stations will be 60, which will cover not only cities but also rural areas as well.

DOM conducts weather forecasts (1-day, 3-day and one-week weather forecast and seasonal forecast for agriculture). For the weather forecast, DOM has been using Doppler weather radar meteo 650C radar since 2011, which was installed by using the budget of the Royal Government of Cambodia.

In addition to the normal weather forecast, DOM conducts a colour coded flood warning system in vulnerable areas with alert level of yellow (to be aware), orange (to be prepared), and red (to take action for evacuation etc.). In order to make higher the accuracy of forecasting, DOM has just installed satellite image receiving system.

Downscaling from GCM:

Downscaling from GCMs is not conducted by the governmental agency but conducted in research level.

Heng (2015, P62)* reported that Cambodia's Initial National Communication to the UNFCCC (United Nations Framework Convention on Climate Change) includes the first attempt to assess the country's future climate using two GCMs (Global Climate Models or General Circulation Models), CCSR (Center for Climate Research Studies, Japan) and CSIRO (Commonwealth Scientific and Industrial Research Organisation, Australia). The analyses showed that there was significant deviation between observed rainfall data and output. Cambodia has adopted regional climate models in combination with a number of GCM models run by the Climate Risk Assessment Division, Center for Global Environmental Research, and National Institute for Environmental Studies (NIES). To cope with the scarcity of historical climate data in evaluating the impact of current climate variability on sectors, long-term historical climate data have been reconstructed using PRECIS for Cambodia as a whole. A dynamic-based impact model was adopted for the agriculture sector.

*) Heng Chan Thoeun (2015) Observed and projected changes in temperature and rainfall in Cambodia, *Weather and Climate Extremes, 7* pp.61–71

(3) Hazard map and risk map for flood, storm and landslide

DHRW (Department of Hydrology and River Works) is in charge of preparing hazard maps and risk maps, but they have not been prepared yet. DHRW has just started field survey on flooding conditions for preparing flood hazard maps. Landslide hazard maps are also not available.

Mekong River Commission (MRC) conducts flood simulation of probable floods of 100-year return period under without and with climate change (moderate, strong and extreme scenarios) for 2030, 2060 and 2090 based on the downscaling from GCM. The figure below is one of the examples of flood simulation by MRC for medium scenario in 2060.

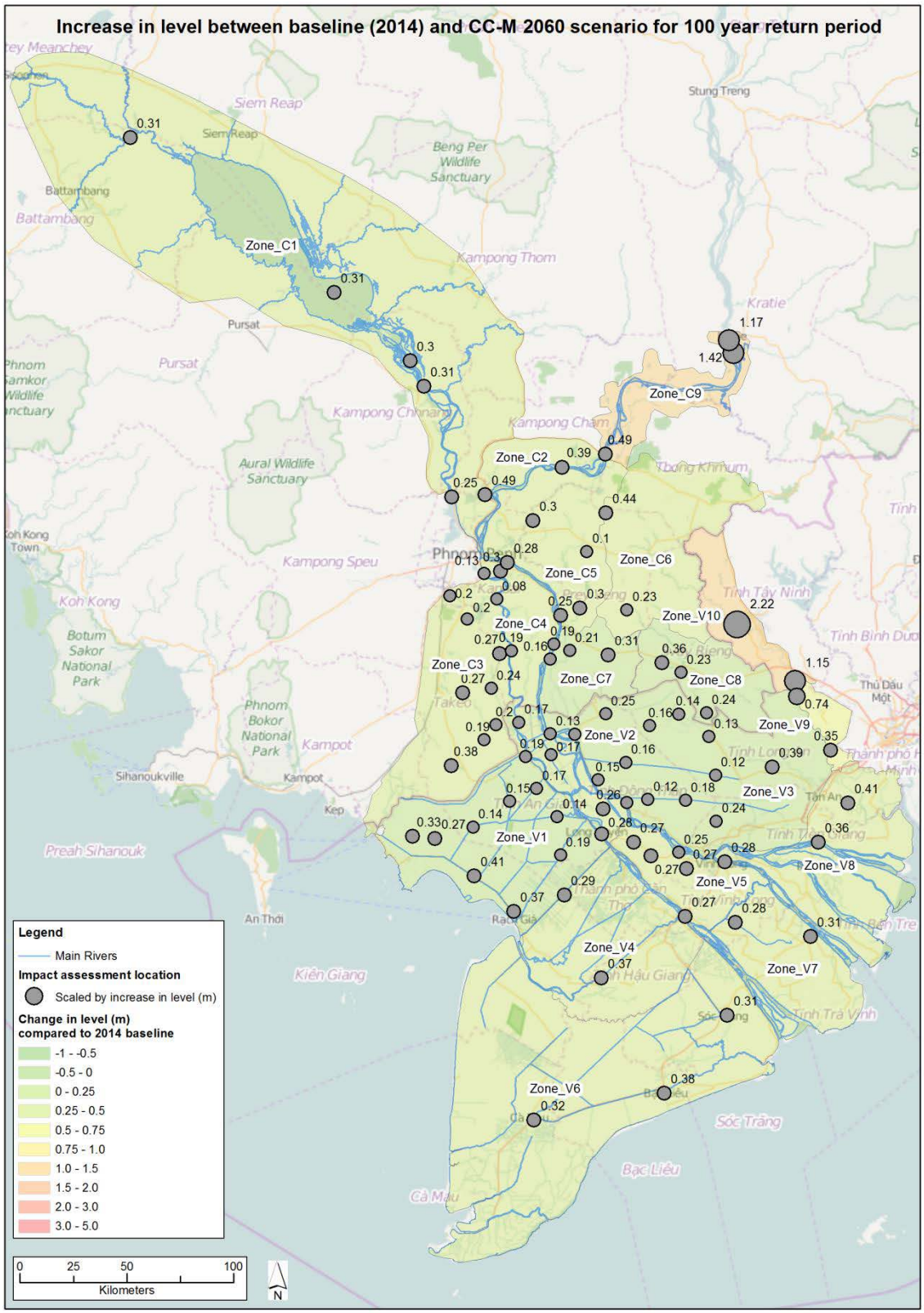


Figure 2.2.1: Simulated flood map in 2060 under medium scenario of climate change in Mekong Delta

Source: MRC; The Flood Management and Mitigation Programme 2011-2015, Task 1C Report

(4) Drought

Emergency preparedness and response plans (EPRP) start with hazard vulnerability capacity assessments and it has been found that the provincial governments have good understanding on these tools and procedures. The drought anomaly index map showed a widespread drought in the central and northern parts of Cambodia during 2015 (Figure 2.2.2). Most of the vulnerable population are located in Banteay Meanchey, Siem Reap, Kampong Cham, Phnom Penh, Kandal, Prey Veng, and Svay Rieng. However, the hazard and risk mapping are lagging behind in terms of their use in the long-term planning process even though there are some community based hazard mappings done using participatory tools. The rainfall distribution in Cambodia from May to October is prone to issues such as late onset, early cessation and intermittent gaps in rainfall especially during July to August are main issues in Cambodia.

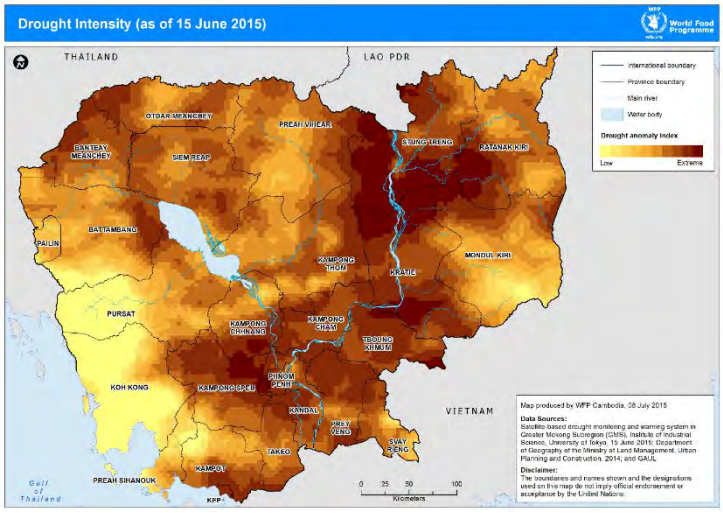


Figure 2.2.2: Map showing drought anomaly index in Cambodia

Source: HRF, 2015

The responsibility of short and medium range weather forecast and dissemination of location specific agro-climatic advisory rests with the Department of Meteorology under the Ministry of Water Resources and Meteorology, other line ministries such as Ministry of Agriculture, Forestry and Fisheries utilize this information for providing suitable advisory to their stakeholders. Drought monitoring has been improved with the establishment of 32 automated weather stations across the country. Though very few, the weather information collected from these stations supplements the weather information obtained from traditional manual weather stations. Nevertheless, it was found that the weather forecasts provided by the Meteorology department are too general covering the entire nation and hence there is a scope in improving the skill and scale in drought forecasts and monitoring.

2.2.3 Planning and implementation

Structural measures for Prevention & Mitigation against floods has been provided for limited areas such as around cities only, and still insufficient in many areas. In rural areas, traditionally, people live in elevated (piloti type) houses to cope with normal size of floods, and this will be also effective under climate change in some extent.

(1) Flood risk management

1) Guideline and standard for DRR and CCA integration against floods and storm

Concrete guideline or standard for DRR against floods or storm incorporating CCA has not been formulated.

2) Road dikes and bridges with higher freeboard considering climate change impacts

There are road dikes in the Mekong floodplain and along the Mekong River, Tonle Sap Rivers etc. Principally, these road dikes are planned to ensure road transportation even during flood period, and not to control or mitigate the flooding condition around the roads. The plans of these road dikes don't include climate change impacts.

In 2016 to 2017, the two bridges along the National Road 11 (NR11), which passes in the Mekong River floodplain areas from Neak Loueng – Prey Veng – NR7 near Kampong Cham and five bridges along NR73 (NR7 – Right Bank along the Mekong River – Kratie) were studied and designed by JICA. For these seven bridges, considering the flood simulation results of MRC under the medium scenario of climate change until 2060, additional height of freeboard between the design high water level and the bottom of the beams were added.

3) Traditional elevated houses

Traditional elevated houses exist in flood prone areas with slow velocity, which are based on the culture of living with floods. This is one of the good practices of community-based DRR against normal size of floods and even with climate change impacts. However, large floods also make damage to these houses (example: 2000 Floods and 2011 Floods in the Cambodian Mekong Delta).

Figure 2.2.3: Traditional elevated house in flood prone areas in Cambodia

Photo: JICA Study Team

(2) Drought risk management

The institutional arrangement for drought risk reduction in Cambodia is not different from the overall institutional mechanism for disaster risk reduction. In specific, the responsibility of drought risk reduction is shared among different line ministries depending on the scope of their mandates and activities mainly relating to irrigation, farming (including fisheries sector), drinking water and health. Drought risk reduction interventions in Cambodia are often focused on the drinking water supply and health and relatively less than other countries on agriculture programs or insurance programs. However, individual provinces differ in their interventions due to the local situation and leadership.

The Ministry of Rural Development has released the National Strategic Plan in 2014 and recently formulated a National Action Plans for RD covering water supply, sanitation and hygiene in which the focus on rehabilitation of infrastructure, WASH (water, sanitation and hygiene) related needs through safe water supply and sanitation, mechanism for pre-planned and strategic planning have been recognized which are relevant for drought risk reduction context as well. For providing drinking water during drought, a program called 'Improved Source' has been put in place mainly focusing on preventing contamination of limited water sources through unsafe sanitation practices.

The Ministry of Agriculture, Forestry and Fisheries has developed a Plan of Action for Disaster Risk Reduction in Agriculture 2014-2018 that identifies drought as one of the important hazards and needs affecting the national food security and rural economy. The plan looks at the ASEAN Agreement for Disaster Management and Emergency Response, National Strategic Development Plan, Strategic National Action Plan for Disaster Risk Reduction as important conduits through which the drought risks are to be minimized in a timely fashion. The National Strategy for Agriculture and Water developed by the Ministry of Water Resources and Meteorology and the Ministry of Agriculture provides a strategic framework to reduce the vulnerabilities affecting the agriculture sector and to improve the capacities of rural sector through sustainable use of natural resources including water. The plan envisages to promote more action based research in agriculture sector, develop crop varieties that are tolerant to drought and other natural hazards, identify good practices for drought risk reduction, put in place water harvesting systems in drought prone areas, increase the readiness of local administration to impending droughts through seed stockpiling, build capacities of local communities and pilot the local emergency funds for quick action. The MRD is also supporting training centers that promote livelihood diversification including phone repairing, pump repairing, agricultural techniques etc., depending on the local demand and link to the credit to start small business activities.

2.2.4 Capacity building

Mainstreaming DRR and CCA into policies, plans, and sustainable development programmes at all levels is one of the important capacity building needs for Cambodia. Coordination mechanism for the implementation of Climate Change Action Plan (CCAP), including those developed by line ministries, could be strengthened in a step-wise manner so that potential uncertainties arising from the estimated climate change impacts could be appropriately adjusted. Special programmes targeting capacity building of staffs from relevant line agencies at different levels could be implemented thereby enabling them to understand climate related signals and prepare for quicker response such as improving capacity on monitoring through expansion of modern automated weather stations, collection, analysis and timely dissemination of hydro-climatic information at the central level and use of such information to support DRR and CCA planning process. At the local level, enhancing understanding and appropriate use of hydro-climatic information, preparation of local hazard and risk maps with CCA integration, knowhow of climate resilient farming, crop insurance, designing disaster proof infrastructure, planning evacuation zones and improving river basin management, rational use of groundwater could also be promoted in vulnerable areas.

2.3 Indonesia

2.3.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

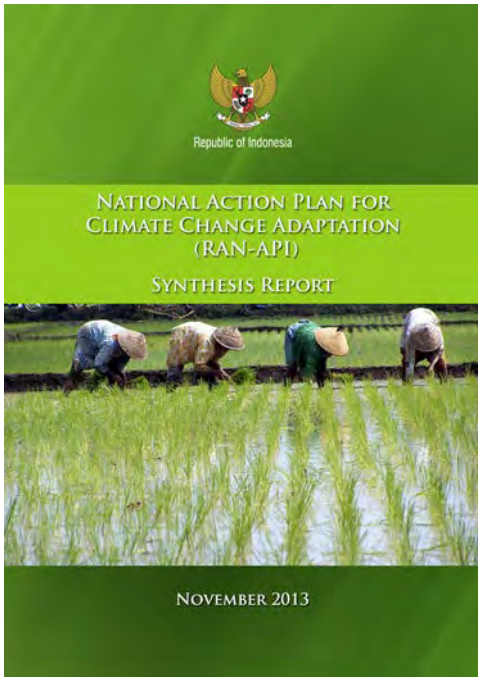
The Law No. 24 of 2007 Concerning Disaster Management (Law 24/2007) established the legal basis of disaster management in Indonesia. The Law 24/2007 can be regarded as the comprehensive disaster management law which delineates national and regional government responsibilities, community rights and obligations, and disaster management stages and requirements. The stages of disaster management of pre-disaster, emergency response, and post-disaster are also described in the Law together with the associated disaster management responsibilities in each stage.

However, the Law 24/2007 is under review for the revision. Once the Law is promulgated, it will be translated to the Government Regulations and Presidential Regulations as guidelines for the implementation of disaster management. The revision of the Law 24/2007 is designed to be in line with other existing Laws. For instance, the Indonesia's government issued new Law No.

23/2014 concerning Local Government, which stipulates that disaster management is one of the mandatory issues to be implemented by the local government. The Law No. 23/2014 regulates the division of roles and authorities of the central government and the local governments.

Meanwhile, environmental protection in Indonesia is basically regulated by Law No.32 on the Management and Protection of the Environment (Environmental Law 2009). A Presidential Regulation on the State Action Plan to Reduce the Greenhouse Effect was issued in 2011 and specifies various activities which may directly or indirectly reduce the greenhouse effect in agriculture, energy and transportation, forestry, industrial areas and waste management.

Apart from the existing legal framework for DRR and CCA, countermeasures for DRR and CCA have already been drafted in the content of *Rancangan Peraturan Menteri PUPR tentang Rencana Aksi Nasional Mitigasi dan Adaptasi Perubahan Iklim serta Pengurangan Risiko Bencana Kementerian PUPR Tahun 2017 – 2030* (Drafted MOPWH Ministerial Regulation about National Action Plan for Climate Change Mitigation and Adaptation and Disaster Risk Reduction 2017-2030) and *Rencana Induk Pengembangan Infrastruktur PUPR Secara Terpadu dengan Pengembangan Wilayah untuk Pulau dan Kepulauan* (Drafted Master Plan for Integrated Public Works and Housing Infrastructure Development for 20 years).



While the RAN-API itself does not have a formal legal basis, it is an important input into the development of the government annual plan as well as the National Midterm Development Plan. Unlike the Presidential decree for the RAN GRK (National Action Plan on GHG Emission Reduction), there is no specific regulation as a legal base for the RAN-API (National Action Plan on CCA). However, the RAN-API directly supports the implementation of the RPJMN (National Midterm Development Plan) and can be regarded as the legal basis. (The image of RAN-API Synthesis Report 2013 is shown on the left. The image is taken from https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/programme-info/RAN-API_Synthesis_Report_2013.pdf.)

The Government of Indonesia developed the Long-term National Strategic Development Plan (RPJPN 2005-2025), establishing four key pillars (pro-poor, pro-growth, pro-jobs and pro-environment) for the national development. The long-term plan is divided into four stages termed the National Medium-Term Development Plan (RPJMN) with a five-year time frame for each plan. Currently, the third RPJMN (2015-2019) is being implemented in an attempt to explicitly incorporate a green economy among other national priorities.

The Government of Indonesia published the National Disaster Management Plan (RENAS PB) 2015-2019. The current RENAS PB encompasses policies, strategies, and programme priorities, and concentrates on disaster management and DRR for the period 2015-2019.

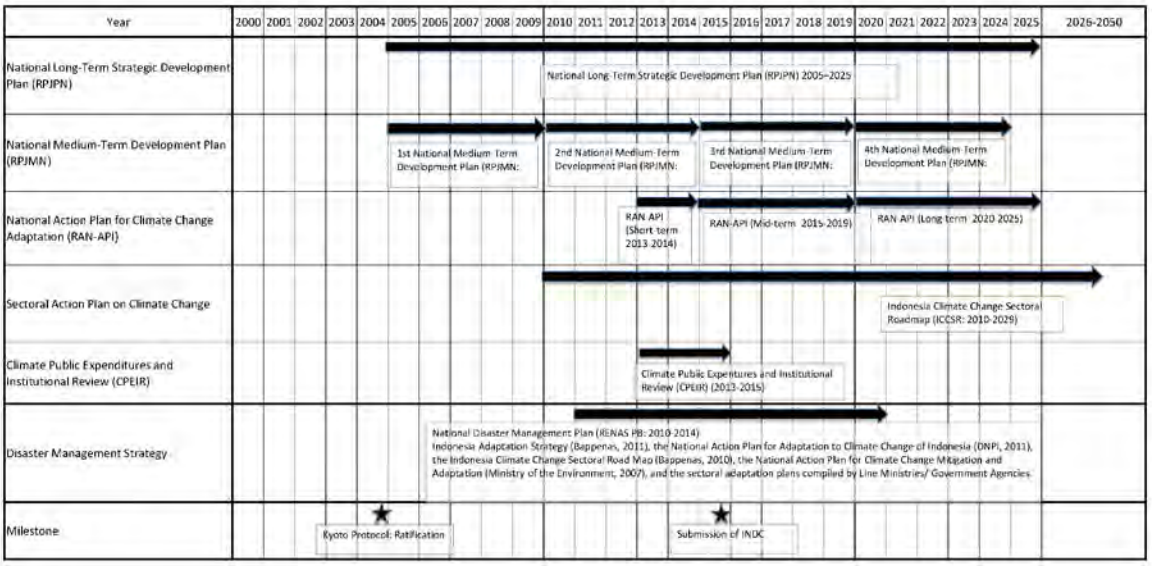
Meanwhile, the National Action Plan on CCA (RAN-API) launched in 2014 consists of an action plan for adapting priority sectors and cross-sectors in the short term (2013–2014), mainstreaming

the adaptation action plan into the National Medium-Term Development Plan (RPJMN) for 2015–2019, and the policy direction of long-term adaptation.

The RAN-API Secretariat started its operation in 2015, and the main task of the Secretariat is to mainstream and monitor adaptations in each ministry's policy and action plan, and local government's development plans. For each ministry, the BAPPENAS is the coordination agency to which the RAN-API Secretariat belongs.

The timeframe for strategies and policies on climate change and disaster management of Indonesia is tabulated as below.

Table 2.3.1: Timeframe for Strategies and Policies on DRM and Climate Change (Indonesia)



The assessments on the current DRM and climate change institutional setting of Indonesia are summarised as below.

- Although there is no formal legal basis for climate change in Indonesia, the RAN-API acts as a *de-facto* legal structure.
- Although there is a comprehensive 5-year national disaster management plan (RENAS PB 2015-2019), there is no stand-alone comprehensive legal framework for DRM and climate change. The current legal framework is diverse and a minimum-level legal order.
- Although the National Medium-Term Development Plan (RPJMN) for 2015–2019 addresses the cross-sectoral environmental challenges including climate change mitigation and adaptation, there is no clear-cut indication on mainstreaming as well as the integration of DRR and CCA.

(2) Organisational Structure

The Disaster Management Law 24/2007 mandates the creation of the National Disaster Management Agency (BNPB) that reports directly to the President. The Law allows the BNPB to coordinate all contingency, preparedness, mitigation, prevention, disaster management training, and disaster risk assessment in the pre-disaster phase. In the emergency response phase, the BNPB is subject to command and control of the coordinated responses of all stakeholders. And in the post-disaster phase, the Law also mandates the BNPB to coordinate the damage and loss

assessments, and the implementation of rehabilitation and reconstruction. Under the current organisational structure, the Unsur Pengarah (Disaster Management Steering Committee) is subordinate to the BNPB in commanding emergency response and the mandate to coordinate in pre-disaster and post-disaster phases.

The main governmental organisations responsible for climate change are the National Development Planning Agency (BAPPENAS), and other stakeholders include the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG), the Ministry of Environment and Forestry (KLHK), the Ministry of Home Affairs (KDN), the Central Bureau of Statistics (BPS), and other national ministries and agencies. To improve coordination among related line ministries and other stakeholders, including private and academic organisations, BAPPENAS has issued a ministerial decree establishing the Climate Change National Coordination Team. The Directorate of Climate Change of the Ministry of Environment and Forestry (KLHK) is directly in charge of climate change mitigation and adaptation in Indonesia.

The main task of the RAN-API Secretariat is to mainstream adaptation in each ministry's policy and action plan and local government's development plan and monitor the progress. For each ministry, the BAPPENAS is the coordination agency where the RAN-API Secretariat belongs, and, for each local government, the RAN-API Secretariat works closely with the Ministry of Home Affairs (MOHA) to influence the contents of the 5-year development plan.

The assessments on the current DRM and climate change organisational arrangement of Indonesia are summarised as below.

- The BNPB has a limited coordination capacity over the Disaster Management Steering Committee, although the BAPPENAS plays a wide range of important roles to plan, coordinate, implement and monitor the RAN-API, thereby mainstreaming CCA into sector-wise and regional development planning.
- The Ministry of Public Works and Housing established the Regional Infrastructure Development Agency (BPIW) in 2015 by integrating all planning divisions of Director Generals. The main function of the BPIW is the creation of technical policies, plans, strategies, standard operating procedures and guidelines of regional development in terms of CCA, thereby making a close intra-ministerial horizontal network inside the PU.
- The PU's climate change mitigation and adaptation team (Tim MAPI) was formulated in 2010, and the function of DRR was added in May 2016 (Tim MAPI and PRB). This is also the institutional integration of DRR and CCA as a close intra-ministerial horizontal network inside the PU.

(3) Funding Structure

Domestically, the Indonesia Multi-Partner Fund Facility for Disaster Recovery (IMDFF-DR) was established as a standing mechanism to help fund the implementation of the Government of Indonesia's Rehabilitation and Reconstruction Action Plans (RENAKSI). The IMDFF-DR is intended to complement government-funded recovery activities, and bring strategic value in developing capacity and promoting sustainability.

The financial sources for the prevention and mitigation of disasters to be mobilised are scattered among line ministries. According to the Climate Public Expenditure and Institutional Review (CPEIR) database of Indonesia, the climate change spending related to the prevention and mitigation of disasters occupied only 0.29 percent of the total government expenditure for the financial year 2012-2013.

The Indonesia Climate Change Trust Fund (ICCTF) is the exclusive national trust fund for climate change in Indonesia. The ICCTF was established to increase the effectiveness and efficiency of Indonesia's coordination in addressing climate change in accordance with the National/Local Action Plan on Mitigation (RAN/RAD-GRK) and the National Action Plan on Adaptation (RAN-API). The total projected available fund by the ICCTF from the financial year 2015 to 2018 is estimated at IDR 203.3 billion (approximately USD 15.2 million).

Table 2.3.2: Projected Available Fund by Indonesia Climate Change Trust Fund (ICCTF) from Financial Year 2015 to 2018

Year	USAID (IDR billion)	UK (IDR billion)	DANIDA (IDR billion)	APBN (IDR billion)	TOTAL (IDR billion)
2015	0.0	0.0	0.7	15.3	16.0
2016	18.5	22.2	2.3	15.3	58.3
2017	34.3	29.6	0.0	20.0	83.9
2018	17.4	4.7	0.0	23.0	45.1
Total	70.2	56.5	3.0	73.6	203.3

Source: ICCTF Credentials 2017

The assessments on the current funding system for DRM and climate change of Indonesia are summarised as below.

- Indonesia's Climate Change Trust Fund (ICCTF) is the only national trust fund for climate change, and it was established to provide financial resources on the local demand basis. The ICCTF increases the effectiveness of Indonesia's coordination in addressing climate change in accordance with the National Action Plan on Adaptation (RAN-API).
- There is no built-in funding system as well as the budgetary allocations that support pre-disaster or stand-by funds for local government units.
- The Government of Indonesia introduced the Climate Change Expenditure Tagging (CCET), enabling consistent assessments of climate spending at both national and local levels. The budget management through the CCET in the integrated manner significantly contributes to the potential integration of DRR and CCA. The CCET has been upgraded to "e-monitoring system" in which the monitoring on expenditures on DRR and CCA is computerised.

(4) River Basin, River and Forest Management Systems

The DGWR (Directorat Jenderal Sumber Air/ Directorate General of Water Resources) of PU (Kementerian Pekerjaan Umum dan Permahan Rakyat/ Ministry of Public Works) is responsible for river basin management (RBM) at national level. DGWR has 34 river basin management offices covering the whole country, which include 14 river basin management offices for the major rivers (Balai Busar Wilayah Sungai) such as the Solo River and Brantas River.

The DGWR and the River Basin Management Offices conduct flood risk management (FRM), landslide risk management (LRM), and water resources management (WRM) mainly focusing on infrastructure development and management. For water resources management including operation of the flood control structures, there are two governmental entities managing dams and weirs for water supply and irrigation water supply. They are Jasa Tirta I for the dams and intake weirs in Solo River, Brantas River, Asahan River etc, and Jasa Tirta II for the dams and intake weirs in the Citarum River and Ciliwung – Cisadane Rivers.

The DGWR as well as the River Basin Management Offices coordinate other related agencies and local government units (LGUs) in case of necessity for formulating plans for FRM, LRM and WRM and their implementation.

Similar to RBM, the DGWR of PU is responsible for river management (RM) at national level. The River Basin Management Offices have the responsibility of RM in the field. In the RM, management of the easement zones along the rivers are also included, which can be done under collaboration from the LGUs.

Forest Management Bureau of Ministry of Environment and Forestry (MOEF) is in charge of forest management (conservation and reforestation) for upland forest and mangrove forest in coastal areas. Also, the Forest Management Bureau implements some structural measures against floods and landslide in the upstream river basins.

2.3.2 Risk assessment

In Indonesia, floods, landslide, drought, earthquake, volcanic eruption, tsunami and forest fire occur. Among these natural disasters, 98% of the disasters are water related disasters. Storm disaster is not so common. There is a web-based disaster database. Downscaling from GCMs have been done by the meteorological agency covering all over the country. Flood hazard and risk maps, landslide hazard and risk maps and drought hazard maps are prepared covering the whole country.

(1) Disaster database

BNPB (Badan Nasional Penanggulangan Bencana/ National Disaster Management Authority) has developed disaster database including disaster records based on the DesInventar, which is a free, open-source methodology and software. The tool has a range of options for analysis allowing national and sub-national authorities and DRR practitioners to understand disaster trends, patterns and their impacts in a systematic manner. Local Governments send disaster data to BNPB and they are compiled into the disaster database called DiBi (Dada Bencana Indonesia – http://dibi.bnpb.go.id).

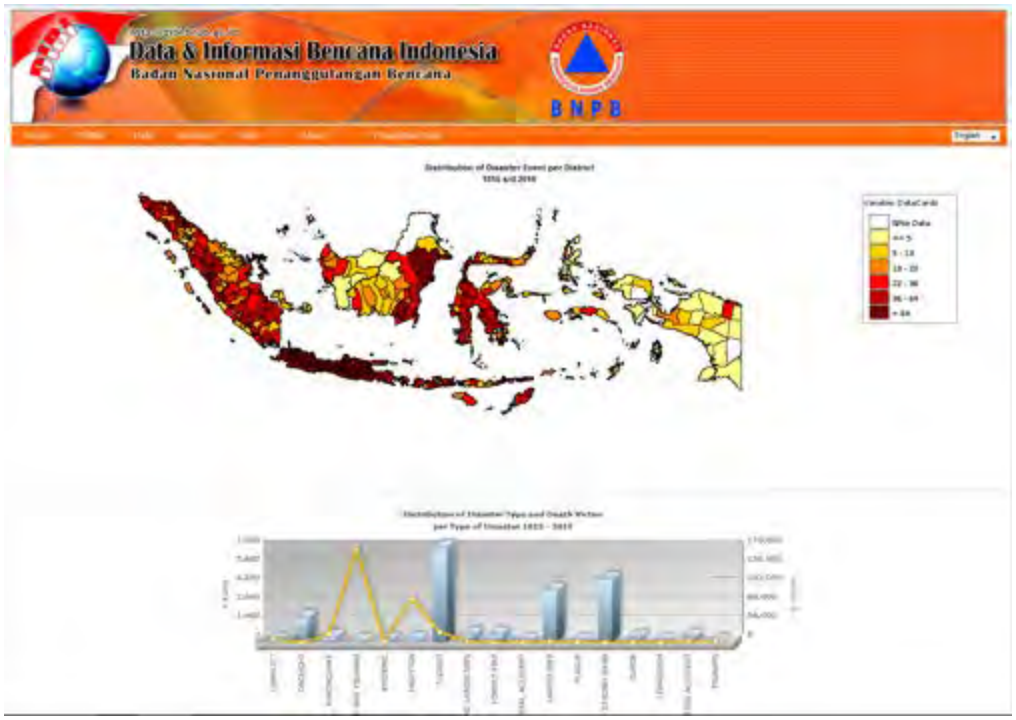


Figure 2.3.1 Disaster Database of Indonesia
Source: BNPB, Indonesia

(2) Meteorological data management and downscaling from Global Climate Models

Meteorological observation system:

BMKG (Badan Meteorologi, Klimatologi, Dan Geofisika/ Agency of Meteorology, Climatology and Geophysics) is the responsible agency for meteorological and rainfall observation and weather forecast. Based on the observed meteorological and rainfall data as well as satellite images of "Himawari", BMKG forecasts weather and rainfall for 6-hourly, 7 days and monthly.

Downscaling from GCM:

BMKG has conducted downscaling from the results of various GCM models covering all over the country. The mesh scale for the downscaling is 20km. JICA has assisted BMKG to improve the resolution of the downscaling. Apart from BMKG, various universities as well as the Research Center of Water Resources of PU etc. have conducted downscaling for research purpose.

(3) Hazard and risk map for flood, storm and landslide

Flood and landslide hazard maps and risk maps of BNPB:

Under the assistance by the UNDP, BNPB is developing a web-based hazard maps and risk maps (vulnerability maps) for various natural disasters (web name: "InaRISK") covering all over the country and based on the satellite images of LAPAN (Lembaga Penerbanga Dan Antariska Nasional/ National Institute of Aeronautics and Space of Indonesia) as well as disaster information and data from the LGUs and BPDBs (Badan Penanggulangan Bencana Daerah/Regional Disaster Management Agencies). The scale of the hazard maps and risk maps (vulnerability maps) are 1 to 250,000 for provinces, 1 to 50,000 or 25,000 for the target 136 districts for spatial planning, planning disaster risk management plan etc. and 1 to 10,000 or 5,000 for evacuation plans and rehabilitation and reconstruction. These hazard maps and risk maps don't include climate change impacts, but they are very useful to know the areas with disaster risks.

Figure 2.3.2: Sample of Flood Hazard Maps of BNPB

Source: BNPB, Indonesia

Flood Hazard Maps of BMKG:

BMKG also prepares flood hazard maps for provincial levels etc. However, their resolution is not so high in general due to the limit of resolution of topographic information.

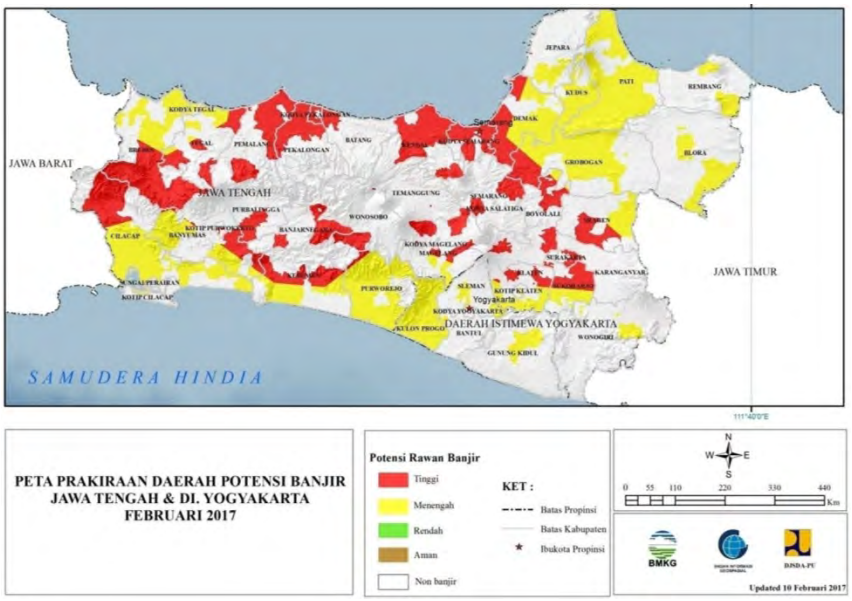


Figure 2.3.3: Sample of the Flood Hazard Map of BMKG

Source: BMKG, Indonesia

Landslide hazard maps and risk maps of PVMBG:

PVMBG (Pusat Vulkanologi dan Mitigasi Bencana Geologi/ Center for Volcanology and Geological Hazard Mitigation) has prepared landslide hazard maps for all over the country and some detailed hazard maps.

Landslide susceptibility maps with risks of landslide disasters are made for some areas with scale of 1 to 50,000 to 25,000. Landslide hazard maps are based on digital elevation model (DEM), geological maps and historical record of landslide. DEM is based on TerraSAR satellite image of German Aerospace Center (DLR) and European Aeronautic Defense and Space Company (EADS) Astrium with 9m x 9m resolution or ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) with resolution of 30m x 30m.

Based on these landslide hazard maps and susceptibility landslide maps, PVMBG advises BPDBs and LGUs for warning of landslide warning. PVMBG also conducts monitoring of landslide by installing telemetric rain gauges and extension meter in high landslide risk areas.

These landslide hazard maps are not so much detailed in general such as painting with wide red colour areas (high risk areas) in mountainous slopes. However, there may be some medium risk areas (yellow colour areas) among the red colour areas, where people can live with support of early warning system. Therefore, how to make more detailed landslide hazard and risk maps is one of the issues to be considered.

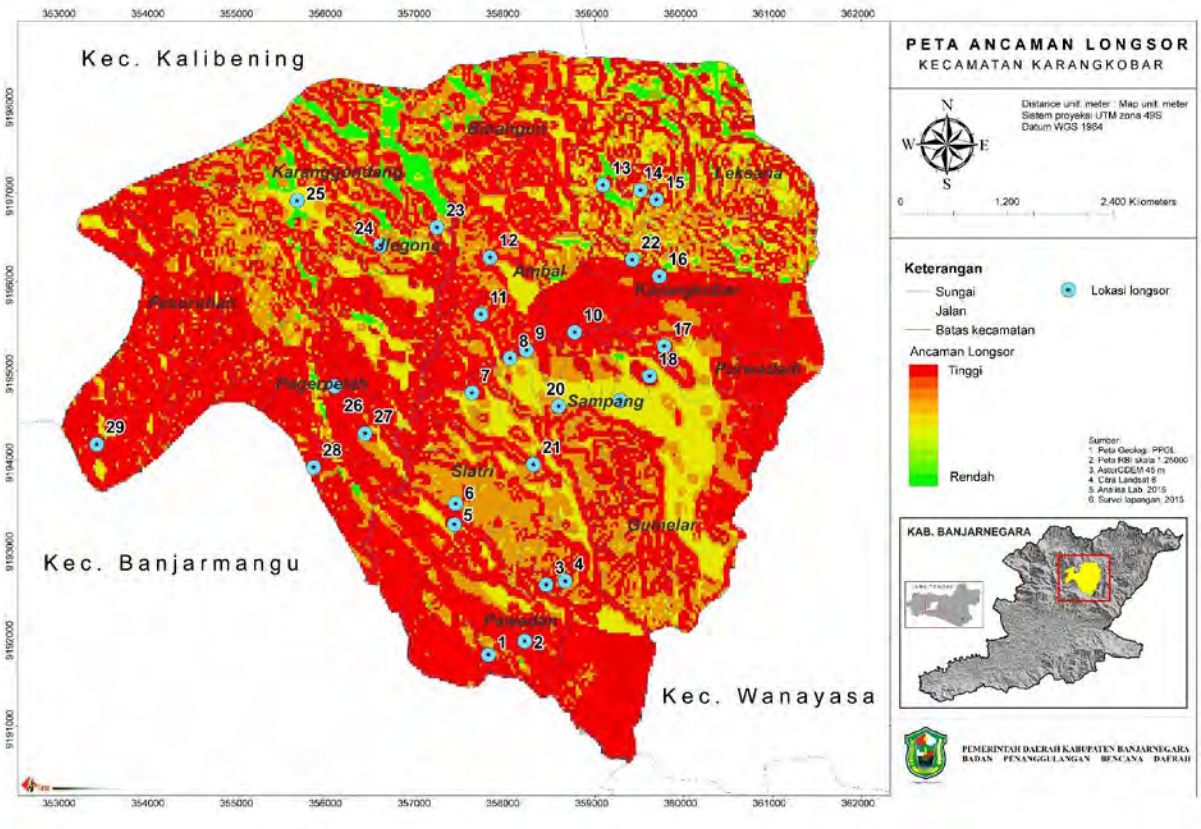


Figure 2.3.4: Sample of landslide hazard map of PVMBG

Source: PVMBG, Indonesia

(4) Risk Map for Drought

Figure 2.3.5 shows the hazard map of drought in Indonesia developed by BNPB. Drought is one among the twelve hazards identified by a nationwide disaster assessment and it has been incorporated in Indonesia's Disaster Management Law (2007).

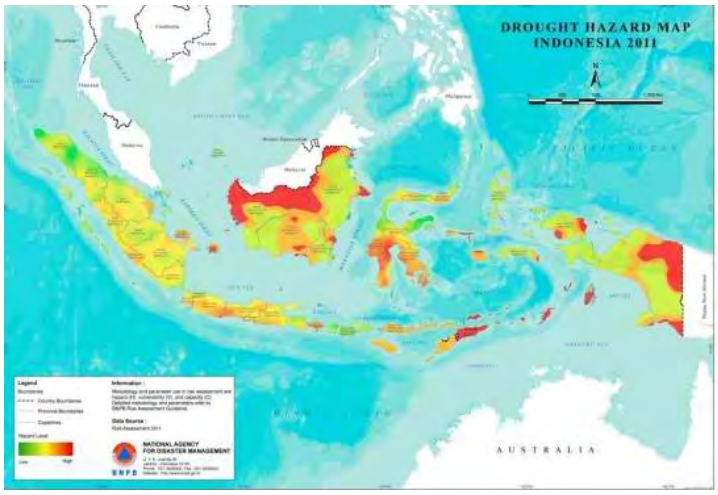


Figure 2.3.5: Drought hazard map of Indonesia

Source: BNPB, 2012

Based on the request of the Ministry of Finance, as the basis for determining the priority of the Special Allocation Fund for Disaster Management, BNPB produce Indonesia Disaster Risk Index (IRBI 2013) for nine types of hazards (multi-hazard). IRBI 2013 is also used as a target in the National Medium Term Development Plan 2015-2019. Its goal is lowering the Disaster Risk Index in the centers of economic growth at high risk.

Depending on major disaster affecting that area, preparedness and mitigation action are taken in Indonesia. For instance, Figure 2.3.6 shown drought vulnerability map of Central Java prepared by its provincial office (BMG Jawa Tengah, 2016).

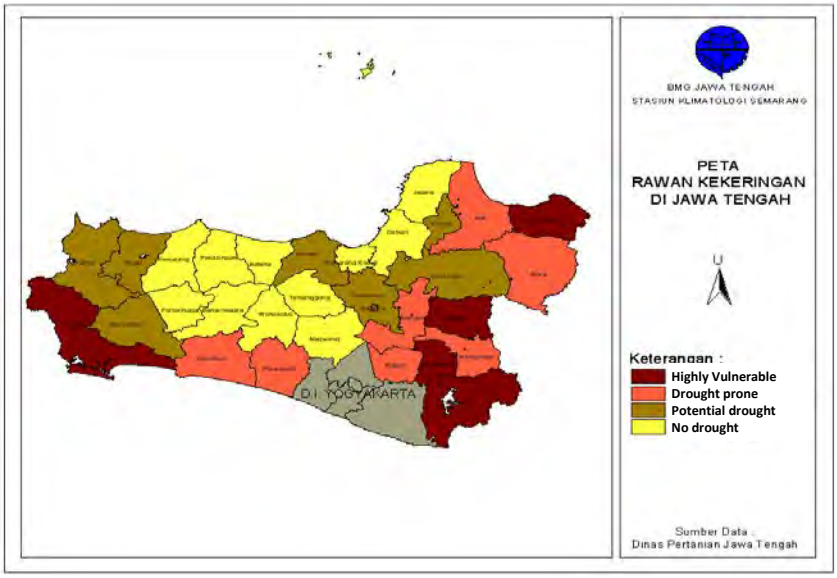


Figure 2.3.6: Drought vulnerability map of Central Java

Source: BMG Jawa Tengah, 2016

The Agency for Meteorology, Climatology and Geophysics (BMKG) issues regular forecasts based on the Standardized Precipitation Index (SPI) which is used for agricultural and water resource related applications. Indonesia has 120 meteorological stations, 31 geophysical stations and 21 climatological stations which are continuously being improved and new automated weather stations are being installed. BMKG has a long-term goal to install 500 automated weather stations. SPI products are released for one month, three months and annual scales and this information is supplemented with a climate early warning system consisting of forecasts related to dry season onset, consecutive dry days and this information is disseminated to all the stakeholders including the Ministry of Agriculture, Directorate of Water Resources and local authorities.

Droughts combined with dryness and high temperature are also directly linked to forest and peatland fires which has both economic, environmental and health impacts in Indonesia and surrounding countries. The meteorology agency has developed fire danger rating system (FDRS) based on real-time weather observations and 3-day weather prediction for regular monitoring of conditions that could lead to forest fires and initiate quick response measures.

2.3.3 Planning and implementation

Guideline of planning DRR with CCA is intended to be prepared by DGWRD of PU, but this has not yet been done. There are some examples of flood control facilities including height against sea water level rise. There are some examples of flood control facilities without climate change impacts, but they can be potential good practices with CCA. There are some examples of integrated operation of reservoirs that will be also effective with climate change impacts. As for landslide risk management,

land use management for not building houses again in the landslide risk areas together with warning and evacuation system can be seen in the sample site visited in this Study.

(1) Flood risk management

In order to find good practices or potential good practices of DRR and CCA integration, some sample sites were selected based on the existing information, advice from the focal point and related agencies as well as the experience of visiting the sites. Followings describe condition of technical guideline and standard for DRR and CCA integration and conditions of the investigated sites.

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

Directorate General of Water Resources (DGWR) of the Ministry of Public Works (PU) intends to develop guideline/ standard for DRR and CCA Integration, but this has not yet been done.

2) Jatilhur Dam in the Citarum River in West Java

Citarum River (catchment area: 6,600km^2) flows from upstream of Bandung to the Jakarta Metropolitan Area. In the Citarum River, there are Saguling (Gross Storage: 0.9 BCM), Cirata (2.2BCM) and Jatilhur Dams (3BCM). Saguling and Cirata Dams are for hydropower generation. Jatilhur Dam is multipurpose for raw water supply to Capital District of Jakarta etc. (1st Priority), irrigation water supply, flood control and hydropower. Integrated operation of these three dams is conducted to ensure raw water supply and flood control etc. Although the integrated operation does not include climate change impacts, this will be also applicable with climate change impacts

Reservoir and Spillway

Downstream from Dam

Jatilhur Dam

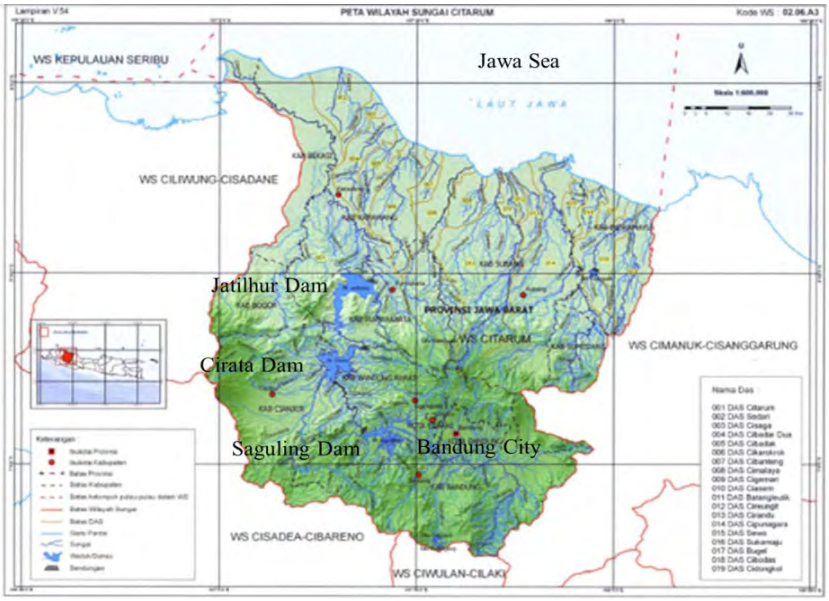


Figure 2.3.7: Jatilhur Dam, Cirata Dam and Saguling Dam in the Citarum River Basin

Source of the map: Pola, Pemgelolaan Sumber Daya Air, Wilayah Sungai Citarum Tahun 2014
Photos: JICA Study Team

3) Brantas River Basin: Neyama Tunnel in Tulungagung in East Java

Tulungagung Area was originally flood prone marsh land caused by the inflow of floodwater from the Brantas River and the surrounding tributaries watersheds. In order to solve the flooding problem in Tulungagung area, a tunnel floodway called “Neyama Tunnel” (two tunnels) with total design discharge of 1,000m^3/s was constructed to discharge floodwater to the Indian Ocean. By these tunnels, flood problem was solved and socio-economic development in the area has been realized.

Although Neyama Tunnel and its channel don't include climate change impacts, there is a possibility for not increasing flood discharge by adding retarding area in the upstream channels of the Tunnels etc.

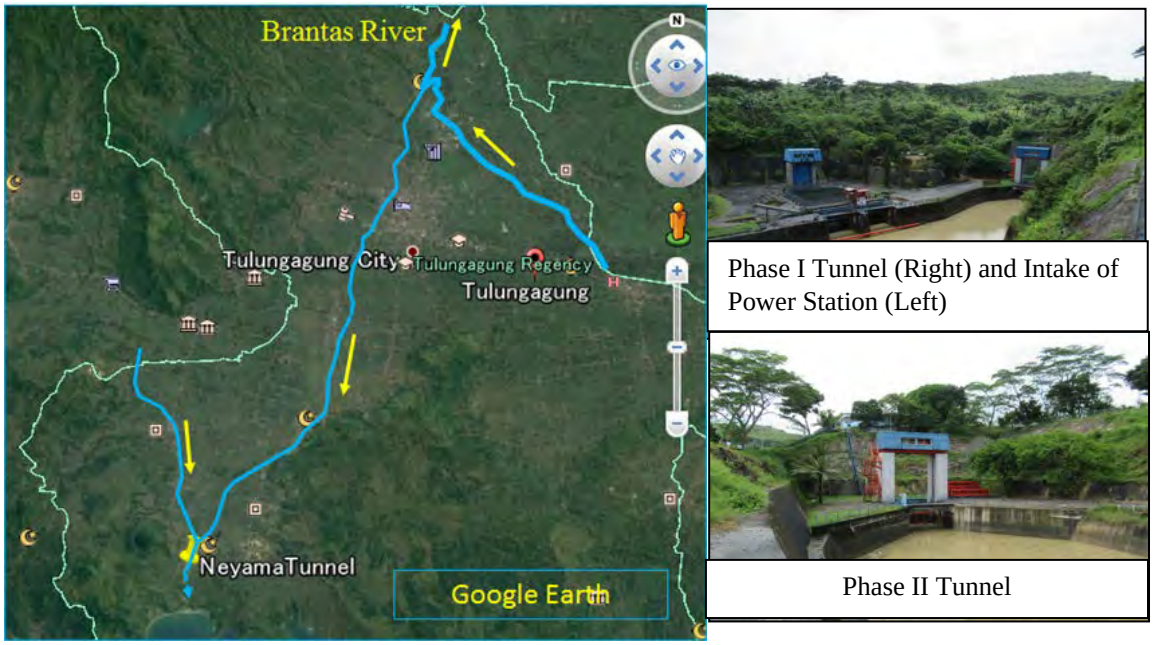


Figure 2.3.8: Tulungagung Neyama Tunnel

Map and Photos: JICA Study Team

4) Flood Control of the East Floodway in Semarang

Eastern side of Semarang City has frequent flood problem by the East Floodway (Banjir Kanal Timur: BKT) and other rivers. The 1st Phase Project under bidding for construction aims to mitigate flood by improving the downstream half of the BKT. Sea water level rise is considered for setting the freeboard of the river wall of the BKT.

(2) Landslide risk management

1) Landslide disaster area in Banjarnegara Municipality

In Banjarnegara Municipality (Kapbupaten) in Central Java Province, about 70% of the area belongs to high risk area of landslide. On December 14, 2014, large deep landslide occured and more than 135 people died. After the landslide, the Municipality has relocated the affected inhabitants to nearby relocation site. Landuse management has been conducted for not building houses in the disaster area again. Telemetric rain gauge was installed by BMKG and telemetric slope sensor (extensometer) was installed by PVMGB. Orthodox landuse management will be also effective for climate change.

Figure 2.3.9: Landslide at Sampang District in Banjarnegara Municipality in December 2014

Photo on December 17 – 18, 2014 from BPBD Banjarnegara Municipality

(3) Drought risk management

The government has intensified its efforts to mainstreaming DRR into its plans and actions, including for drought. At the local level, disaster management offices have been established and have their own disaster management plan. Respective line agencies such as agriculture, health, directorate of water resources, planning agencies, finance coordinate with the government on drought risk management at national, provincial, and community levels. Depending on major disasters affecting that area, preparedness and mitigation actions are taken. The provincial government also has a strategy to deal with before, during and after situation of drought events. In case of irrigation, Central Java government coordinate with extension staffs, get information from meteorology office, and also check the available infrastructures for water structure. Based on the situation and coordination with farmers, they evaluate area to be irrigated against available water in the storage and then they plan for cropping such as whether plant one crop or two crops. However, recently rainfall pattern is so uncertain that sometimes it rains for two weeks and then stop for a long time affecting decisions whether to grow crop or not.

The National Committee on Water Management comprising of BMKG, Directorate of Groundwater, DG Water Resources etc. monitor the water resources and meteorological conditions on regular basis and provide necessary policy recommendations for addressing the impending drought conditions. Addressing the forest and bush fires is an important and integral part of the drought risk reduction mechanism developed in Indonesia. The Government Regulation No 45/2004 specifically calls for protection of forest fires and to achieve it the regulation has called for establishing a national forest fire map, develop partnerships with local communities and build capacities of stakeholders to mitigate forest fires. Indonesia is a party to the United Nations Convention to Combat Desertification (UNCCD) and as a part of it the county has developed a National Action Plan that identifies drought as an important issue to be addressed through arresting land degradation especially in East Nusa Tenggara, West Nusa Tenggara, and Central Sulawesi islands, improvement of irrigation facilities, rehabilitation of degraded lands, promoting agroforestry, water conservation, strengthening local institutions and sustainable land management.

To cope with increasing frequency of drought incidence, various structural measures has been implemented for improving water storage and supply capacity through construction of new dams, construction/rehabilitation of small ponds and installation of groundwater pumps.

2.3.4 Capacity building

Indonesia has been implementing several DRM measures and some of them are already being aimed at CCA integration. BAPPENAS has developed a 2-week training course on integrating DRR and CCA in the local development plan for government officials. At the local level, disaster management offices have been established and have their own disaster management plan. Indonesia (BNPB) has established information platform such as inaRISK and disaster database. Similarly, indices such as Indonesia Disaster Risk Index, Standardized Precipitation Index (SPI), Fire Danger Rating System (FDRS) (by BMKG) are used. BMKG has a long-term goal to install 500 automated weather stations. These are vital information sharing capacities for decision support and for DRR and CCA integration. For integrating CCA into DRR for flood risk management, landslide risk management and even water resources management in a practical way, a standardized guideline for DRR and CCA integration could be developed by incorporating methods for assessing impacts of climate change, including downscaling from GCMs and statistical analysis based on the observed hydro-meteorological data. Preparation of hazard maps and risk maps with and without climate change impacts and formulation of DRR plan incorporating stage-wise CCA implementation could also be promoted. In case of drought, a real-time El Nino monitoring facility could be developed. At the local level, scaling-up of already existing initiatives such as construction of local ponds, conservation of water sources and watersheds, and Climate Field Schools or Crop Insurance could be considered.

2.4 Lao PDR

2.4.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

In 1999, the Prime Ministerial Decree No.158 was adopted, and the Decree created a foundation for policy development on DRM in Lao PDR, establishing the legal base for the National Disaster Management Committee (NDMC) with responsibilities for policy formulation on DRM. The Prime Ministerial Decree No. 220 on the National Disaster Management Office (NDMO) replaced the Prime Minister Decree No 158.

Meanwhile, the Environmental Protection Law was enacted in 1999, which is the general environmental legislation focusing on sustainable socio-economic development, maintaining biodiversity, and controlling pollution. Apart from the Environmental Protection Law, there are dozens of diversified laws related to climate change such as air protection, energy, agriculture and forest, and water resources.

The new Climate Change Law and the Disaster Management Law were drafted, and they are in the process of enactment. It is expected that both of the Laws will be officially enacted by 2019. Originally, the Climate Change Law and the Disaster Management Law were intended to integrate into a comprehensive legal framework for DRR and climate change as a new Climate Change and Disaster Management Law in Lao PDR. However, the integration of the both Laws was given up due to the restructuring of the recent governmental organisations.

Climate Change has been streamlined in the 8th Five-Year National Socio-Economic Development Plan (NSEDP) 2016-2020, setting guidelines for integrating a series of activities on DRR, CCA, and mitigation. Although disaster management and climate change are described in OUTCOME 3 of the 8th NSEDP as "preparing to cope with the disaster risks and climate change" so as to mainstream CCA in three sectors such as water resources, agriculture and public health, there is no clear-cut indication on the integration of DRR and CCA in the current 8th NSEDP.

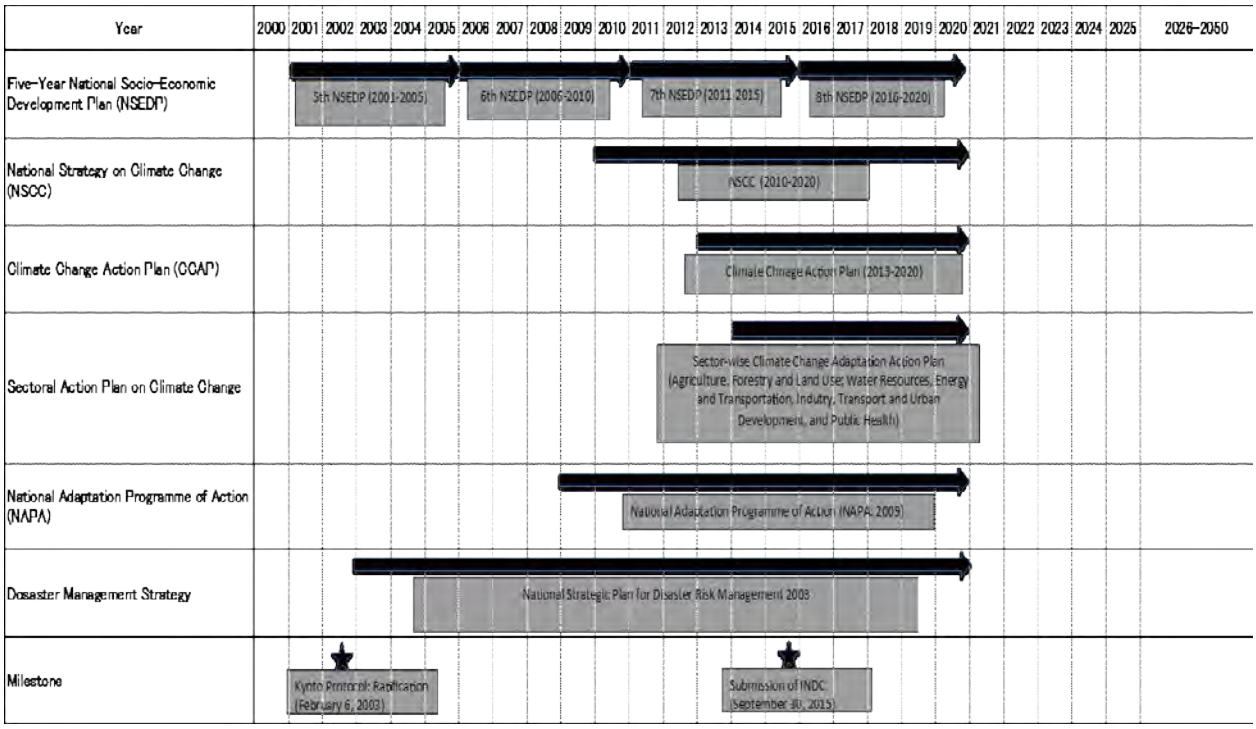
In order to mainstream DRR in the investment plan under the national socio-economic development plan, "Mainstreaming Disaster Risk Reduction into the Methodology for Preparing Urban Master Plans in Lao PDR" and "Guidelines for Mainstreaming Disaster Risk Reduction into Public Investment Planning in Lao PDR" were developed in 2012 under the component for "Mainstreaming Disaster Risk Reduction into Urban Planning Process in Lao PDR" of the project for the Operationalization of the Strategic Plan for Disaster Management (OSPDM), implemented by the National Disaster Management Office (NDMO) in partnership with the Ministry of Natural Resources and Environment (MoNRE), with technical support from the Asian Disaster Preparedness Center (ADPC) and the World Bank, and financial support from the Global Facility for Disaster Risk Reduction and Recovery (GFDRR).

The National Disaster Prevention and Control Committee (NDPCC) and the Ministry of Labour and Social Welfare (MLSW) evaluated their experiences in disaster management and lessons learned, adopting the Strategic Plan on DRM in Lao PDR 2020 and action plans. The Strategic Plan outlines strategic disaster management objectives up to 2005, 2010 and 2020 (short, medium and long-term goals), respectively. The Strategic Plan specifically aims at reducing the damage caused by natural disasters, shifting strategy from relief and response after disasters to mitigation and preparedness before disasters, and building capability of communities in response to natural disasters.

Meanwhile, the National Climate Change Strategy (NCCS) 2010 is the cardinal policy document which identifies key strategic priority areas for the climate change mitigation and adaptation options as well as the sector-wise mitigation and adaptation options such as agriculture, food security, forestry, land use, water resources, energy, transport, industry, urban development and public health. In addition to the overarching strategy set out in the NCCS 2010, the Climate Change Action Plan for the period 2013-2020 defines mitigation and adaptation actions in the same targeted sector as the NCCS 2010.

The timeframe for strategies and policies on climate change and disaster management of Lao PDR is tabulated as below.

Table 2.4.1: Timeframe for Strategies and Policies on DRM and Climate Change (Lao PDR)



The assessments on the current DRM and climate change institutional setting of Lao PDR are summarised as below.

- Although the current legal documents for DRM and climate change are both diverse and not adequate to address major issues related to DRR and CCA, the Climate Change Law and the Disaster Management Law are currently in the process of enactment, which can be regarded as desirable legal actions. However, both of the Laws had not yet been consolidated as a legal framework for DRR and CCA, which might contribute to the future integration of DRR and CCA if consolidated.
- The current 5-year national development plan (NSEDP 2016-2020) addresses the importance of mainstreaming of DRM and climate change in sector-wise development plans, and furthermore, there is, though imperfect, a concept of the integration of DRR and CCA in the said NSEDP.

(2) Organisational Structure

The National Disaster Management Committee (NDMC) and the NDMO (National Disaster Management Office) were established in 1999 through the Prime Ministerial decree No 158. In 2011, the NDPCC (National Disaster Prevention and Control Committee) formally replaced the previous NDMC as the main organisation responsible for coordinating DRM and recovery efforts at the national level.

The DDMCC (Department of Disaster Management and Climate Change) of the MONRE, as a secretariat to NDPCC, was initially located in the MLSW and served as the country focal point for disaster management. With the government restructuring, the NDMO and their functions were transferred to the DDMCC of the MONRE as the secretariat of the NDPCC in 2013.

The newly established DDMCC elevated the secretariat of the NDPCC to 'department-level' which is viewed as important for improving and coordinating powers across the line agencies and

sub-national departments and offices involved in DRM. The DDMCC is also expected to put priority on preparedness and early warning aspects of DRM.

At the national level, there are a number of coordination mechanisms which support the NDPCC. These include the Ministry Focal Points, and the Ministry Focal Point Units established in key line agencies. Focal Point Units exist within each key line ministry, and the Unit coordinates the work within relevant departments of each line ministry.

The NDPCC is the highest inter-ministerial body for disaster management in Lao PDR, and it is the overall coordination body for disaster management policies, mobilisation of national and international assistance in times of disasters, information management and public awareness. The NDPCC also coordinates the establishment of disaster management committees at provincial, district and village levels in the following ways. The DDPCCs is chaired by the district governors. District level committees are still being established functionally in all the districts.

- Provincial Disaster Prevention and Control Committees (PDPCC)
- District Disaster Prevention and Control Committees (DDPCC)

The Ministry of Natural Resources and Environment (MONRE) is the main ministry dealing with climate change in Lao PDR. The National Steering Committee on Climate Change (NSCCC) and its Technical Working Groups was established in 2008, and the Department of Disaster Management and Climate Change (DDMCC) of the MONRE serves as a central focal point for all domestic and international networks on mitigation and adaptation activities as well as (i) promoting and organizing disaster management training for government staff and communities, (ii) coordinating relief activities for disaster victims during disaster, and (iii) acting as a centre for disaster management information management and assessment.

The NSCCC is chaired by the Deputy Prime Minister, and the vice chairs of the NSCCC are the Ministers of Planning and Investment (MPI), Water Resources and Environment Administration (WREA), Ministry of Natural Resource and Environment (MONRE), and Ministry of Agriculture and Forestry (MAF). Seven Technical Working Groups (TWGs) and the secretariat support the works of the NSCCC.

The assessments on the current DRM and climate change organisational arrangement of Lao PDR are summarised as below.

- The DDMCC as a secretariat of the NDPCC should be institutionally strengthened in terms of staff and budget, since the current human resources and financial resources are not sufficient to meet the requirements of the functions as a secretariat.
- The vertical coordination of the nation-wide 3-layer administrative levels of the National–Provincial–District Disaster Prevention and Control Committee is relatively weak in light of:
  - collecting, sharing and feedback the information on disaster management;
  - preparing and updating a disaster preparedness plan;
  - implementing risk identification and assessment;
  - carrying out a rapid damage assessment after disasters;
  - applying standard operation procedures;
  - mobilising financial resources; and
  - monitoring and evaluation on implementing disaster management activities.

- Horizontal coordination between a DRM focal point and line ministries is relatively insufficient.

- Horizontal coordination between a climate change focal point and line ministries is relatively insufficient.
- Opportunities for training and knowledge sharing on mainstreaming and integration of DRM and climate change at all local levels are not sufficient.

(3) Funding Structure

At the national level, the funding system of Lao PDR for DRM includes National Disaster Fund, National Contingency Fund and State Accumulation Fund. The National Disaster Fund is managed by the NDPCC and administered by the Department of Social Welfare within the MLSW. According to the Decree on the Disaster Prevention Fund (MLSW 2013), the fund includes an annual government's operating budget, project budgets, and donations made by local and international community and private sector. These funds are used for a variety of activities ranging from dissemination of strategies and plans, loss assessments, victim relief, and infrastructure recovery. While the financial sources for the prevention and mitigation of disasters to be mobilised are scattered among line ministries, the above disaster-related funds have the following characteristics.

- The National Contingency Fund is a LAK 100 billion (approximately USD 12.1 million) per annum fund administered by the Department of Budget within the Ministry of Finance. To access these funds, a provincial government, in coordination with national line ministries, is required to prepare a recovery plan and budget.
- The State Accumulation Fund was established under Prime Minister Decree 291 (2013), and the primary source of the Funds is the allocation of 3 percent of the total government annual budget.
- The Provincial Contingency Fund is the allocation of 1.59 percent of the overall provincial expense budget, and is managed by the Department of Finance. The PDPCC and DDPCC manage the use of the Fund.

The Government of Lao PDR has not been utilising the Adaptation Fund except for the USD 4.5 million grant project of "Enhancing the climate and disaster resilience of the most vulnerable rural and emerging urban human settlements. The main objective of the project is to enhance the climate and disaster resilience of the most vulnerable rural and emerging urban human settlements in Southern Lao by increasing sustainable access to basic infrastructure systems and services, emphasizing resilience to storms, floods, droughts, landslides and disease outbreaks.

The list of the funding sources for the CCA projects funded by the international funding sources is tabulated below.

Table 2.4.2: List of Funding Sources for Climate Change Adaptation Project (Lao PDR)

Project Name	Funding Source	Duration
Improving the Resilience of the Agriculture Sector to Climate Change Impacts	UNDP	2012 - 2015
Poverty Environment Initiative: Phase II	UNDP	2012 - 2016
Mainstreaming Biodiversity in Lao PDR's Agricultural and Land Management Policies, Plans and Programmes	UNDP	2011 - 2016
Integrated Disaster and Climate Risk Management	UNDP	2013 - 2016
Effective Governance for Small-scale Rural Infrastructure and Disaster Preparedness in a Changing Climate	UNDP	2013 – 2016
Effective Governance for Small-Scale Rural Infrastructure and Disaster Preparedness in a Changing Climate	UNDP/GEF	2015-2016 (Phase II)
Institutionalizing DRR and Management (DRRM) in agriculture for enhanced resilience programming and integrated implementation across	FAO	2014-2016

Project Name	Funding Source	Duration
sectors		
Institutionalizing DRR and Management (DRRM) in agriculture for enhanced resilience programming and integrated implementation across sectors	FAO	2014-2016
Strengthening agro-climatic monitoring and information systems to improve adaptation to climate change and food security in Lao PDR	FAO	2014-2016
Enhancing the climate and disaster resilience of the most vulnerable rural and emerging urban human settlements in Lao PDR	Adaptation Fund	2017-2021
The Lao PDR Global Climate Change Alliance Programme	EU	2012-2017
Developing multi-scale CCA strategies for farming communities in Cambodia, Lao PDR, Bangladesh and India	Australia Center for International Agricultural Research (ACIAR)	2010-2015

Source: Asia Pacific Adaptation Network 2016

The assessments on the current funding system for DRM and climate change of Lao PDR are summarised as below.

- Although there is a wide range of options to mobilize DRM and climate change finance from various domestic and international funding sources, especially the Adaptation Fund, the Government has not been fully utilising the Adaptation Fund. On the other hand, the size of the National Contingency Fund is not enough to meet its demands.
- The Climate Public Expenditure and Institutional Review (CPEIR) has not been implemented by international organisations to effectively mobilise the limited financial sources.
- Although there are a couple of the built-in funding systems such as the State Accumulation Fund and the Provincial Contingency Fund, the amount of these Funds is not enough to meet their demands.
- The Climate Change Expenditure Tagging (CCET), which enables consistent assessments of climate spending at both national and local levels, has not yet introduced in Lao PDR.

(4) River Basin, River and Forest Management Systems

Department of Water Resources (DWR) of Ministry of Natural Resources and Environment (MONRE) is responsible for overall River Basin Management (RBM), which is being developed.

DWR is responsible for overall River Management (RM). Department of Waterways (DW) of the Ministry of Public Works and Transport (MPWT) has the responsibility of constructing flood control structures along the rivers in urban areas, bank protection along the entire stretch of the rivers as well as management of the entire stretch of the river courses including landuse approval in the areas along the rivers (easement zones).

Ministry of Agriculture and Forestry (MAF) is in charge of forest management. Forest coverage was 70 percent in 1940s but it decreased to 40 percent in the beginning of 2010. However, by the efforts of conservation of forest and reforestation, forest coverage area recovered to 47 per cent in 2015.

2.4.2 Risk assessment

Lao PDR has various natural disasters such as wind (storm), floods, landslides and drought. There are disaster databases in Lao PDR. There is no governmental agency conducting downscaling from GCM. There are flood, landslide and drought hazard maps, but their resolutions are still insufficient.

(1) Disaster database

Disaster data and records are managed by the Disaster Management Division (DMD) of Social Welfare Department of Ministry of Labour and Social Welfare (MLSW). There is also disaster information system called "Lao Disaster Information (LaoDi)" managed by the Department of Disaster Management and Climate Change, MONRE.

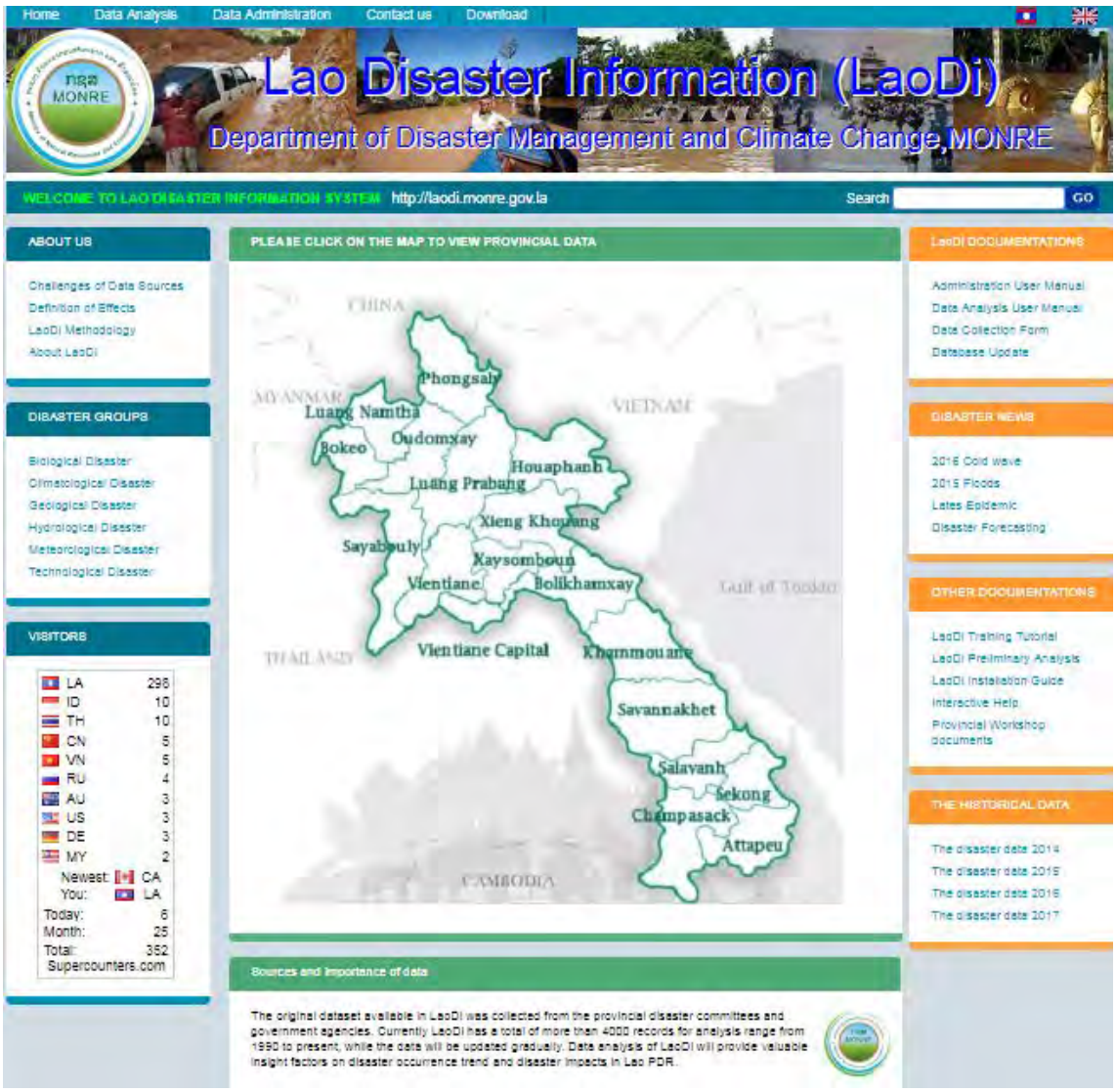


Figure 2.4.1: Lao Disaster Information (LaoDi)

Source: Department of Disaster Management and Climate Change, MONRE, Lao PDR

(2) Meteorological data management and downscaling from Global Climate Models

Meteorological observation system:

Department of Meteorology and Hydrology (DMH) of MONRE is the responsible agency for meteorological observation. Based on the observed meteorological data, DMH conducts weather forecast of daily, weekly, monthly and three monthly. DMH is also conducting observation of water level along the Mekong River at major stations and along the tributaries. The observed water level data is utilized for flood forecast.

Downscaling from GCM:

There is no governmental agency conducting downscaling from Global Climate Models (GCMs).

(3) Hazard and risk map for flood, storm and landslide

Flood and landslide hazard maps and risk maps:

Asian Disaster Preparedness Center (ADPC) prepared flood hazard maps for the country and some provinces, but they are rough. There is no governmental agency making flood hazard maps and risk maps. Flood hazard maps with climate change impacts have not been prepared yet.

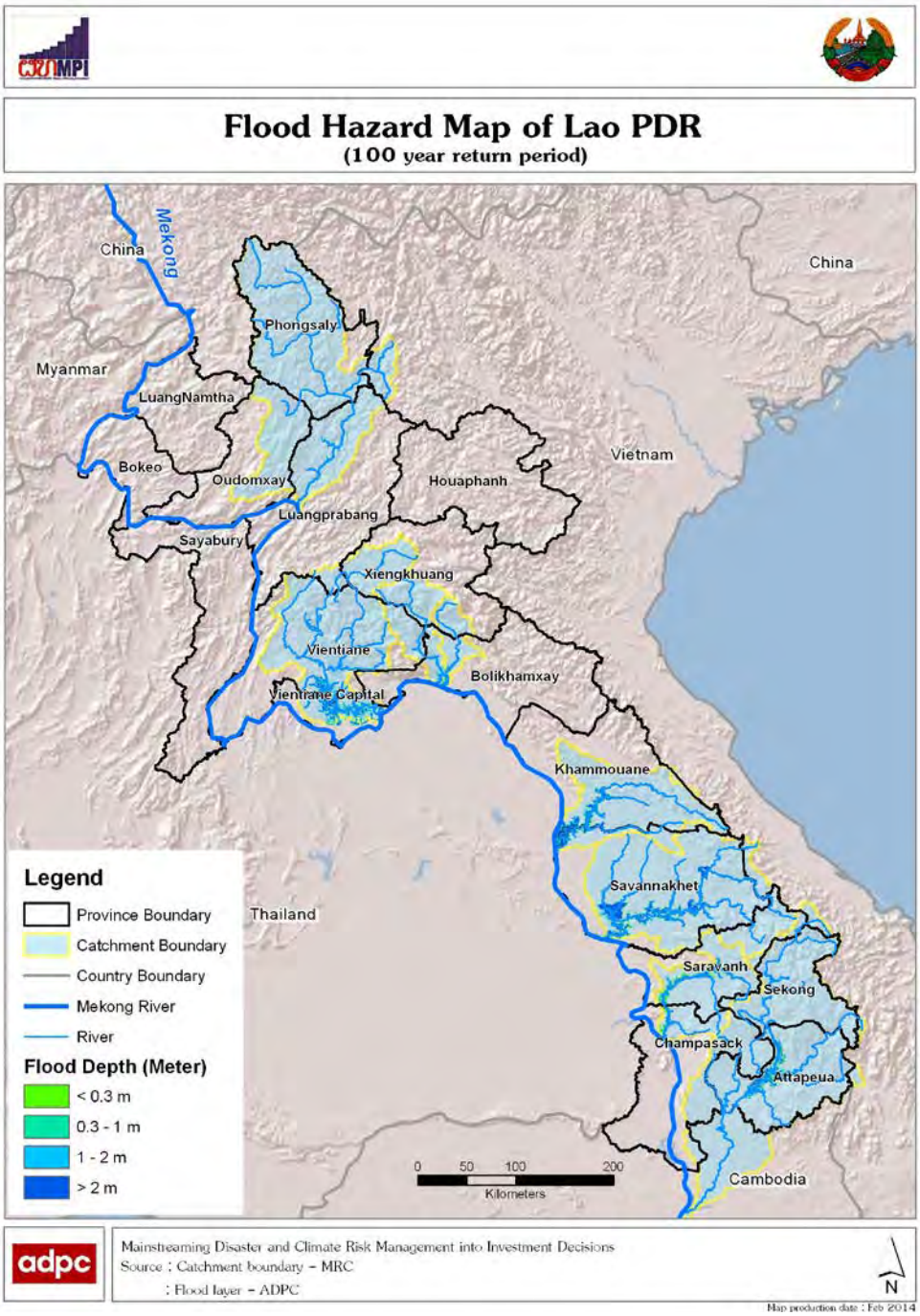


Figure 2.4.2: Example of flood hazard map of Lao PDR

Source: ADPC

Landslide susceptibility maps:

ADPC with UNDP prepared landslide susceptibility maps in the country, but they are rough. There is no governmental agency making landslide hazard maps and risk maps.

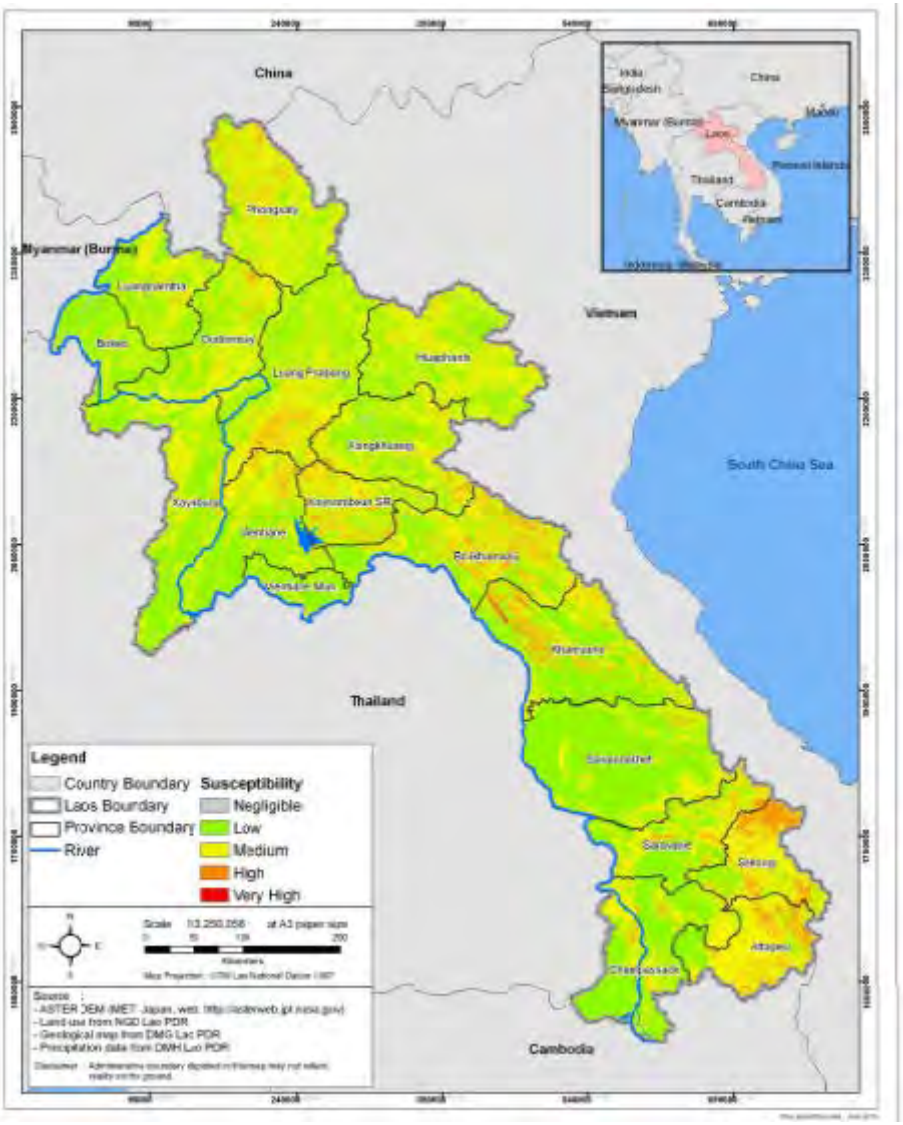


Figure 2.4.3: Example of landslide susceptibility map of Lao PDR

Source: ADPC

(4) Risk map for drought

The wide variation in rainfall across geographical and time scales makes Lao PDR vulnerable to droughts. As a result, severe drought could be observed in the northern and southern parts of Lao PDR. In Lao PDR, out of 1.985 million ha under agriculture, only 0.27 million ha are being irrigated and the rest 86% of agriculture area is rainfed (FAOSTAT, 2005) [4]. There is a significant gap between wet season and dry season irrigated areas in Lao PDR which makes dry season crops more susceptible to drought. Risk reduction becomes complicated in prefectures such as Champasak Province which has both flood and drought prone area as it is a big province in the southern Lao.

Lao PDR is at the initial stages of conducting comprehensive Drought Risk Assessment. Currently, the country has developed a Drought Hazard Map with the collaboration of Asian Disaster Preparedness Center (ADPC), Bangkok and the hazard map is current at the scale of national level (Figure 2.4.4). The individual prefectural hazard maps are being developed. In terms of the usage of these maps for actual decision making, the risk and hazard maps prepared are being used for preparing provincial level plans. The hazard and risk information has also been provided to private sector from Korea for installing the industrial plants and the hazard map was used for identifying the location. Prepared by ADPC, with support from UNDP, the hazard and risk profile maps are made up to provincial level in 2010. At village level, the risk and hazard maps were made using participatory techniques in more than 100 villages.

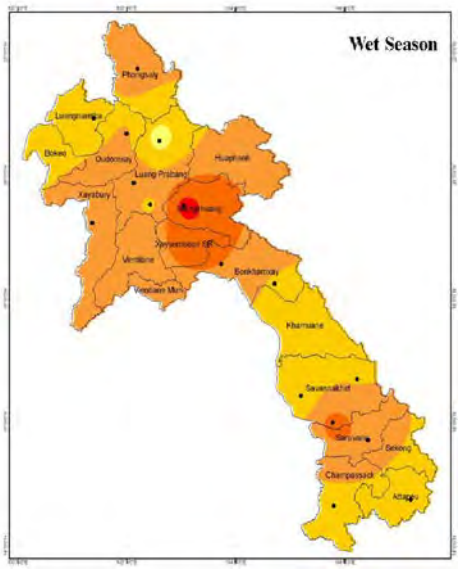


Figure 2.4.4. Moderate to severe drought susceptibility during wet season in Lao PDR
(UNDP, ADPC, MSLW, 2010)

The drought susceptibility maps prepared by ADPC, based on rainfall data from a limited set of weather stations (16) across the country, in collaboration with UNDP and Ministry of Labor and Social Welfare indicated that the Xiengkhuang, a few parts of neighboring provinces, northern and southeast parts of Salavan, surroundings of Oudomxai and Pakkagnoung; most parts of Khamuane, parts of Borikhamxay, most parts of Xaysomboun SR and neighboring parts of Borikhamxay, surrounding area of Donghene station and most parts of Huaphanh are highly susceptible to drought at various times of the year (UNDP, ADPC, MSLW, 2010) [5].

For conducting comprehensive drought risk assessment, there is a need for rich weather and climate data from observatories which is lacking in Lao PDR. In terms of availability of data for decision making, the data on impacts on social sector etc. has been archived in the form of excel sheets with in the MLSW. Disaster inventory was introduced and established with the help of UNDESA/UNDP and this data is available for the past 10 years. The disaster monitoring and response system (DMRS)[6] being managed by AHA center of ASEAN also provides information as required; however, it is more about real time monitoring of disasters in the ASEAN region and the EOC of MLSE is linked to the AHA center. As of 2010, Lao PDR has a total of 19 Regional Basic Synoptic Network Stations (RBSN), 4 Regional Basic Climatological Network Stations (RBCN). 93 rain gauge stations and 29 secondary climate stations. Until 2018, 51 weather stations are to be installed. Most of the instruments

[4] FAOSTAT. (2005). FAOSTAT Inputs: Land. Retrieved 08 15, 2016, from FAOSTAT: http://faostat3.fao.org/download/R/RL/E

[5] UNDP, ADPC, MSLW. (2010). Developing National Risk Profile of Lao PDR. Part I: Hazard Assessment. Vientiane, Lao PDR: UNDP and ADPC. Retrieved from http://www.adpc.net/igo/category/ID275/doc/2013-sWNa61-ADPC-Final_Report_Part1.pdf

[6] http://dmrs.ahacentre.org/dmrs/

are analogue in nature, aged and deteriorated with potential risk of errors both by the low quality of the instruments and by human errors due to limited proficiency and manpower (Pathoummady, 2010)[7]. Many of the current weather stations have only a limited historical data with quality constraints.

2.4.3 Planning and implementation

Guidance for DRR and CCA has not been prepared yet. Planning and implementation for mainly flood risk management without climate change impacts has been conducted in limited places such as around city of Vientiane. For landslide, mainly tree planting on the slope causing landslide problems are done.

(1) Flood and storm risk management

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

No concrete guideline or standard of DRR incorporating CCA is formulated.

2) Flood control dike cum road along the Mekong River in Vientiane

There are some examples of the DRR implementation against flood disaster such as the flood control cum road dikes along the Mekong River in Vientiane. CCA has not been incorporated in this dike. However, there is a possibility of raising dike or add river walls along the dikes in case of increasing flood discharge by climate change impacts.

Figure 2.4.5: Flood control dike cum road along the Mekong River in Vientiane

(2) Landslide risk management

In the northern mountainous areas, there are landslides problems. Mainly tree planting is done for the slope causing landslides.

[7] Pathoummady, S. (2010). Status of Meteorological Network, Observations and Data Management. JMA/WMO Workshop On Quality Management In Surface, Climate And Upper Surface, Climate And Upper air Observations In RA II (ASIA). Tokyo, Japan: JMA/WMO. Retrieved from http://www.jma.go.jp/jma/en/Activities/qmws_2010/Presentation/S402_Pathoummady.pdf

(3) Drought risk management

Disaster risk reduction in Lao PDR has been designed to handle the sudden onset disasters than the slow onset disasters partly since the country puts higher emphasis on sudden onset disasters such as floods than droughts. In Lao PDR, the responsibilities for DrRR are not decided by the ministries but at the national level by an inter-ministerial committee called National Committee for Disaster Prevention and Control (NCDPC) hosted by the Ministry of Labor and Social Welfare (MLSW), with its Department of Disaster management and Climate Change (DDMCC) acting as a secretariat with line sectors participating in the committee and the committee may invite other agencies if required depending on the nature of the drought event. Similar committees have been established at the sub-national level including provincial, district and village levels and provincial and village committees have already been put in place in most places.

Drought mitigation is handled by the individual ministries. Water resources management law stipulates the roles of the department of water resources and all details related to water resources governance in Lao PDR are stipulated by this law. With regard to water resource management, the Ministry of Public Works and Transport will have to report to government and they coordinate with other ministries to ensure that river bank is in proper condition. There is a law to manage watersheds within the natural resources and agriculture department of water resources within Ministry of Natural Resources.

The Lao PDR government is currently implementing the 8th National Socio-economic development plan (NSEDP, 2016-2020). The Lao PDR has made efforts to integrate CCA and DRR into NSEDP to a great extent as a part of the Outcome 3, Output 2. In its draft NSEDP, the Lao PDR government stated that the government has cooperated with the GMS Cooperation Framework in terms of developing Action Plan for Flood and Drought Control and Management to establish national Early Warning Center under the ADB-GMS Program (Ministry of Planning and Investment, 2015; ADB, 2016) [8],[9]. Drought early warning is the responsibility of Department of Meteorology and Hydrology that installs and maintains a network of weather observatories across the country. Lao PDR has 19 Regional Basic Synoptic Network stations (RBSN), 4 regional basic climatological network stations (RBCN), 33 secondary synoptic stations. In addition, the country also has 132 rain gauge stations and 113 hydrological stations, a C-band Doppler weather radar, MTSAT-1R, CMA Cast and COMS-1 Satellite Ground Receiving Station. The Ministry of Agriculture has developed a Plan of Action for disaster risk reduction and management in agriculture that identified several key projects to be implemented to reduce the drought risks.

Table 2.4.3 provides a list of recent initiatives for addressing drought risks, being implemented by various agencies in Lao PDR in collaboration with the government ministries. ADB project on flood and drought helped in two basins to upgrade to automatic stations which are under construction now. JICA has already supported satellite weather stations which are already running. CLA CAT was used from China to obtain weather information. MOA and FAO developed the Plan of Action (PoA) for disaster risk reduction and management in agriculture (2014-2016). PoA becomes a one voice for the ministry to share with the donors and promote the projects identified in it.

[8] ADB. (2016). Greater Mekong Subregion Economic Cooperation Program: Overview. Retrieved from Asian Development Bank: http://www.adb.org/publications/greater-mekong-subregion-economic-cooperation-program-overview

[9] Ministry of Planning and Investment. (2015). Five Year National Socio-Economic Development Plan VIII (2016-2020). Vientiane: Ministry of Planning and Investment. Retrieved from http://rightslinklao.org/wp-content/uploads/downloads/2016/03/Draft_8th_NSEDP_2016-20.pdf

Table 2.4.3: Some initiatives addressing drought risks in Lao PDR by various donor agencies

Initiative	Donor	Hazard focus	Major interventions
GMS Flood and Drought Risk Management and Mitigation Project -- Lao PDR: Flood Protection and Drought Mitigation Project	ADB	D & F	Resettlement plans, upgrades in water infrastructure, CBDRM
Northern rural infrastructure development sector project	ADB	D & F	Improvement in irrigation systems and roads, establish water user groups, capacity building and land use zoning
Improving the Resilience of the Agriculture Sector to Climate Change	UNDP	D&F	Ecosystems-based approach to agriculture, integrating climate change into agriculture, land use planning, water harvesting, tolerant rice varieties, training and capacity building
Integrated disaster and climate risk assessment	UNDP	D&F	Local level DRM planning, community early warning systems, information management systems, coordination among communities, training and capacity building
Effective governance for small-scale infrastructure and disaster preparedness in changing climate	UNDP	D&F	Budgeting and planning for reduced risks through DDF guidelines, climate-proofing of communities and enhancing ecosystem functions through participatory land use planning
Institutionalizing Disaster Risk Reduction and Management (DRRM) in agriculture for enhanced resilience programming and integrated implementation across sectors	FAO	D & F	Strengthened institutional mechanisms, improved technical capacities, tools and methods and implementation of Plan of Action for agriculture
Strengthening agro-climatic monitoring and information systems to improve adaptation to climate change and food security in Lao PDR (PPG)	FAO	D & F	Enhance monitoring, analysis, communication and use of agro-meteorological data and information for decision making; improve monitoring and analysis of agricultural production systems by strengthening Land Resources Information Management System (LRIMS) and Agro-Ecological Zoning (AEZ)

D: Droughts; F: Floods; CBDRM: Community based disaster risk management. Source: Authors

Developing early maturing drought tolerant rice varieties has been one of the major strategies for drought risk reduction in agriculture in Lao PDR in the collaborative initiatives of FAO and MOA. Alternative livelihood strategies have been promoted in collaborative initiatives of FAO and Government of Lao PDR. Community based participatory vulnerability mapping was done, identifying evacuation locations, being prepared, posters in the village disseminating the information etc. Mung bean broadcasting in rice paddies after harvesting is being promoted to improve soil fertility as a part of the current project.

The ADB project on the Capacity Enhancement for Coping with Climate Change is the only policy level project on mainstreaming CCA and DRR in Laos so far. A project was implemented with assistance from UNDP on improving resilience to agriculture sector to climate change and has components related to DRR in Xaiyabuli (flood) and Savannakhet (drought) provinces for four years which finished in 2016. This project looked at the integrated water management, provision of water supply, drought and flood season water supply and storage, school gardens, school children education and DRR techniques including community based DRR. Under small scale governance project, the UNDP has done climate risk and vulnerability assessment. No publications but almost finalized and done by International Consulting for Environment and Management (ICEM) for different districts (12 districts), identify climate risks and the tools being developed in this project can be extrapolated to other areas. Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change impacts (IRAS) by MAFRI, UNDP and GEF just conducted the awareness generation in Savannakhet

and Xaiyabuli provinces but only two districts in each province. GIS map for agriculture loss from drought and floods was developed as a part of this IRAS project, climate change training and adaptation module was developed, farmers field schools through which the training was done. JICA is helping to improve the hydro-meteorological observatories AWS (18) and 6 LS stations.

2.4.4 Capacity buildings

Lao PDR is at the earliest phase to consider CCA concerns into their DRR. To improve the technical capacity on DRR, different government mechanisms could be considered for mainstreaming both DRR and CCA into their plans and actions. Improving capacity of concerned government agencies to conduct analysis of climate change impacts including downscaling from GCMs and statistical analysis of hydro-meteorological data could facilitate the process of DRR and CCA integration. Similarly, improving capacity of concerned agencies on the preparation of hazard maps and risk maps with and without climate change impacts would help in planning and implementation of DRR and CCA interventions. Opportunities of transferring experiences from other Member States could be considered for this purpose. Besides these, good practices of DRR and CCA integration from other countries such as Climate Field School or Crop Insurance could also be introduced, while the country could share its experience on Community Based Disaster Risk Management to other Member Counties.

2.5 Malaysia

2.5.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

The National Security Council (NSC) Directive No.20 (Policy and Mechanism on National Disaster Relief and Management) promulgated in 1997 stipulates the mechanism on the disaster management including responsibilities and functions of the relevant agencies under the integrated emergency management system, setting the main guideline for disaster management in Malaysia. The Directive No.20 prescribes the management mechanism to ensure effective coordination and mobilisation of resources for disaster management. This executive order was complemented by other sectoral legislation including Land Conservation Act 1960, Environmental Quality Act 1974, Town and Country Planning Act 1974 and Street, Drainage and Building Act 1974.

The National Environmental Quality Act 1974 is the legal basis of environmental management in Malaysia, while the Environmental Management and Climate Change Division (PASPI) of the NRE is responsible for the policies relating to environmental and climate changes such as the National Environmental Policy and the National Climate Change Policy. Laws and regulations related to climate change remain diverse in Malaysia with the following individual acts such as Renewable Energy Act (2011), Sustainable Energy Development Authority Act (2011), Malaysia Biofuels Industry Act (2007) and Electricity Supply Act (1993).

The Eleventh Malaysia Plan 2016-2020 is a strategic plan that paves the way to deliver the future prospect of Malaysia, and the Plan focuses on climate resilient development that incorporates CCA into policy and development planning, evaluation and implementation. Strategy D3 of the Eleventh Malaysia Plan 2016-2020 includes the components such as enhancing CCA, developing a national CCA plan, building resilient infrastructure, strengthening natural buffers, and

increasing resilience of agriculture sector. (The image of the Eleventh Malaysia Plan is shown on the left. The image is taken from http://english.astroawani.com/malaysia-news/11th-malaysia-plan-six-strategic-thrusts-moving-towards-vision-2020-60389.)

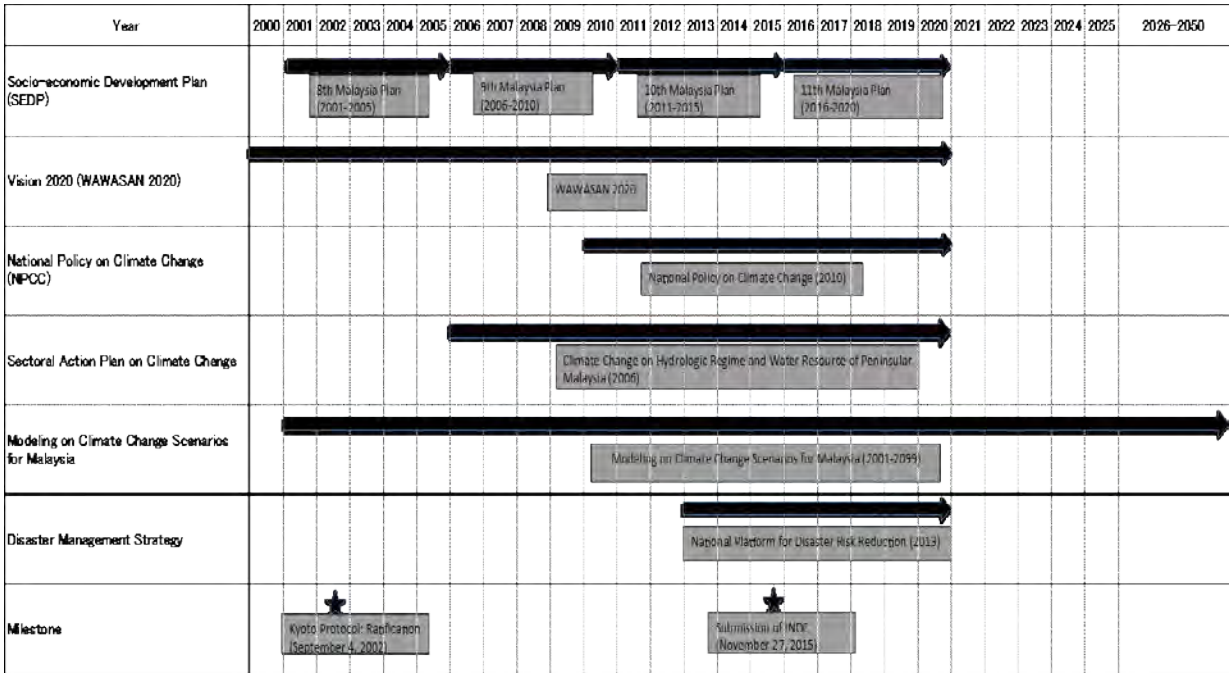
On the other hand, Malaysia's National Platform for DRR was formalised in 2013, involving various stakeholders from the government as well as the private sector. Malaysia's 11th version of the Five-year Plan (2016-2020) focuses on strengthening DRM across 5 phases (prevention, mitigation, preparedness, response and recovery). The following strategies are undertaken to reach these objectives:

- Strengthening DRM by establishing DRM policy and institutional framework, improving disaster detection and response capacity, and incorporating DRM into development plans and creating community awareness; and
- Enhancing CCA by developing a national adaptation plan, and strengthening resilience of infrastructure, natural buffers including water and agriculture sector as well as creating awareness on health impacts.

In 2010, Malaysia launched the National Policy on Climate Change to provide a framework for various activities for mainstreaming climate change through the efficient management of resources and enhanced environmental conservation. The policy also aims to strengthen institutional and implementation capacity to improve the opportunities to reduce negative impacts on climate change. The policy is based on the principles of sustainable development, coordinated implementation, effective participation and common but differentiated responsibilities.

The timeframe for strategies and policies on climate change and disaster management of Malaysia is tabulated as below.

Table 2.5.1: Timeframe for Strategies and Policies on DRM and Climate Change (Malaysia)



The assessments on the current DRM and climate change institutional setting of Malaysia are summarised as below.

- There is no clear-cut indication of the integration of DRR and CCA in the 11th Malaysia Plan 2016-2020.
- There are no stand-alone comprehensive legal frameworks for both DRM and climate change, and the current legal frameworks are still diverse.
- Although the National Policy on Climate Change (NPCC) 2010 provides a framework for various activities for mainstreaming climate change in sector-wise development plans, there is no clear-cut indication of the integration of DRR and CCA in the NPCC.

(2) Organisational Structure

The Government of Malaysia on the 26th August 2015 has established the National Disaster Management Agency (NADMA) under the Prime Minister's Department taking over the responsibility of disaster management from the NSC. The government formed NADMA to coordinate the disaster management works of various agencies towards a better nation in handling DRR.

The disaster management mechanism in Malaysia is operated at four levels, namely the Community Level, District Level, State Level and followed by the Central or Federal Level. If at any situation a disaster happens at the local level, the community will activate the committee at the community level known as the Community Based Disaster Risk Management (CBDRM) headed by the local heads. If the disaster escalates involving a district, the committee at the district level will be activated known as the District Disaster Management Committee (DDMC). This committee is chaired by the District Officer. Once two or more districts are affected by the disaster, the state level committee known as State Disaster Management Committee (SDMC) will be activated. At state level the committee is headed by the State Secretary. If the situations get even worse involving many states in the country then only the Central Disaster Management Committee (CDMC) chaired by the Minister in the Prime Minister's Department will be declared open.

The Environmental Management and Climate Change Division (PASPI) of the Ministry of Natural Resources and Environment (NRE) is the central focal point for climate change in the government of Malaysia. A National Steering Committee on Climate Change (NCCC) was established in 1994 to guide national responses on climate change and to promote the implementation of both adaptation and mitigation activities. Thus, the National Policy on Climate Change provides the framework to mobilise and guide government agencies, industry, community as well as other stakeholders in addressing the challenges of climate change.

The assessments on the current DRM and climate change organisational arrangement of Malaysia are summarised as below.

- The newly established NADMA as a focal point should be institutionally strengthened in terms of staff and budget, since the current human resources and financial resources are not sufficient to meet the requirements of the functions as a focal point.
- The vertical coordination of the nation-wide 4-layer administrative levels of the Central–State–District-Community Disaster Management and Relief Committee is relatively weak in light of:
  - collecting, sharing and feedback the information on disaster management;
  - preparing and updating a disaster preparedness plan;
  - implementing risk identification and assessment;
  - carrying out a rapid damage assessment after disasters;
  - mobilising financial resources; and

- monitoring and evaluation on implementing disaster management activities.

- Horizontal coordination between NADMA and line ministries is relatively insufficient.
- Opportunities for training and knowledge sharing on mainstreaming and integration of DRM and climate change at all local levels are not sufficient.

(3) Funding Structure

While there is no official funding to NADMA as yet for the prevention and mitigation of disasters, the DRM budget is available under the Development Expenditure (DE funds) from the federal government. When the DRM budget is secured under the DE funds, the guideline for the value management including the cost-benefit analysis can be applied.

In Malaysia, the domestically available DRM fund is the National Disaster Relief Fund (KWABBN) which provides assistance to disaster victims to enhance the overall resilience of communities to disasters. KWABBN is a relief fund and its usage is limited to certain activities such as in the context of "Build Back Better" in the Sendai Framework for Disaster Risk Reduction (SFDRR).

Regarding the international Adaptation Fund to finance concrete adaptation projects and programmes in developing country, Malaysia has not been accessing to the Adaptation Fund so far. However, the adaptation projects are being developed based on the INDC of Malaysia. The current climate change projects in Malaysia mostly focused on mitigation efforts with a limited focus on adaptation.

(4) River Basin, River and Forest Management Systems

Department of Irrigation and Drainage Malaysia (JPS (DID)) of the Ministry of Natural Resources and Environment (NRE) has the direction of promoting River Basin Management (RBM) in the country. RBM has started in some river basins such as Kelantan and Muda River Basins focusing on Water Resources Management (WRM). However, as States have responsibility for RBM, JPS advises the States. Flood Risk Management (FRM) and landslide risk management (LRM) have not been included in the RBM yet.

JPS (DID) is the responsible agency for overall management of river channels in terms of giving permission for constructing river related structures in the river and easement zones. However, in reality, States have responsibility of landuse management including easement zones and there are still some problems of illegal houses inside some rivers.

The Forestry Department of Peninsular Malaysia (JPSM) of NRE, Sabah Forest Department and The Forest Department of Sarawak are the responsible agencies of forest management including conservation of forest and reforestation for upland forest and mangrove forest in the coastal areas. Forest management especially logging is strictly conducted by tagging the logs. However, wide plantations such as oil palm and rubber are extended in the country especially in Peninsular Malaysia, which are under responsibility of the Ministry of Agriculture and Agro-based Industry (MOA). It seems that the rainfall runoff rate and sediment production may be relatively high from the plantation areas, because vegetation over the surface soil is generally limited.

2.5.2 Risk assessment

Disaster database of NADMA is being developed, but each line agency has its own disaster database. Downscaling from GCM has been conducted for all over Malaysia, and analysis on climate change impacts on rainfall, river discharge etc. has been conducted. There are flood hazard and risk maps without and with climate change impacts. Landslide hazards have been prepared only along the national roads.

(1) Disaster database

As National Disaster Management Agency (NADMA) was established in 2015, disaster database is not available yet. However, the line agencies related to natural disasters keeps disaster data related to their works.

(2) Meteorological data management and downscaling from global climate models

Meteorological observation system:

Malaysian Meteorological Department (MMD) under the Ministry of Science, Technology and Innovation is the responsible agency for meteo-hydrological observation. Satellite images of NOAA (National Oceanic and Atmospheric Administration) and Himawari are also used for monitoring. Based on the observed data etc., and weather simulation, weather forecast is conducted.

Downscaling from GCM:

MMD is the responsible agency for downscaling from GCM and conduct simulation by Regional Climate Models (RCM). The RCM covers Peninsular Malaysia, Sabah and Sarawak with about 50km mesh in principle (Source: MMD; “Climate Change Scenarios for Malaysia 2001 – 2099”).

In 2010, National Hydraulic Research Institute of Malaysia (NAHRIM) developed the regional hydrologic-atmospheric model of East Malaysia called as Regional Hydro-climate Model of Sabah and Sarawak (RegHCM-SS) with 9 km spatial grid resolution. In 2010, NAHRIM also undertook the study entitled "The study of the impact of climate change on sea level rise in Malaysia" where the sea water level rise due to climate change has been projected along the Malaysian coastline by 2100. In 2014, the extension study of the Impact of Climate Change on Hydrologic Regime and Water Resources of Peninsular Malaysia were carried out with 6 km spatial grid resolution.

In addition, NAHRIM (National Hydraulic Research Institute of Malaysia) and NRE made the “Technical Guide for Estimation of Future Design Rainstorm under the Climate Change Scenario in Peninsular Malaysia”. The objectives of the Technical Guide are 1) To assist engineers, hydrologists and decision makers in designing, planning and developing water-related infrastructure under changing climatic conditions, 2) To introduce an approach of quantifying the scale of climatic change to surface water systems, and 3) To set climate change factor (CCF: ratio of rainfall for each of the future periods to the present rainfall, see figure below). NAHRIM also produces “N-HYDAA: NAHRIM Hydroclimate Data Analysis Accelerator” for analysing climate change impacts on rainfall & runoff, stream flow, and drought etc. However, according to JPS, it needs some adjustment for applying the CCF for realistic designing river improvement etc., because increase of flood water level under climate change will be estimated to be very high in general and very high river wall etc. will be necessary.

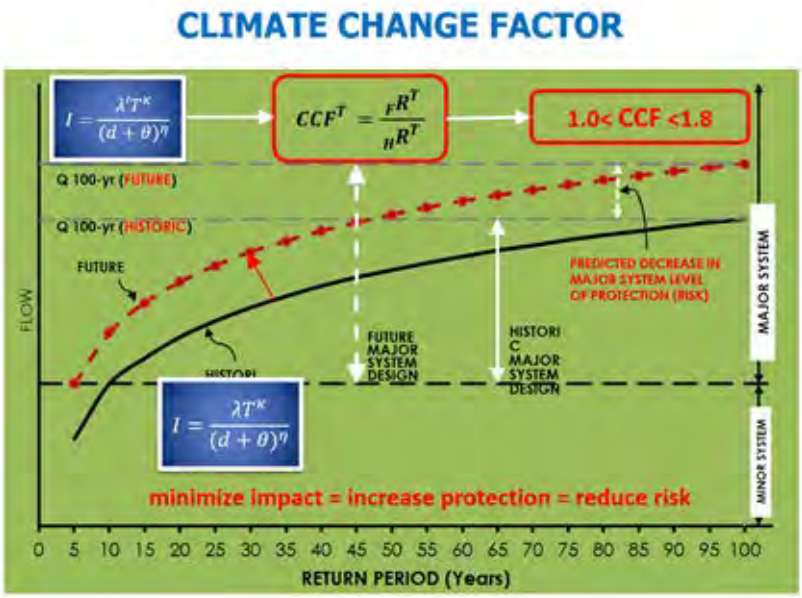


Figure 2.5.1: Estimated Climate Change Factor by NAHRIM, Malaysia

Source: Presentation of Malaysia Mission to Senior Official Level Forum of this Study

(3) Hazard and risk map for flood, storm and landslide

<u>Flood hazard maps and risk maps:</u>

Flood hazard maps and risk maps are prepared by the Department of Water Resources Management and Hydrology of JPS (DID). Hazard maps and risk maps of probable floods (such as 100-year return period) are prepared for some river basins based on hydrological and hydraulic simulation. Flood hazard maps including climate change impacts are also prepared.

NAHRIM has carried out assessment on river basins vulnerability and flood-prone areas due to climate change impacts on flood events and magnitudes through generation of flood hazard map. It is to quantify the climate change impacts on extreme flood magnitude and extents, to evaluate vulnerability level of the river basins and to propose adaptation measures.

Flood hazard maps were generated based on four (4) scenarios which are baseline, baseline with future landuse, baseline with climate change (current landuse) for 2030 and 2050 and baseline with future landuse and climate change for 2030 and 2050. The simulation was carried out with design flood hydrograph of 10, 50 and 100-years of return period.

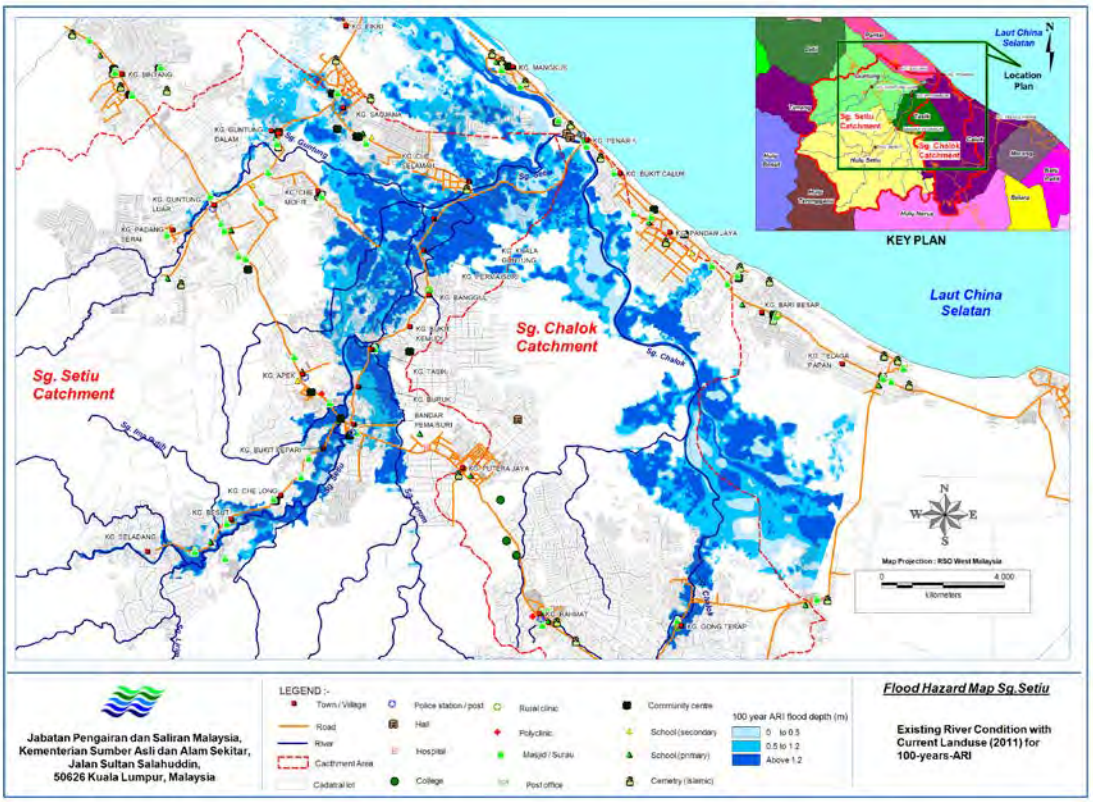


Figure 2.5.2: Flood hazard map of simulated 100-year return period of flood
Data source: Department of Water Resources Management and Hydrology of JPS (DID)

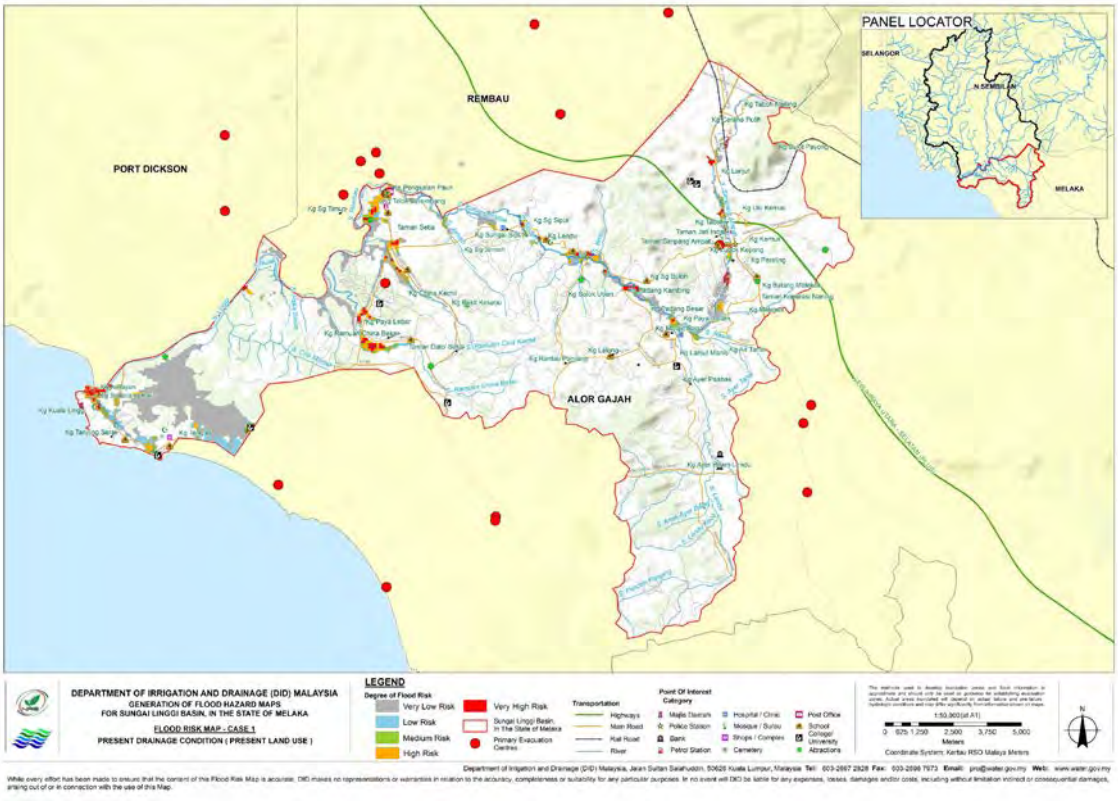


Figure 2.5.3: Flood risk map
Data source: Department of Water Resources Management and Hydrology of JPS (DID)

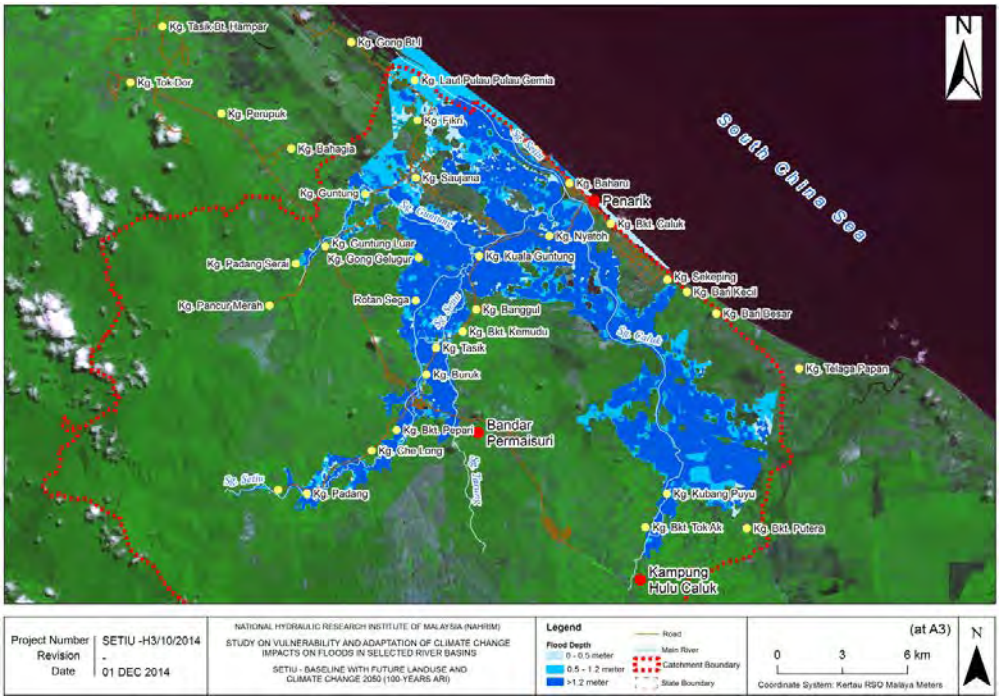


Figure 2.5.4: Flood hazard map Setiu River simulated 100-year return period of flood under climate change condition and future land use (2050)

Data Source: National Hydraulic Research Institute Malaysia (NAHRIM)

Landslide hazard maps and risk maps:

Landslide hazard and risk maps are prepared in some slopes identified as prone to landslide by the Department of Minerals and Geoscience.

(4) Risk map for drought

Malaysia is considered one of the least drought-prone countries among the ASEAN countries as indicated by the interactions with various government agencies and development partners in Malaysia. Drought prone areas in Malaysia are located in the northern region of peninsular Malaysia consisting of parts of Perlis, Kedah and Penang (Figure 2.5.5) and the northern parts of the Sabah region.

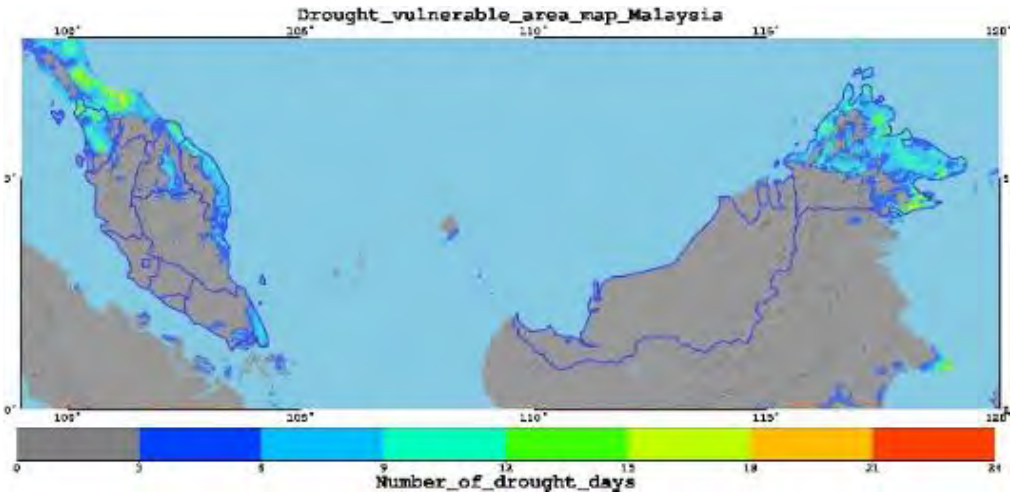


Figure 2.5.5: Drought-prone regions of Malaysia

Source: University of Tokyo, 2016

Malaysian Meteorological Department (MMD) uses the Standard Precipitation Index and rainfall anomalies to reflect the drought severity in Malaysia. Though limited in number, prolonged droughts had a serious implication for rice production in major granary areas such as Muda, Kada, Barat Laut Selangor, Kerian etc. During 1977-1992, there were six incidences of hydrological droughts which had resulted in inadequate water for irrigation and forced farmers to cancel transplanting of rice in Muda area. Droughts in 1992, 1998 and 2014 had received particular attention because their impacts were felt nationwide (Abdulah, Jusoh, & Kassim, 2014) [10]. Nearly 2.2 million people were affected by drought in 2014 (EM-DAT, 2016) [11]. Department of Irrigation and Drainage (DID) has initiated drought monitoring program since early 2001. Status reports of drought are updated on monthly basis through its information portal, INFOKEMARAU.[12]

Hydrological drought is a term use to define the deficiencies in surface flow into reservoir, stream flow and rainfall: a) Rainfall: if total rainfall deficit for at least 3 consecutive months above 35% from normal and the latest SPI index is less than -1.5, or the deficit for 6 consecutive months above 35% and latest SPI index is less than -1.5, MMD will issue for drought early warning to the responsible agencies. a) River Discharges: when the low flow exceeds 5-years Average Recurrence Interval (ARI) continuously for 3 months, a drought event is considered as occurring. On a daily basis, DID Malaysia reports the 7-day low flow for ARI of 2, 5 and 20 years for 23 stations throughout Peninsular Malaysia and upload the information via its website known as ***InfoKemarau.*** b) Dam Levels / Storage Dam: drought event would be considered when a dam levels falls below the normal level for 3 months continuously. DID Malaysia reports the water level in 23 dams and include useful information such as maximum water level, percentage of balance of storage, danger and critical level. This information may also be derived from the ***InfoKemarau.***

National Hydraulic Research Institute of Malaysia (NAHRIM) conducts research on vulnerability due to climate change impacts. NAHRIM has been participating in 'Big Data Analytics - Open Innovation Network (BDA-DGOIN)' project of Malaysian Administrative Modernization and Management Planning Unit (MAMPU). In this project, NAHRIM has developed 'Projected Hydro-climate Data Analysis & Visualization for Potential Drought & Flood Events in Peninsular Malaysia system'. This system has been developed under the supervision of the Information Management Division and Water Resources & Climate Change Research Centre of NAHRIM (NAHRIM, 2014) [13]. The system could examine large datasets (10 billion record) to uncover hidden pattern, unknown correlations and trends of climate change.

(5) National Risk Register (NRR)

Malaysia is in the process of producing a National Risk Register to register all the natural disasters the country is prone to and assessing the risks of all these disasters and emergencies Malaysia is facing for the next five years. The NRR will be a public resource for individuals and organisations wishing to understand the disaster risk, strengthening governance, investing in DRR and be more resilient and

[10] Abdulah, N., Jusoh, J., & Kassim, A. (2014). Country Report-Malaysia. Capacity Development to Support National Drought Management Policy. WMO, UNFCCD, FAO, CBD and UNW-DPC, 6-9th May, 2014, Hanoi.
[11] EM-DAT. (2016). The International Disaster Database. Brussels, Belgium: EM-DAT. Retrieved from http://www.emdat.be/
[12] http://infokemarau.water.gov.my/index.cfm
[13] NAHRIM. (2014, November 27). *RAINWATER HARVESTING SYSTEM*. Retrieved from National Hydraulic Research Institute of Malaysia (NAHRIM): http://www.nahrim.gov.my/en/products/59-sistem-penuaian-air-hujan/201-introduction.html#introduction

be better prepared. This initiative is in accordance to the four Priority for Actions under the Sendai Framework for DRR.

2.5.3 Planning and implementation

Guideline for planning and designing flood control facilities with climate change impacts is being prepared. Although there is no example of flood control facilities with climate change impacts, but there are several examples of flood control facilities without climate change impacts, which have potential of adding flood control capacity under climate change impacts.

(1) Flood and storm risk management

Followings are the conditions of guideline and standard of DRR and CCA integration as well as some examples related to flood risk management.

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

JPS (DID) is currently preparing a guideline for DRR and CCA integration for flood control, so that the proposed structural measures will be practical size for design and implementation with climate change.

NAHRIM has prepared Technical Guide No. 1 titled Estimation of Future Design Rainstorm under the Climate Change Scenario in Peninsular Malaysia published in January 2013. To date, NAHRIM is producing the revised Technical Guide No. 1 with 3 GCMs, 4 scenarios (A1Fi, A1B, A2 and B1) and 15 realisations.

2) Flood control and drainage project in the Pahang River downstream

A flood control and drainage project (under-construction by JPS (DID)) is located about 7km from the river mouth of the Pahang River in Pekan City, where habitual flood has been occurring every year especially during high tide. Design flood water level is the maximum water level in 2007, which is the maximum water level within these 50 years.

The Project constructs river dike with river wall (L=4.5km) for making polder system as well as gravity drainage from the inland area of the polder with reserving wetland inside the polder for retention. CCA is not included in this Project, but it is possible to raise the river wall in stage-wise manner.

River Dike and River Wall


Drainage Channel and Sluice Gate

Figure 2.5.6: Under-constructed flood control project in the downstream of the Pahang River

Source: Construction Office of the Projek Saliran Dalaman (Map) and JICA Project Team (Photos)

3) Segamat river flood control in the Muar River Basin

Muar River Basin including Segamat River (one of the tributaries) experienced floods in 2011 etc. 2011 Flood was the worst one with 100-year return period. In order to solve the flooding problem in Segamat Town, river improvement of the Segamat River, diversion channel to the Segamat River to the Gunuang River, and river improvements of the Gunuang and Chodan River are being implemented by JPS (DID) of Segamat District in Jahor State. CCA is not included, but stage-wise raising of the dikes etc. is possible However, bridges are difficult to be raised or extended.

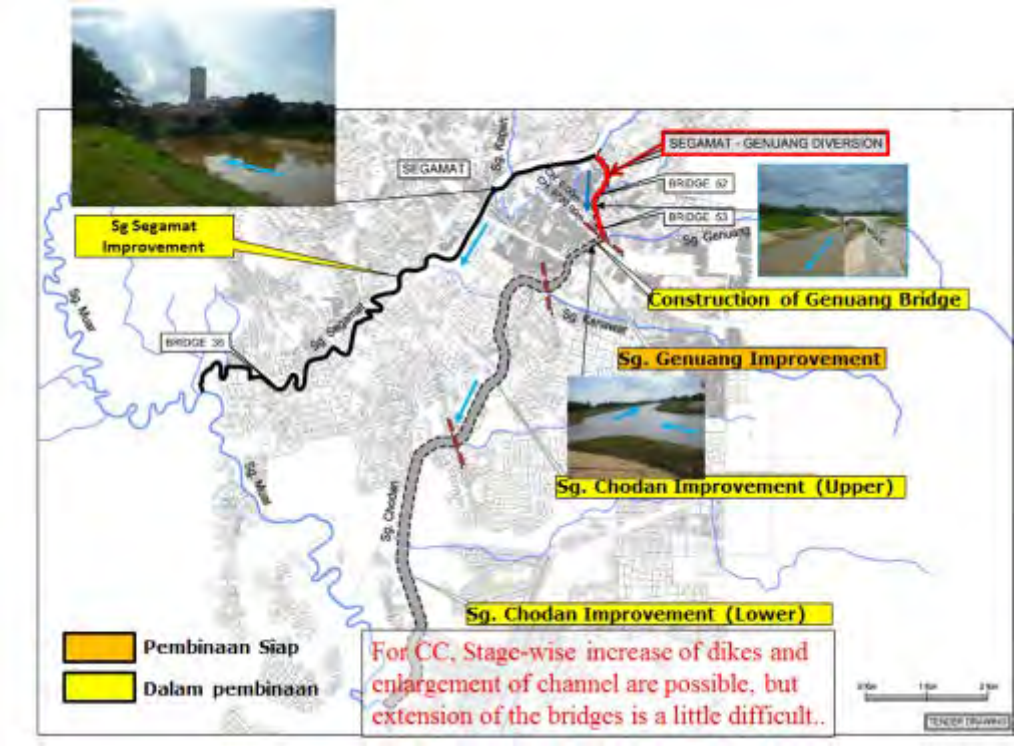


Figure 2.5.7: Under-construction of the flood control project in the Segamat River

Source: JPS Segamat District (Map) and JICA Project Team (Photos)

4) Smart Tunnel for the Kelang River in Kuala Lumpur

Smart Tunnel is one of the flood control facilities of the Integrated FRM system in the Kelang River to protect Kuala Lumpur (especially central area of KL). JPS (DID) has the responsibility of managing Smart Tunnel.

Smart Tunnel is a kind of floodway tunnel with retention ponds at the inlet and outlet of the Tunnel Floodway to minimize flood discharge from the Gombak River to the center of KL. Design discharge of 290m^3/s in the Gombak River is divided into 280m^3/s to Smart Tunnel and 10m^3/s to the downstream of the River. CCA is not included in this Project. However, retention capacities can be increased in some extent in case of increasing flood discharge by climate change impacts etc. SMART Tunnel is managed very well and functioning well. However, this facility is not common but special example for mitigating floods in Kuala Lumpur.

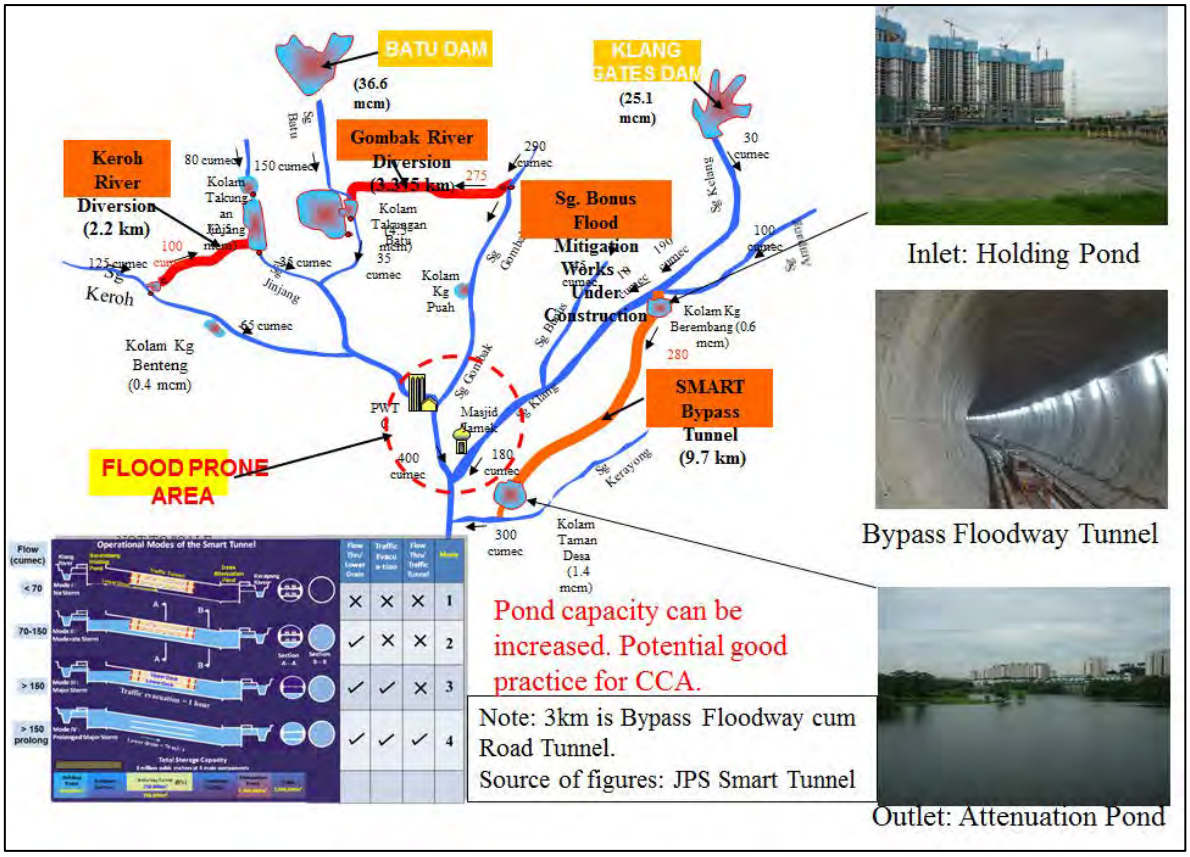


Figure 2.5.8: Smart Tunnel in the Kelang River Basin in Kuala Lumpur

Source: Smart Tunnel Management Office of JPS (DID) and JICA Project Team (Photos of the Ponds)

5) Other examples of flood control projects

a) Segget River Improvement Project in Johor Bahru: Improvement of the Seggat River in the center of Johor Bahru for mitigating inland floods as well as treatment of the river water including sewage for improving the river environment and amenity.

b) A retention pond in a new residential area in Johor Bahru for not increasing discharge to the downstream reaches of the river by the development of residential areas. The retention pond has room for increasing its storage capacity in case of increasing discharge by climate change.

(2) Landslide risk management

Landslide control measures are mainly provided for the slope along the national roads with landslide risk.

(3) Drought risk management

National Disaster Management Agency (NADMA) is the main agency for disasters including for droughts. Line ministries and their departments coordinate with NADMA at different levels. Disasters, including drought, are incorporated into individual ministries and their department's strategy/action plan. Relevant sector has their standard operating procedure (SOP) in an event of drought. Line agencies/ministries, such as Agriculture, Forestry, Palm Oil Board, Department of Irrigation and Drainage, Health etc., may carryout vulnerability assessment for drought.

The drought risk reduction initiatives in Malaysia have not received higher attention as compared to floods, landslides and other disasters which are more frequent. Interviews with government and other stakeholders revealed that the government has not seen drought, but increasing water stress, as a major issue impacting the country, and hence there is a low focus on drought risk reduction as such. Led by the National Security Council of the Prime Minster and involvement of line agencies, Standard Operating Procedure (SOP) for drought has been formulated based on past experience, notably nationwide droughts in 1992 and 1998 (Abdulah, Jusoh, and Kassim, 2014). The SOP provides guidelines on the classification of drought, the responsible agencies to monitor drought, line of communication and roles and responsibility of relevant agencies should the drought event be classified to reach danger level. The SOP was put into practice for the first time in 2014 drought.

2.5.4 Capacity buildings

Guideline and standard for incorporating impacts of climate change into the DRR plans as well as indication of possible CCA options are being prepared by the Department of Irrigation and Drainage (DID) such as a practical way to determine design values. This is one of the good practices of the activities towards DRR and CCA integration which could be shared as a lesson for other countries yet to develop such a guiding tool. Similarly, the National Hydraulic Research Institute of Malaysia (NAHRIM) could be engaged more to generate realistic climate predictions not only within Malaysia but also to support other countries such by providing trainings to other Member States on the use of NAHRIM Hydroclimate Data Analysis Accelerator (N-HYDAA). Malaysia could also learn about the CBDRM practices from Lao PDR as well as sea water prevention measures from Viet Nam.

Professional training program on DRR at MJIIT, Malaysia

Figure 2.5.9: Elements of professional training program on DRR being offered by MJIIT

Source: MJIIT, 2017

The Malaysia-Japan International Institute of Technology (MJIIT) of the Universiti Teknologi Malaysia (UTM) entrusted with the mission of promoting training and practice in the field of disaster resilience in collaboration with institutions in Japan and elsewhere has been implementing a short-term professional training program on disaster risk reduction where several of the NADMA officials have undergone training. The training program provides practical and technical training on matters of disaster risk reduction. It has been able to bring in international expertise including that of International Centre for Water Hazard (ICHARM), which has pioneered hydrological risk assessments with applications in flood risk reduction, in imparting capacities of DRM professionals. The regular interactions between MJIIT and NADMA helped MJIIT to tailor its training and capacity

building programs to the policy requirements of government professionals which put MJIIT in unique place among the DRM institutions in Malaysia and ASEAN region. Often, the MJIIT has been able to garner multi-institutional collaboration across the region bringing together the bi-lateral agencies such as JICA and national institutions such as Disaster Preparedness and Prevention Center (DPPC), Public Sector Engineers Special Interest Group (PSESIG), The Institution of Engineers Malaysia and Construction Research Institute of Malaysia (CREAM) that enriched the content and skill delivery in the professional training programs being offered.

2.6 Myanmar

2.6.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

In Myanmar, the Natural Disaster Management Law was enacted in 2013, and the Disaster Management Rules was prepared as the operating rule of the disaster management in 2015. The Law was developed to be in line with Hyogo Framework for Action (2005-2015) and to comply with the AADMER. The Law does not include the concept of CCA, and focuses on risk information, preparedness, awareness and early warning, and data management for early warning systems, together with the following objectives:

- to implement natural disaster management programmes systematically and expeditiously in order to reduce disaster risks;
- to form the National Committee and Local Bodies in order to implement natural disaster management programmes systematically and expeditiously;
- to coordinate with national and international government departments and organizations, social organizations, other non-government organizations or international organizations and regional organizations in carrying out natural disaster management activities;
- to conserve and restore the environment affected by natural disasters;
- to provide health, education, social and livelihood programmes in order to bring about better living conditions for victims.

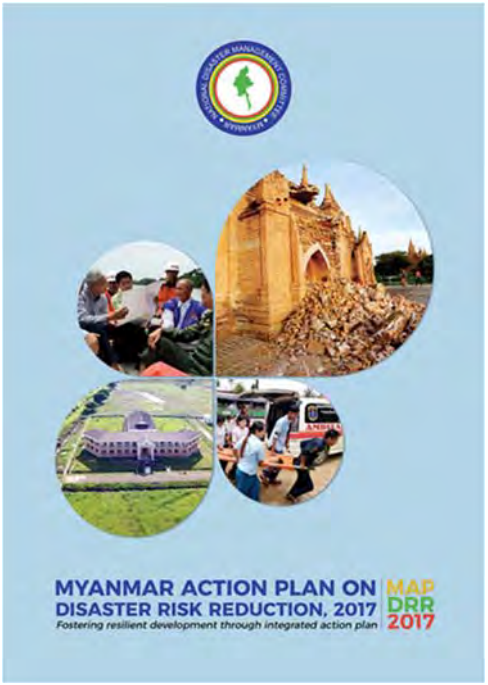
The Law enables the formation of the National Disaster Management Committee (NDMC) with its specified roles and duties.

The Environmental Conservation Law was enacted on 2012, and the major objective of the Law is to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process. Furthermore, the Law enables the formation of an Environment Conservation Committee and the establishment of an Environmental Management Fund for environmental conservation works. The Law also identifies several duties and powers of the MONREC, one of which is to create guidance related to mitigation and adaptation of climate change. In response to the Environmental Conservation Law, the Environmental Quality Guideline was developed in 2015, which was designed to monitor environmental conditions including climate change impacts.

The government of Myanmar formulated the environmental policy with seven strategic pillars of its 20-Year National Comprehensive Development Plan (2011-30). Under the Plan, the formulation of the national environmental policy associated with strategic policy frameworks and action plans needs to address a number of sector-wise environmental policies including climate change mitigation and adaptation policies up to 2030. These issues include biodiversity, water resources, terrestrial resources, marine and coastal resources, energy and electricity, climate change and DRR, air quality, land use and spatial planning, waste management, food

safety and consumer protection, and animal welfare. In the Plan, climate smart approaches to development, including resilience, risk management and climate change mitigation strategies, are aligned to environmental protection and natural resource management approaches in the pursuit of sustainable development.

In 2012, the Myanmar Action Plan on DRR (MAPDRR) was developed by the Government of Myanmar to address disaster risks. The MAPDRR is composed of 7 components, which are: i) policy and institutional arrangements; ii) hazard, vulnerability and risk assessment; iii) multi-hazard early warning systems; iv) preparedness and response programmes at national and regional levels; v) mainstreaming of DRR into development; vi) community-based disaster preparedness and risk reduction; and vii) public awareness, education and training.



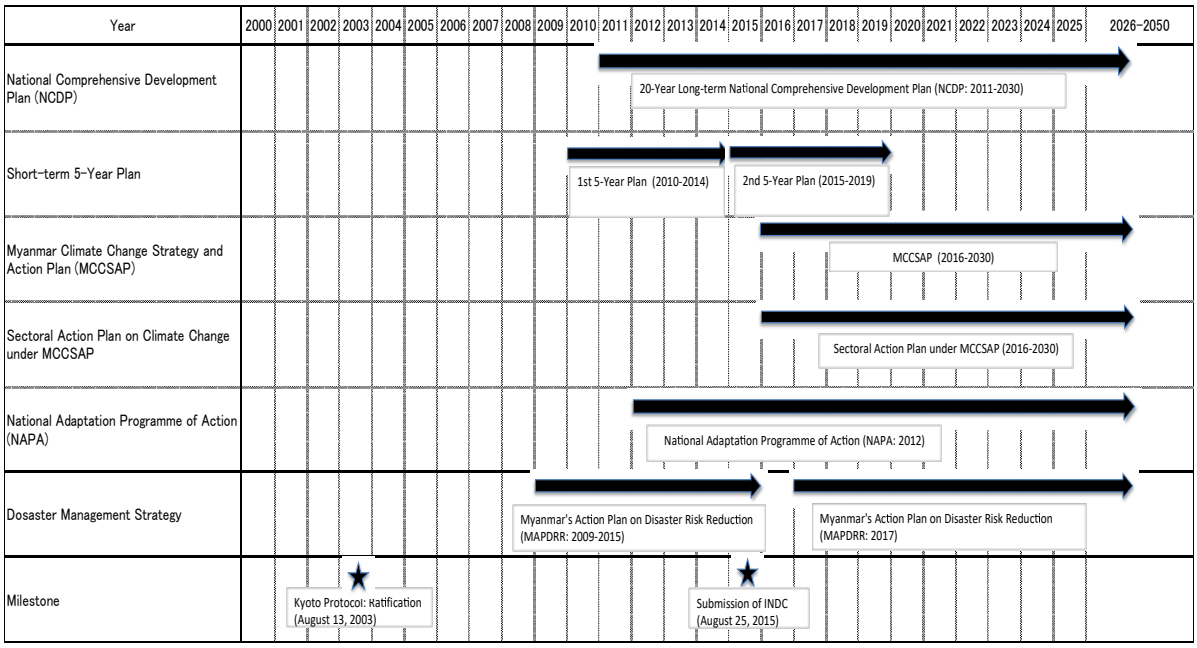
The Myanmar Action Plan on Disaster Risk Reduction (MAPDRR 2017) was launched on 9 October 2017. The MAPDRR 2017 has laid long-term vision for building resilience by 2030. There are a series of consultation with regards to identifying the regional and sectoral priorities, and the 32-priority actions are identified for the implementation over 2016-2020. The MAPDRR 2017 covers not only natural hazards but also man-made accidents focusing on managing risks rather than managing disasters.

It also addresses the emerging risk of small and recurrent disasters such as riverbank erosions, strong wind, lightning strikes and localized flooding. It fosters all of government and all of society engagement especially the active participation of private sector and academia in disaster risk reduction interventions. (The image of Myanmar Action Plan on Disaster Risk Reduction 2017 is shown on the left. The image is taken from https://themimu.info/sites/themimu.info/files/documents/Core_Doc_Myanmar_Action_Plan_on_Disaster_Risk_Reduction_2017.pdf.)

On the other hand, the Myanmar Climate Change Strategy and Action Plan (MCCSAP 2016-2030) outlines a vision and roadmap for Myanmar's strategic responses to address climate related risks and opportunities up to 2030, thereby identifying priority actions in key development sectors to build the adaptive capacity of communities and sectors. The MCCSAP aims at supporting key stakeholders in their decision making at the national and local levels to respond to the challenges and opportunities associated with climate change.

The timeframe for strategies and policies on climate change and disaster management of Myanmar is tabulated as below.

Table 2.6.1: Timeframe for Strategies and Policies on DRM and Climate Change (Myanmar)



The assessments on the current DRM and climate change institutional setting of Myanmar are summarized as below.

- Although the 20-Year National Comprehensive Development Plan (2011-30) as well as the Myanmar Climate Change Strategy and Action Plan (MCCSAP) refer to the importance of mainstreaming CCA in the sectoral development plans, there is no clear-cut indication of the integration of DRR and CCA in the these plans.
- Although there is a stand-alone comprehensive legal framework for DRM, the current legal framework is still diverse. On the other hand, the current legal framework on climate change is also diverse and scattered over a dozen of legal documents.

(2) Organisational Structure

The Ministry of Social Welfare, Relief and Resettlement (MSWRR) is the central government ministry for natural disaster matters. One of the key disaster management responsibilities of the MSWRR is to resettle and rehabilitate disaster victims. The MSWRR is comprised of two departments: the Relief and Resettlement Department (RRD) and Department of Social Welfare. The RRD was established with the objectives to provide emergency assistance for the victims of natural disasters for ensuring immediate relief and to conduct preventive measures to reduce the loss of lives and properties due to disasters.

In order to deal with natural disasters occurring at any time in the country, for systematic measures for disaster prevention, for speedy and effective responses to disaster, National Disaster Management Committee, led by Vice President-2, has been formed in accordance with Chapter (3), Article (4), sub-article (A) of Disaster Management Law.

Duties and Power of NDMC are;

a) To set up required organizations in order to implement the activities of the Committee; to provide policies according to the priority of step by step activities; to review the progress of the work of the Committee and give instructions as necessary;

b) To provide guidance in order to use domestic resources as necessary in the face of natural disasters;
c) To adopt basic principles on coordination for activities which are necessary to receive assistance from outside;
d) To manage national finance and national resources and then to distribute them required places;
e) If necessary, to issue orders and instructions in order to carry out natural disaster management functions without hindrances, avoid the misuse of rescue materials and prevail laws and orders and peace in the community during and after the natural disasters.

12 working committees have also been formed under the respective leadership of Ministers concerns for effective implementation of National Committee's policy and guidance. The working committees are:

(a) Working committee for National Disaster Management
(b) Working Committee for International Relations
(c) Working Committee for funds management
(d) Working Committee for Search and Rescue
(e) Working Committee for Security
(f) Working Committee for Transport and Communication
(g) Working Committee for Media and Information
(h) Working Committee for Rehabilitation and Resettlement
(i) Working Committee for Health Care Management
(j) Working Committee for Initial Need Assessment, Losses and Needs Identification
(k) Working Committee for Livelihoods Restoration
(l) Working Committee for Environmental Conservation

The disaster management activities of those (12) working committees include disaster risk reduction activities, emergency responses activities and rehabilitation and resettlement activities after disasters. Responsibilities are divided and shared in line with relevant Ministries for effective implementation. Working committees are operating respective tasks under the management of National Committee.

Moreover, The State/Region Working Committees and District, Townships, Wards/Village Tracts Working Committees for Disaster Prevention are also organized.

In order to become resilient community through widespread dissemination of disaster risk reduction related knowledge, MSWRR arranges disaster related educative talks in community, community-based drills and simulation exercise, opening of disaster management trainings, distribution of pamphlets and posters, broadcasting of video clips and animation movies reflecting real events happening in the community due to lack of awareness. In addition, basic disaster management trainings, specialized trainings for disaster risk management and training for master trainers are being opened continuously at Disaster Management Training Center at Hinthada, Ayeyarwady Region, not only for the government officials but also for the members of community-based organizations and individuals who are interesting in Disaster Risk Management.

International and national website for weather information are monitored and analyzed in Emergency Operation Centre (EOC) of MSWRR and Disaster alert and notifications are released

in normal time. During emergency, chair and members of NDMC gather at EOC in order to manage the situation properly.

The Environment Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC) is the focal point for climate change and deals with climate change issues at international level including negotiations and reporting to UNFCCC. It is also responsible for translating global level decisions at national level implementation, which includes endorsement of projects for support under different climate change funds such as Least Developed Countries Fund (LDCF), Green Climate Fund (GCF), Global Environment Facility (GEF), Trust Fund, Special Climate Change Fund (SCCF), and Adaptation Fund (AF) under Kyoto Protocol. The ECD is also responsible for linking to other ministries and departments for addressing climate change.

The establishment of Technical Working Group (TWG) of the Myanmar Climate Change Alliance (MCCA) has significantly increased the participation of several sectoral stakeholders, and the inter-ministerial coordination in addressing climate change. The ECD plays an important coordination role as CCAs, and effectively uses the TWG of the MCCA to this end.

Meanwhile, in 2016, the Government of Myanmar has established a high-level National Environmental Conservation and Climate Change Committee chaired by the Vice President together with 6 Sub-committees. One of them is the Climate Change Mitigation and Adaptation Sub-committee, and the ECD acts as its secretariat.

The assessments on the current DRM and climate change organisational arrangement of Myanmar are summarised as below.

- The Myanmar Climate Change Alliance (MCCA) was launched in 2013 with the support of the Global Climate Change Alliance (GCCA). The MCCA works as a platform to mainstream climate change into the Myanmar policy development and reform agenda, but it also supports all on-going actions and activities on climate change. Under this umbrella organisation, the sector-wise climate change adaptation of major line ministries have been well prepared, thereby mainstreaming CCA into development plans of line ministries.
- The Relief and Resettlement Department (RRD) of the MSWRR should be institutionally strengthened in terms of staff and budget, since the current human resources and financial resources are not sufficient to meet the requirements of the functions as a focal point.
- Although the local-level disaster preparedness committees as well as some community based disaster risk reduction programmes are functioning, the vertical coordination of the nation-wide 5-layer administrative levels is relatively weak in light of:

    - collecting, sharing and feedback the information on disaster management;
    - preparing and updating a disaster preparedness plan;
    - implementing risk identification and assessment;
    - carrying out a rapid damage assessment after disasters;
    - applying standard operation procedures;
    - mobilising financial resources; and
    - monitoring and evaluation on implementing disaster management activities.

- Horizontal coordination between a DRM focal point and line ministries is relatively insufficient.

- Opportunities for training and knowledge sharing on mainstreaming and integration of DRM and climate change at all local levels are not sufficient.

(3) Funding Structure

The financial sources for the prevention and mitigation of disasters to be mobilized are scattered among line ministries. Meanwhile, the Myanmar Humanitarian Fund (MHF) is an OCHA-managed funding mechanism to provide an emergency response and timely assistance to urgent needs of people affected by natural disasters. Prior to 2015, the MHF was known as the Myanmar Emergency Response Fund (MERF). The MHF allocations are made to ensure a rapid response to sudden-onset emergencies or to rapidly deteriorating conditions in an existing emergency and to support humanitarian response activities within an underfunded emergency.

Available international funding source for climate change adaptation is the Adaptation Fund. USD 7.29 million project "Addressing Climate Change Risks in Water Resources and Food Security in the Dry Zone of Myanmar", is the only project under the Adaptation Fund. The project seeks to minimize the increasing impacts of climate change on agricultural and livestock production cycles in the Myanmar Dry Zone.

The list of the funding sources for the CCA projects funded by the international funding sources is tabulated as below.

Table 2.6.2: List of Funding Sources for Climate Change Adaptation Project (Myanmar)

Project Name	Funding Source	Duration
Adapting Community Forestry Landscapes and Associated Community Livelihoods to a Changing Climate, in Particular an Increase in the Frequency and Intensity of Extreme Weather Events	Least Developed Countries Fund/GEF	On-going
FishAdapt: Strengthening the adaptive capacity and resilience of fisheries and aquaculture-dependent livelihoods in Myanmar	GEF	2017-2021
Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar	The Adaptation Fund	2015-2019
Ridge to Reef: Integrated Protected Area Land and Seascape Management in Thanintharyi	GEF	72 months Approved in 2015
Building Climate Resilience of Urban Systems through Ecosystem-based Adaptation (EbA) in the Asia-Pacific Region	Least Developed Countries Fund/GEF	Approved in 2014
Building Resilience of Health Systems in Asian LDCs to Climate Change	Least Developed Countries Fund/GEF	42 months Approved in 2016

Source: Asia Pacific Adaptation Network 2016

The assessments on the current funding system for DRM and climate change of Myanmar are summarised as below.

- Although there is UN-supported Myanmar Humanitarian Fund (MHF) for funding the post-disaster assistance, the Fund is not fully utilized.
- Although the international Adaptation Fund is available, Myanmar utilized the Adaptation Fund only for the project "Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar", and the access to the Adaptation Fund is not satisfactory.
- There is no built-in funding system that represent pre-disaster or stand-by funds for local government units.

- There is no demand-driven fund to provide a long-term finance scheme for effectively addressing climate change.
- The budget management through the CCET in the integrated manner has not yet been introduced, which will significantly contribute to the potential integration of DRR and CCA, if introduced in future.

(4) River Basin, River and Forest Management Systems

There is a direction of River Basin Management (RBM), but integrated management covering the mainstream basins of the major river basins and tributary river basins has not been realized yet and in the process of development.

The Directorate of Water Resources and Improvement of River System (DWIR) under the Ministry of Transportation and Communications (MOTC) is the implementing agency of the Ayeyarwady Integrated River Basin Management (AIRBM) Project funded by the World Bank and has key responsibilities related to the major rivers and river basin management.

AIRBM project is implementing by the cooperation of DWIR and Deportment of Meteorology and hydrology (DMH) under MOTC. Decision Support System / Basin Master plan, Hydro-informatics center (HIC) and System Integrator (SI) are included in the AIRBM project. It is noted that the SI is the supporting system for modernization of DMH system including detailed design and implementation. In the future, under the management of National Water Resource Committee (NWRC), HIC can support the improvement of River Basin Management Plan and Data System.

The Irrigation and Water Utilization Management Department (IWUMD) under the Ministry of Agriculture, Livestock and Irrigation (MOALI) has responsibility of managing water use in the tributary river basins of the major rivers as well as medium to small size river basins. The IWUMD is constructing and managing the irrigation systems including irrigation canals with related facilities such as weirs, navigation locks and sluice gates, irrigation dams and multipurpose dams including flood control function. The IWUMD is also responsible for flood risk management in the tributary river basin including construction of dikes and improvements of the channels of the rivers and canals. Also, in case of flooding along the major rivers, The IWUMD constructs flood control structures such as dikes along the rivers.

Based on the River Conservation Law in 2006, The DWIR has the responsibility of managing water resources of the major rivers such as Ayeyarwady, Chindwin River, Sittaung River etc. This is mainly focused on maintenance of navigation system along the major rivers. Relating to this, The DWIR is also doing dredging of navigation course, cutting bending portions and bank protection against erosion, monitoring water level (by DMH), water quality and sediment deposition and erosion in the river courses. However, management of the river courses including the easement zones along the river from upstream to downstream is not conducted, which is necessary to be included in the river management.

If any river structures are constructed along the major rivers, tributaries as well as other medium to small size of the rivers, approval or agreement from the DWIR is necessary.

In terms of management in the river basin area against floods, storm including storm surge, landslide and drought, land use management and forest management are important. The Forest Department under the Ministry of Resources and Environmental Conservation (MONREC) is responsible for forest management including conservation of forest and reforestation for upland forest and mangrove forest in the coastal areas. Mangrove forest is effective for mitigating storm surge.

2.6.2 Risk assessment

There are stored disaster data, but disaster database has not been developed yet. Downscaling from GCMs has been done by some international research institute etc. Flood hazard maps have been prepared in some areas in the country. There are no flood hazard maps with climate change impacts. Landslide hazard maps have not been prepared yet.

(1) Disaster database

Relief and Resettlement Department (RRD) of the Ministry of Social Welfare, Relief and Resettlement keeps disaster damage and loss records including damage data, but database of disaster damage has been developed and publicised in web-based system and can be accessed at http://www.mdld-rrd.gov.mm.

(2) Meteorological data management and downscaling from global climate models

Meteorological observation system:

Department of Meteorology and Hydrology (DMH) of the Ministry of Transportation and Communications (MTC) is conducting meteorological observation mainly at townships and conducting weather forecast. DMH is measuring water level along the major rivers such as Ayeyarwady, Chindwin, Sittaung, Thanlwin and Bago Rivers and forecasting flood water levels. DMH is now developing weather observation and forecasting systems by using s-band radar rain stations in Rakine State,Yangon and Mandaley supported by the Government of Japan. There are other projects for upgrading meteorological gauging stations supported by India. Some of the meteorological stations may have data up to 50 years or so.

Meteorological observation stations are mainly located in townships and not enough in upstream of river catchment areas.

Downscaling from GCM:

There is no governmental agency conducting downscaling from Global Climate Models (GCMs).

Future changes of temperature and precipitation have been estimated for Myanmar using a number of global and regional climate models. For the purpose of NAPA (National Adaptation Programme of Action), the predictions from the model 'Providing Regional Climates for Impacts Studies' (PRECIS) are reported. The model was conducted using 20 km x 20 km resolution, and operated by the South East Asia System Analysis Research and Training Regional Centre (SEA START RC) using A2 emissions scenario. The baseline information uses modelled data for the period 1971-2000. The model used data collected at seven stations, assumed to be representative of seven physiographic regions in Myanmar.

(3) Hazard and risk maps for flood, storm and landslide

Flood hazard maps and risk maps:

DMH is preparing hazard maps and risk maps for storm, floods and drought. DMH developed some hazard maps along the Ayeyarwady, Chindwin and Thanlwin Rivers and some cities including Yangon, Mandalay, Mawlamying. For developing these hazard maps, some satellite images are supported by JAXA, ADB and own capacity. These are on clear hazard maps for flood. However, there are no flood hazard maps with climate change impacts.

Landslide hazard maps and risk maps:

There are no hazard maps and risk maps of landslide.

(4) Risk map for drought

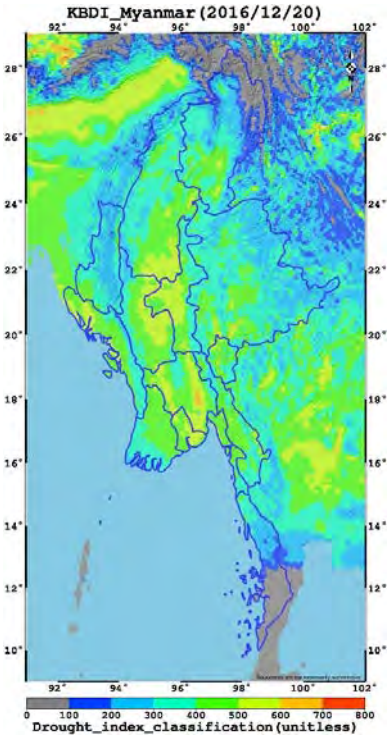


Figure 2.6.1: Drought index of Myanmar

Source: University of Tokyo, 2016

Myanmar is prone to drought and the main problem in Myanmar is intersessional variability leading to drought. The dry zone in the central part of the Myanmar is a semi-arid region due to agro-climatic conditions, it receives 400-700 mm rainfall or less and has been classified as dry zone based on long-term climatic information and rest of the country has better rainfall conditions.[14] The issue of less rainfall leading to inter-seasonal variability and dry spells is aggravated during the El Nino years and is having significant impact on water resources and the livelihoods dependent on the natural resources. The central dry zone (CDZ) is located at the centre of Myanmar and is characterized by high temperatures and erratic rainfall due to being located in the rain shadow area of the Arakan mountain range in the west of the country.[15]

Myanmar Action Plan for DRR includes the component of multi-hazard early warning system. The flood map is also being developed as an activity under the MAP DRR; however, the government is yet to move to multi-hazard early warning systems due to lack of technical capacity and the efforts to develop a drought early warning system are yet to be initiated. However, The University of Tokyo has developed a satellite-based drought monitoring and early warning system (DMEWS) for Asian Pacific counties using freely available data, and to develop capacity of policy makers in those countries to apply the developed system in policy making (See Figure 2.6.1) (University of Tokyo, 2016).[16] The tool uses the Keetch-Byram Drought Index (KBDI) which is an index used to determining forest fire potential of droughts which is calculated based on the daily water balance, where a drought factor is balanced with precipitation and soil moisture.[17] Our interviews indicated limited understanding on its existence at the government level and hence its use in Myanmar couldn't be verified.

The Regional Drought Mechanism by UNESCAP enhances the capacity of governments to use space-based data for effective drought monitoring and early warning.[18] More details on this can be found at Box 1 "Condition of drought in ASEAN" under the Section 2.11.

2.6.3 Planning and implementation

Concrete guideline for DRR with CCA has not been prepared yet. There are several structural measures against floods and storm surge without climate change impacts, which will be also effective with climate change. Countermeasures against landslides without climate change are only provided for some portions with landslides problems along the roads.

[14] http://www.ais.unwater.org/ais/pluginfile.php/597/mod_page/content/79/Myanmar_2.pdf
[15] http://bytelife.altervista.org/monsoon.htm
[16] http://wtlab.iis.u-tokyo.ac.jp/DMEWS/Myanmar/
[17] http://twc.tamu.edu/kbdi
[18] https://www.unescap.org/news/un-initiative-strengthens-drought-monitoring-and-early-warning-asia-pacific

(1) Flood and storm risk management

Followings are the conditions of guideline and standard of DRR and CCA integration as well as some examples of countermeasures related to flood risk management.

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

Climate change impacts are considered in the plans such as Myanmar's National Adaptation Programme of Action (NAPA) to Climate Change (2012) and Myanmar Climate Change Strategy and Action Plan (MCCSAP) 2016-2030, but no concrete guideline or standard of DRR incorporating CCA is formulated.

2) Cyclone shelter and reforestation of mangrove in Ayeyarwady River Delta

Cyclones usually cause damage in the western coastal areas in Rakine State, but Cyclone Nargis in May 2008 caused tremendous damage in Ayeyarwady Delta Area including about 140,000 dead persons.

For the Ayeyarwady Delta, strengthening of Preparedness by forecasting and warning cyclones is being conducted by the assistance of JICA. In addition, for evacuation, cyclone shelters have been constructed in the Delta area by Myanmar Government and by the assistance of several international agencies including JICA. Furthermore, in order to recover mangrove forest in the delta area, forestation/reforestation and management of mangrove has been conducted. This will be also effective to mitigate damage by storm surge under present and with climate change.

Moreover, cyclone shelters have been constructed in natural disaster affected areas, which are Rakhine State, Yangon Region, Bago Region, Kayin State and Tanintharyi Region by the Myanmar Government with the assistance of several international agencies.

Although there are various points to be improved for the cyclone shelters such as management system including maintenance, locations and access, capacity and strength of the structures against wind and storm surge, the cyclone shelters are very important to reduce damage by storm surge. Early warning system should also be prepared and designed together with the evacuation plan to the shelter. (Note: Based on the information from the "Cyclone Shelter Assessment", UN-HABITAT and Norwegian Ministry of Foreign Affairs).

The above measures are mainly for the conditions without climate change, but they will be also effective for the conditions with climate change.

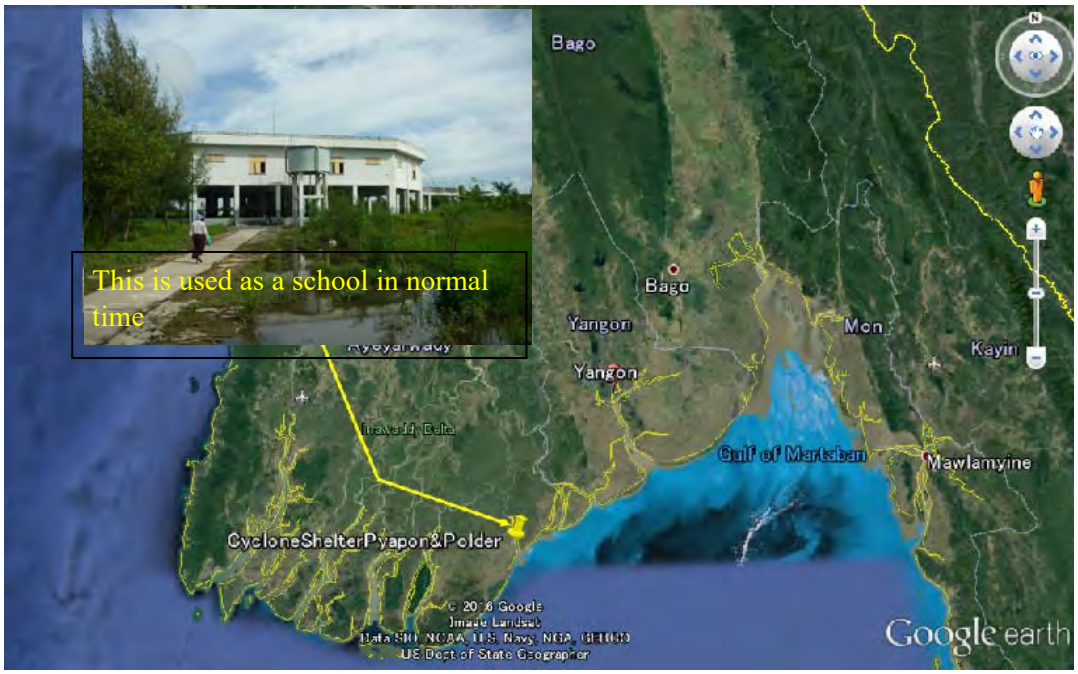


Figure 2.6.2: One of the cyclone shelters in Ayeyarwady Delta in Myanmar

Source: Map and photo by JICA Project Team

3) Bago-Sittaung Canal

In the Bago River Basin, based on the integrated plans for navigation, irrigation and flood mitigation, which was formulated about 140 years ago (in the middle of 1870s), various water use cum flood control facilities such as Bago-Sittaung Canal, navigation locks, irrigation and drainage canals with sluice gates, and Moe Yin Gyi storage cum retarding basin were constructed. Although these structures were planned and designed without consideration of the impacts by climate change, these structures have been affected by climate change in these 140 years and still functioning with renovation in 2014, which includes rehabilitation of the dikes and dredging along the Bago-Sittaung Canal etc. These facilities have experienced climate change in these 140 years and still functioning.

However, even though there are four flood control dams (Salu Dam, Shwe Laung Dam, Kodukwe Dam and Zaung Tu Dam), which were newly constructed in the upstream catchment of the Bago River Basins, there are still flood problems in Bago City as well as the low-lying areas. The floods in the low-lying areas are also affected by the floods from the Sittaung River.

Figure 2.6.3: Bago river flood control and navigation channel system
Source: IWUMD (Irrigation and Water Utilization Management Department: map)
and JICA Project Team (photos)

(2) Landslide risk management

Landslide is problematic in the mountainous areas. There is no clear responsible agency for landslide risk management. Ministry of Construction (MOC) is conducting some recovery and rehabilitation along the roads, where landslide disasters occur.

(3) Drought risk management

Myanmar has made initial progress in DRR planning at the national level and the national disaster response mechanism was developed with the support of ADB. In terms of institutional setting for addressing the drought risk reduction concerns, the country took an integrated approach where the drought aspects are combined with the rest of the hazard mechanisms at the national level represented by a Central Committee chaired by the Vice Prime Minister and RRD is the main focal agency. It is focused on recovery, preparedness etc. while the regional committees and township committees were formed integrating DMH, IWUMD etc. Although the national committee looks disaster risk reduction in an integrated fashion, specific elements of drought risk reduction are assigned to the concerned ministries, such as the Ministry of Agriculture, Livestock and Irrigation deals with drought impacts and related risk reduction activities in agriculture and associated water resources management[19], and the Ministry of Social Welfare, Relief and Resettlement addresses the social aspects of the drought risk reduction.

So far, Myanmar has DRR plans only at the township level. At the village level, the village development committee members (village representatives) are nominated by the government and the process is participated by the village representatives. Water management is a crucial aspect in the drought risk reduction and a very little progress has been made in this area. The water management is done through regional level water management committees comprising of irrigation, agriculture, statistical departments, general admin dept. of township and this committee decides when and to what crops to release the water. Though there are water user groups unofficially, they are not established

[19] For example, the Department of Fisheries under the Ministry of Agriculture, Livestock and Irrigation supports fish farmers whose fish ponds were damaged by flooding and drought. After heavy rainfall, the Department of Fisheries provided a total of 27 million fish seeds for 28,000 acres of fish ponds in Yangon, Bago, Ayeyarwady and Sagaing Regions in 2015-2016 and another 6 million fish seeds for 19,000 acres of fish ponds in Yangon, Bago, Ayeyarwady and Magway Regions in 2016-2017.

under every pump. There is a Water Resources Committee in Myanmar and related departments and ministries are part of this committee. At the village level, the village irrigation committees usually take care of the village level ponds. If the tanks have command more than 5000 acres, then the national level IWUMD takes care of them.

In terms of government programs, some of the sector ministries are bringing new crop varieties to deal with the dry zone problems such as legumes etc. The Government of Myanmar has established a dry-zone greening department based in Mandalay within the Ministry of Natural Resources and Environmental Conservation and it promoted several afforestation projects. The government agencies are looking at the dry zone in terms of water resource management, agriculture with typical sectoral approach and very few are looking at the DRR point of view. Livelihoods and Food Security Trust Fund has programs looking at the issues of the dry zone for the last ten years since cyclone Nargis with broad based interventions focused on risk reduction.[20]

Efforts are being made to customize the climate outlook for geographical areas (three states and regions). Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) is working with DMH in developing agro-meteorological bulletin on a shorter timescale (3-5 days) as an Artificial Intelligence system where the user gives input and the system provides an outlook (SESAME, Specialized Expert System for Agro-Meteorological Early Warning) developed by RIMES and UNESCAP, DMH and MOALI and piloted in two townships (Please see the best practices section of this report).

UNDP is working in dry zone in an adaptation project and one of the first Adaptation Fund project in Myanmar.[21] Enhancing the climate information services, working with government, direct execution by UNDP and looks into water resources and food security and looks at water resource management, agriculture practices, livestock, post-harvest, afforestation, connecting to CBDRM and strengthening the climate information services. RIMES will look into past climate trends in collaboration with DMH. The project will develop a multi-hazard map which can be used for policy purposes. It also intends to look into climate change projections available, IPCC Fifth Assessment Report, etc.

2.6.4 Capacity building

Climate change impacts are yet to be fully incorporated into ministerial level disaster planning. As a disaster-prone country, Myanmar could consider modernising their hydro-meteorological information system such as through installation of automatic weather stations. Improvement in monitoring, analysis and dissemination of hydro-meteorological data could be considered along with capacity building on climate downscaling and analysis of long term climatic data for preparation of hazards and risk maps with climate impacts. Dissemination of information could be further improved beyond regular forecasting to accommodate demand-based information sharing at various levels. A stage-wise approach of DRR and CCA integration could be a practical way to introduce and upscale relevant good practices such as harvesting of rainfall and excess runoff for its uses latter in the dry periods, dam regulation, gates to control storm surge, water efficiency measures, watershed conservation and rational use of groundwater.

[20] http://www.lift-fund.org/project-database
[21] http://adaptation-undp.org/resources/pifs/myanmar-af-project-proposal

2.7 The Philippines

2.7.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

In July 2009, the Government of the Philippines enacted the Republic Act (RA) No.10121, titled the Philippine DRR and Management Act of 2010. The RA 10121 is legally designed to strengthen the DRR and management system, to provide for the national DRR and management framework, and to institutionalise the national DRR and management plan.

The RA 10121 also provides the legal framework to decentralize the responsibilities and authority for implementing DRR measures to the local governments. It mandates LUGs to set aside 5 percent of the estimated revenue as the Local DRR and Management Fund (LDRRMF) to support disaster risk management activities such as preparedness programmes including training and purchase of rescue equipment, but also for response activities.

According to the Republic Act No. 8185, the amendment to the Local Government Code, the Local DRR and Management Fund (LDRRMF) can only be used in areas affected by disasters. The implementing rules of RA No. 8185 also stipulates that the fund may be used to provide financial assistance to other LGUs.

Climate Change Act of 2009 (Republic Act 9729) was enacted into law in 2009 and provided the legal basis for the creation of the Climate Change Commission, which serves as the policy-making body of the government tasked to coordinate and evaluate action plans addressing climate change. The Act seeks to mainstream climate change in various phases of policy formulation and implementation by all units of the Government. Section 14 of the Act recognizes that LGUs are the frontline agencies in the planning and implementation of Local Climate Change Action Plans (LCCAP) in their respective areas.

The Department of Budget and Management (DBM) issued Local Budget Memorandum (LBM) No. 68 which asks LGUs to submit, together with the General Annual Budget, their respective Local DRR Management Plans (DRRMPs) and Local Climate Change Action Plans (LCCAPs) and encourages LGUs to identify, prioritize, and tag and track all climate change expenditures to help ensure transparency and increase effectiveness of climate change expenditures.

The People's Survival Fund (PSF) was established pursuant to Section 18 of Republic Act No. 9729 (Climate Change Act of 2009), as amended by Republic Act No. 10174. The Act created the PSF to provide a long-term finance scheme for effectively addressing climate change.

The Climate Change Commission (CCC) is currently trying to further remedy RA 10174 by targeting 100 per cent compliance by 2017. At present, only 9 per cent of 1,700 local LGUs have local climate change action plans, although each LGU should have a local climate change action plan (LCCAP) as mandated by the Climate Change Act of 2009.

The National Economic and Development Authority (NEDA) of the Philippines formulated the Philippine Development Plan (PDP) 2017-2022. The PDP 2017-2022 is the first medium-term development plan that is anchored on a long-term vision. It is the first of the four six-year plans that aim to realise AmBisyon Natin 2040, the 25-year vision for the country. The PDP 2017-2022 has identified DRR and CCA as main crosscutting concerns. This can be mainly found in Chapter 11 on Reducing Vulnerability of Individuals and Families. The plan envisages rolling out climate and disaster vulnerability and risk assessment nationwide. (The image of the

Philippine Development Plan 2017-2022 is shown on the left. The image is taken from http://www.neda.gov.ph/2017/07/26/philippine-development-plan-2017-2022/.)

DRR and CCA have been integrated into a wide range of different sectors and sub-sectors using various strategies in order to address climate change vulnerabilities and contribute to the reduction of disaster risks. Part 6 (Foundations for Inclusive and Sustainable Development) of the PDP includes chapters related to DRR and CCA covering strategy framework on foundation for inclusive growth, a high-trust society and a globally competitive knowledge economy created with subsector strategies such as incorporation of disaster resilience measures, ensuring security of infrastructure facilities, framework on ecological integrity, clean and healthy environment, mitigation and preparedness at the local level, strengthening implementation of response, recovery and rehabilitation efforts and strengthening monitoring and evaluation of effectiveness of DRR and CCA actions.

The Philippine Strategic National Action Plan for DRR 2009-2019 (SNAP) is a road map to achieve the vision and strategic objectives for DRR in the ten-year time period, indicating the vision and strategic objectives of the Philippines. The 2011-2028 NDRRMP highlights the importance of mainstreaming DRR and CCA particularly in the areas of environment, agriculture, water, energy, health, education, poverty reduction, land-use, urban planning, public infrastructure and housing. The NDRRMP also outlines activities aimed at strengthening the capacity of the national government and the LGUs to build the disaster resilience of communities and to institutionalise arrangements for reducing disaster risks at all levels.

The development of National Strategic Framework on Climate Change (NSFCC) and the National Climate Change Action Plan (NCCAP) serves as a guidance for the Philippine's actions and initiatives for climate change. The NCCAP outlines the agenda for CCA and mitigation for 2011 to 2038.

Consistent with the Environmental Management Bureau's project-level efforts to integrate DRR and CCA into development projects as well as the associated environment impact assessments in the Philippines, the Environment Management Bureau (EMB) of DENR issued EMB's Memorandum Circular No. 2011-005 on November 11, 2011 regarding "Incorporating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) concerns in the Philippine EIS System" together with "EIA Technical Guidelines Incorporating DRR and CCA".

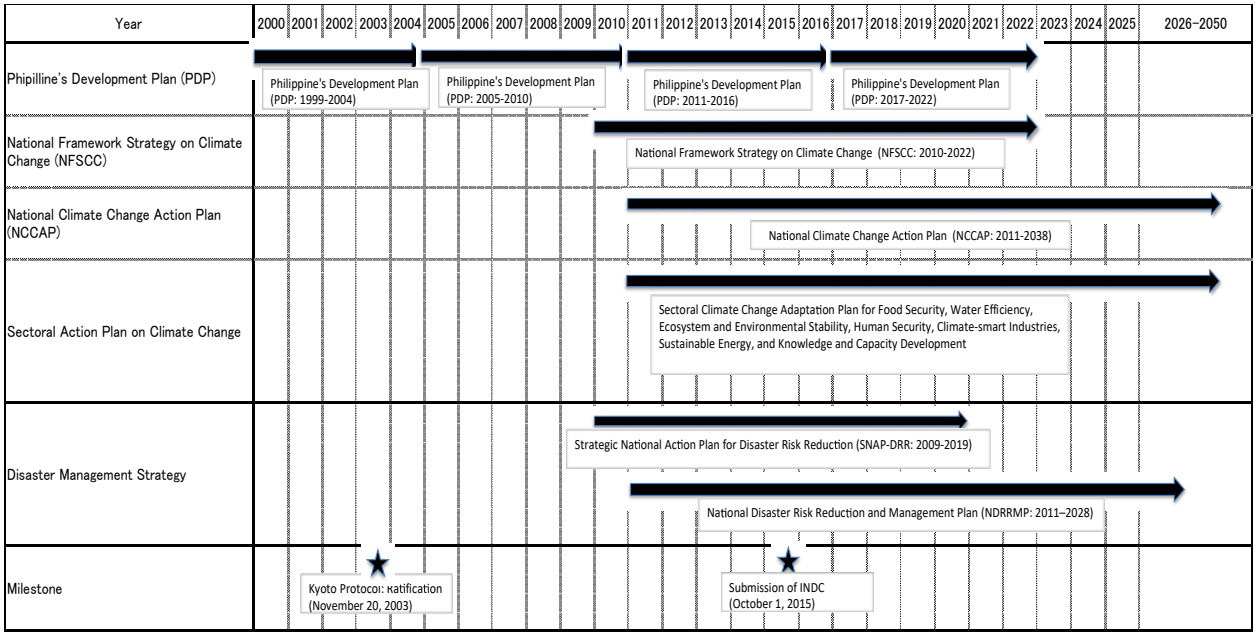
The said EIA Technical Guidelines is intended to promote climate change adaptation and disaster risk reduction at the project level as well as to streamline EIA requirements under the Philippine Environmental Impact Assessment System. The Guidelines have the following objectives:

- To provide enhanced standards for the preparation of EIA reports that are customized for specific industry types as required under the PEISS; and

- To provide guidance for project proponents in integrating DRR and CCA concerns in the project planning stage through the EIA Process in order to facilitate review and implementation of projects by incorporating international best practices.

The timeframe for strategies and policies on climate change and disaster management of the Philippines is tabulated as below.

Table 2.7.1 Timeframe for Strategies and Policies on DRM and Climate Change (The Philippines)



The assessments on the current DRM and climate change institutional setting of the Philippines are summarised as below.

- Although the legal framework for DRM (Republic Act No. 9729) is separate from that for climate change (Republic Act No. 10121), there is a strong relationship between the DRM focal point and the climate change focal point.
- Under the PDP 2017-2021, DRR and CCA are subject to be integrated into a wide range of sector-wise adaptation plans as well as local adaptation plans through downstream strategies and policies in order to address climate change vulnerabilities and contribute to the reduction of disaster risks.

(2) Organisational Structure

In 2011, the National DRR Management Council (NDRRMC) adopted the National DRR Management Framework (NDRRMF). The NDRRMF is a key component to ensure the country's DRR as well as sustainable development. The NDRRMC which is the national platform under the OCD, acts as the main coordinator for all disaster management and serves as the President's adviser on disaster preparedness programmes, disaster operations and rehabilitation efforts undertaken by the government and the private sector. It has the overall responsibility for approving the NDRRMP.

At the same time, the NDRRMC is responsible for the mobilizing of resources for national risk reduction management, including for the National DRRM Fund (NDRRMF) as well as for the monitoring of utilization of the Local DRRM Fund (LDRRMF).

The OCD is the operating arm and secretariat of the National DRR and Management Council. It has the primary task of coordinating the activities and functions of the various government agencies and instrumentalities, private institutions and civic organisations for the protection and preservation of life and property during emergencies.

At the regional and local levels, the OCD reviews and evaluates the Local DRRM Plans (LDRRMPs) to facilitate the integration of DRR measures into the local Comprehensive Development Plan (CDP) and Comprehensive Land Use Plan (CLUP).

The DRRM Act 10121 empowers local governments and communities to enforce DRR measures and to address their respective risks; it mandates them to establish a Local DRM Office LDRRMO and to set aside certain part of their estimated revenue as the Local DRR and Management Fund LDRRMF.

The Department of Environment and Natural Resources (DENR) is responsible for governing and supervising the exploration, development, utilization, and conservation of the country's natural resources. The National Mapping Resource and Information Authority (NAMRIA) is the central mapping agency under the DENR who provides natural resources data, while the Mines and Geosciences Bureau (MGB) is the primary government agency under the DENR responsible for the conservation, management, development and proper use of the country’s mineral resources.

The Philippine Climate Change Commission (CCC) is an independent and autonomous body that has the same status as a national agency and is attached to the Office of the President.

The People's Survival Fund (PSF) is a special fund in the national treasury for financing of adaptation programmes and projects. A People's Survival Fund Board, referred to as the PSF Board, shall be lodged under the Climate Change Commission (CCC) and shall be composed of the followings.

- Secretary of the Department of Finance (DOF) as Chair
- Vice Chairperson of the CCC
- Secretary of the Department of Budget and Management (DBM)
- Director-General of the National Economic and Development Authority (NEDA)
- Secretary of the Department of the Interior and Local Government (DILG)
- Chairperson of the Philippine Commission on Women (PCW)
- A Representative from the Academe and Scientific Community
- A Representative from the Business Sector
- A Representative from the NGOs.

The assessments on the current DRM and climate change organisational arrangement of the Philippines are summarised as below.

- DRRM Plans and DRRM Offices at all 5-layer administrative levels of National–Regional–Provincial–Municipal–Barangay are strongly supported by the OCD’s nation-wide vertical network.
- The OCD reviews and evaluates the Local DRRM Plans to facilitate the integration of DRR

and CCA measures into the local Comprehensive Development Plan (CDP) and Comprehensive Land Use Plan (CLUP).

- Local DRRM offices are under the office of the governor and city or municipal mayor, and strongly assisted by staff responsible for administration and training, research and planning, and operations and warning.
- The collaboration between the NDRRMC and Climate Change Commission (CCC) contributes to institutionally integrating DRR and CCA, thereby promoting the integration of DRR and CCA at all administrative levels, especially in formulating local plans and actions.

(3) Funding Structure

The Government of the Philippines has the following special funds to cushion impacts of disasters.

- National DRR and Management Fund (NDRRMF)
- Local DRR and Management Fund (LDRRMF)
- People's Survival Fund (PSF)
- Special Provisions in General Appropriations Act

In the national budget for the financial year 2016, PHP 1.0 billion (approximately USD 19.9 million) was allocated under the PSF. The Government of Philippines raised its 2016 budget for DRR following the devastating impacts of Typhoon Yolanda in late 2013. The budget for the NDRRM Fund for the financial year 2016 has been increased by almost three times to PHP 38.9 billion (approximately USD 774.1 million) from PHP 14 billion (approximately USD 278.6 million) of the previous financial year 2015.

However, the current administration allocated only PHP 15.7 billion for the NDRRM Fund for the financial year 2017. This is a PHP 23.2 billion (approximately USD 461.7) decrease from PHP 38.9 billion (approximately USD 774.1 million) in the financial year 2016 under the previous administration.

The RA 10121 mandates LUGs to set aside 5 percent of the estimated revenue as the Local DRR and Management Fund (LDRRMF) to support DRM activities such as preparedness programmes. Of the 5 percent lump sum allocation, 30 percent of the LDRRMF is automatically allocated as Quick Response Fund (QRF) which serves as a stand-by fund for relief and recovery programmes. The rest of the 70 percent can be used for pre-disaster measures. In this way, the QRF is the built-in budgetary allocations that represent pre-disaster or stand-by funds for LGUs in order to immediately assist areas affected by natural disasters.

The People's Survival Fund (PSF) was created in accordance with the section 18 of the Republic Act No.9729 (Climate Change Act of 2009), as amended by the Republic Act No.10174. In the national budget for the financial year 2016, PHP 1.0 billion (approximately USD 19.9 million) was allocated under the PSF.

The Government of the Philippines has not been accessing to the Adaptation Fund, and the list of the funding sources for the CCA projects funded by the international funding sources is tabulated as below.

Table 2.7.2: List of Funding Sources for Climate Change Adaptation Project (The Philippines)

Project Name	Funding Source	Duration
CCA Program for Philippines	World Bank	2010-2016
Supporting the Philippines' national and international climate policies	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)	2015-2019
Climate Resilience and Green Growth in Critical Watersheds	ADB and Japan Fund for Poverty Reduction	2014-2016
Bicol Agro-Water Project (BWAP)	USAID	2012-2017
Abuan Integrated Watershed Management Program (AIWMP)	USAID	2012-2017
Philippines Biodiversity and Watersheds Improved for Stronger Economy and Ecosystem Resilience (B+WISER) Program	USAID	2012-2017
Water Security for Resilient Economic Growth and Stability (BE SECURE) Project	USAID	2012-2016
Building Climate Resilience in Water Stressed Communities (CREST)	USAID	2012-2017
Ecosystems Improved for Sustainable Fisheries (ECOFISH) Project	USAID	2012-2017

Source: Asia Pacific Adaptation Network 2016

The assessments on the current funding system for DRM and climate change of the Philippines are summarised as below.

- Although there is a wide range of options to mobilize DRM and climate change finance from various domestic and international funding sources, they are not fully utilized.
- There is the built-in funding system as well as the compulsory budgetary allocations that support pre-disaster or stand-by funds for local government units under the Local DRRM Fund.
- Although there is the demand-driven People's Survival Fund (PSF) to provide a long-term finance scheme for effectively addressing climate change, the Fund is not actively utilized by local government units.
- The Government of the Philippines started the pilot project of the Climate Change Expenditure Tagging (CCET) at local government units, enabling consistent assessments of climate spending at both national and local levels. The budget management through the CCET in the integrated manner significantly contributes to the potential integration of DRR and CCA.

(4) River Basin, River and Forest Management Systems

There is River Basin Control Office (RBCO) in the Department of Environment and Natural Resources (DENR), which is currently establishing branch offices in the country. However, their activities started recently and there is lack of staff. RBCO is currently formulating master plans of FRM etc. for the major 18 rivers basins one by one. Landuse in the river basins is under the responsibility of Local Government Units (LGUs). In case that a river basin relates to several LGUs, management of the area of the river basin is divided into those LGUs and also to the related agencies such as the DENR. Like this, coordination mechanism for RBM has not been developed yet.

The Department of Public Works and Highways (DPWH) is constructing and managing the infrastructures for flood control or bank protection along the rivers. Management of the landuse including rivers is under the responsibility of LGUs. Water Code states that the DPWH can take responsibility of managing easement zones along the rivers, but the DPWH has not taken this responsibility yet. Hence, currently, management of easement zone is also under the

responsibility of the LGUs. Like this, coordination mechanism of RM has not been developed yet.

The Forest Management Bureau in the DENR is in charge of forest management (conservation and reforestation) for upland forest and mangrove forest in coastal areas.

2.7.2 Risk assessment

Disaster data are kept by Office of Civil Defense (OCD). Downscaling from GCMs has been done for all over the Philippines. Flood hazard maps without climate change have been prepared by several agencies in all over the country. Landslide hazard maps have been prepared in all over the country. However, resolution of flood and landslide hazard maps are still to be improved in general due to limitation of accuracy of topographic data.

(1) Disaster database

The Philippines has various natural disasters such as storm and storm surge by typhoons and tropical storms, floods and landslides by typhoons, tropical storms and depressions, drought, earthquake, volcanic eruption and tsunami.

Office of Civil Defense (OCD) has a database of historical disasters including record of response activities.

(2) Meteorological data management and downscaling from global climate models

Meteorological observation system:
Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) under the Department of Science and Technology (DOST) observes meteorological condition and conduct forecast to people in terms of climate, typhoon, wind, rainfall. PAGASA is also managing meteorological database. In addition, Among the 18 major river basins, PAGASA has developed flood forecasting systems in the 7 river basins (Cagayan, Agno, Pampanga, Bicol River, Tagum-Libuganon River Basins etc.). For Metro Manila area, PAGASA conduct flood forecast based on the rainfall and water level observation stations of Effective Flood Control Operation System (EFCOS) of Metropolitan Manila Development Authority (MMDA) and the stations installed by Korean International Cooperation Agency (KOICA).

PAGASA also monitors hydrological operation of the 9 dams in Luzon Island and conduct flood forecast for these dam river basins.

Downscaling from GCM:
PAGASA has conducted downscaling of the effect on rainfall by climate change based on various models of GCM (AR4 and AR5 of Intergovernmental Panel on Climate Change (IPCC)) for all over the country. Resolution of the downscaling is 12km mesh. There is also another downscaling conducted on project basis such as the Pasig-Marikina River Basin by Tokyo University of Japan.

(3) Hazard and risk maps for flood, storm and landslide

Flood hazard maps:
PAGASA prepares flood hazard maps. They are 1 to 10,000 scale flood hazard maps for 18 provinces/ areas, 1 to 15,000 scale flood hazard maps for 4 provinces and 1 to 50,000 scale flood hazard maps for 8 provinces/ areas. The 1 to 10,000 flood hazard maps were prepared by the “Ready Project” funded by the United Nations Development Programme (UNDP) and AusAID.

Mines and Geoscience Bureau (MGB) of the Department of Environment and Natural Resources (DENR) has also prepared flood hazard maps together with landslide hazard maps. These hazard maps are prepared based on field investigation, questionnaire to people of floods and landslide

conditions and expert judgement. These hazard maps are based on topographic maps of the National Mapping and Resources Information Authority (NAMRIA) of DENR, which have scale of 1 to 10,000 (mainly urban areas) to 1to 50,000 (mainly rural areas). Topographic elevation of digital elevation model (DEM) has been upgraded by NAMRIA to be around 1 to 10,000 scale accuracy based on the data of IfSAR (Interferometric synthetic aperture radar by satellite). The flood hazard maps and landslide hazard maps of MGB are good reference for indicating flood and landslide risk areas, but their resolution is necessary to be improved.

PAGASA has also prepared flood risk maps for the Pasig-Marikina River Basin including northern part of the Laguna Lake by the GMMA-RAP (Greater Metro Manila Area Risk Analysis Project) assisted by AusAID and GeoScience Australia. Digital elevation model (DEM) based on Lidar Data was used for this Project and conducted one and two-dimensional unsteady flood simulations.

The above flood hazard maps of PAGASA and MGB and the flood risk map by PAGASA don't include climate change impacts.

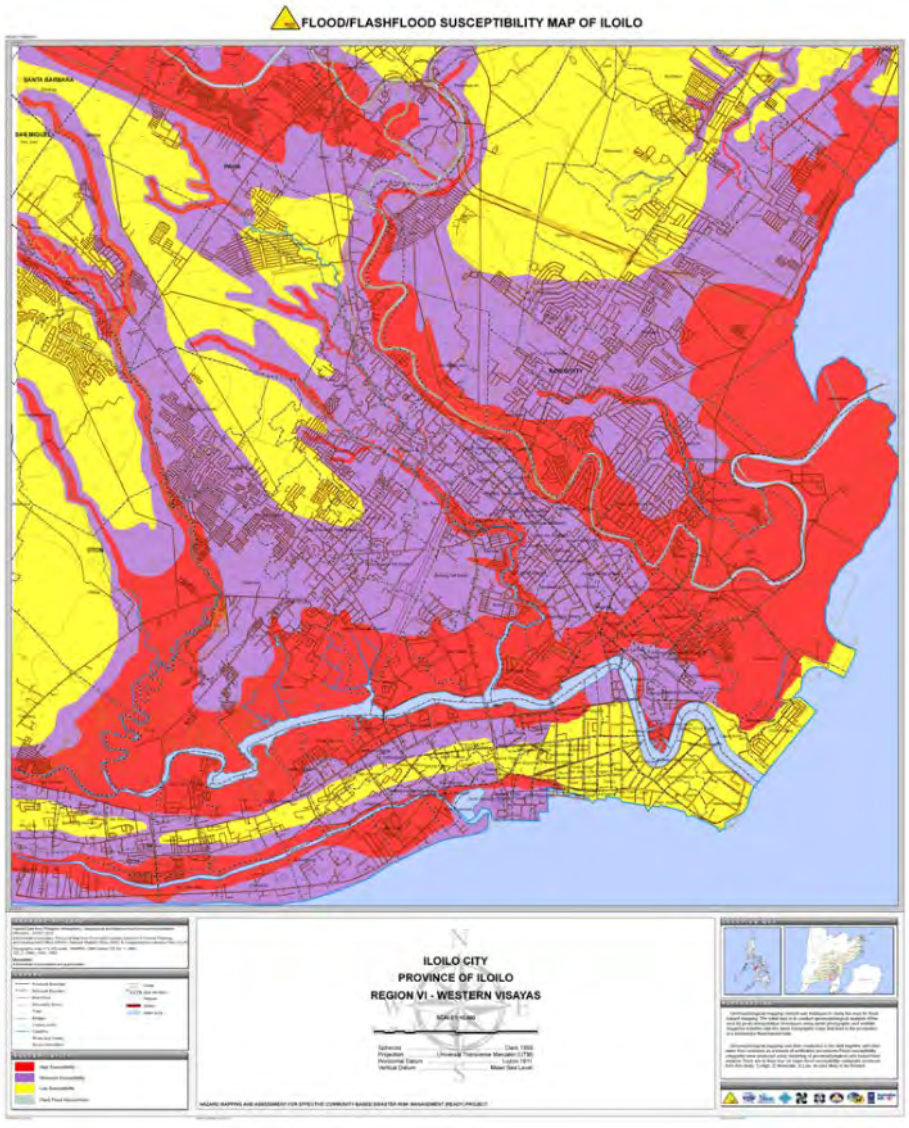


Figure 2.7.1: Example of flood hazard map of PAGASA (1/10,000) in Iloilo

Source: PAGASA

Landslide hazard maps:

MGB has prepared rain induced landslide and flood hazard maps (susceptibility maps) with scale of 1 to 10,000 all over the country and some urban areas with scale of 1 to 50,000. However, for mountainous areas with steep slope, wide slope areas become very high or high landslide susceptibility. Therefore, it is expected that more detailed landslide hazard maps such as scale 1 to 1,000 are also necessary for the communities to find out safer place for living. For preparing such detailed landslide hazard maps, utilization of satellite images with resolution of 2m x 2m or higher will be effective.

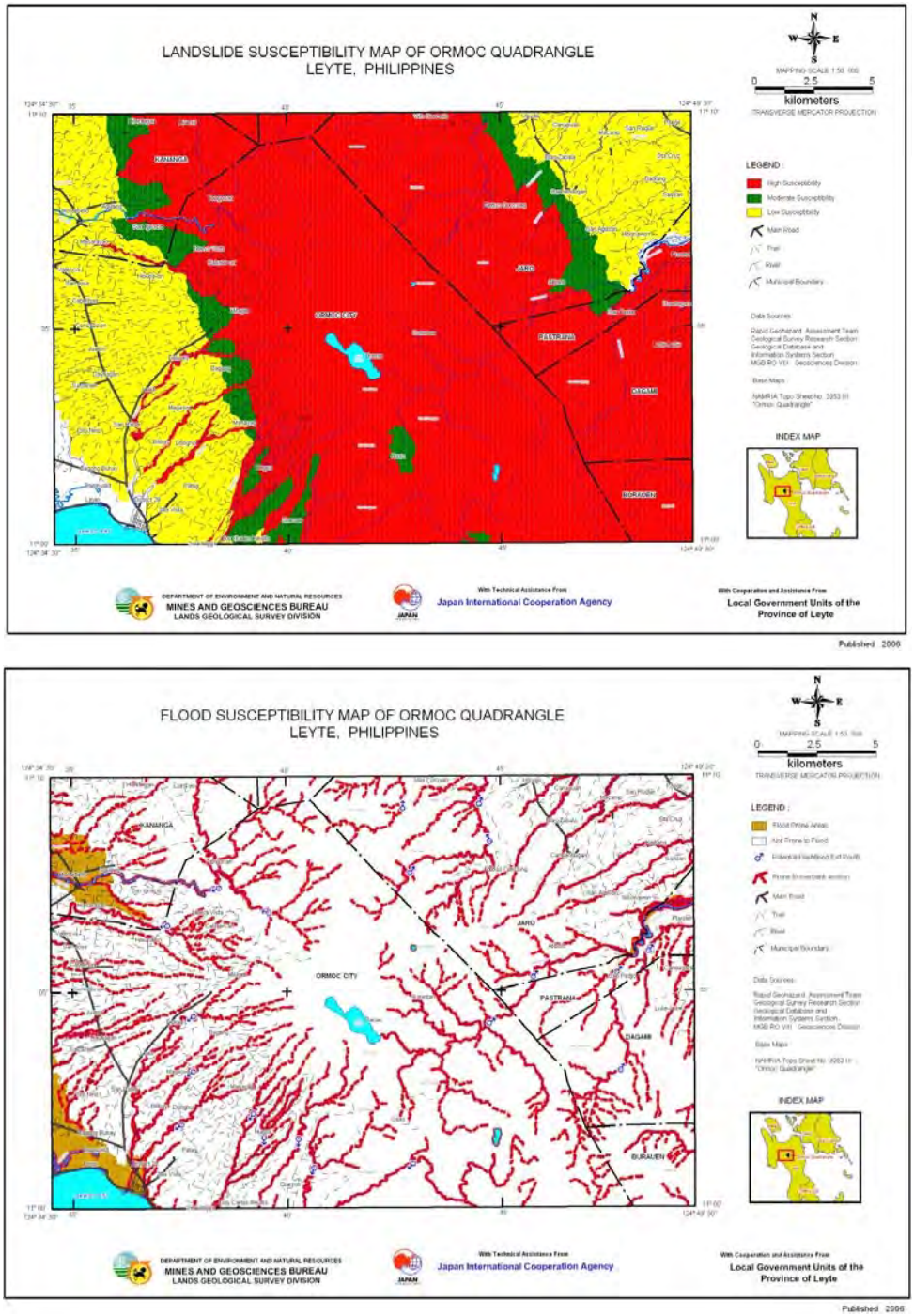


Figure 2.7.2: Example of landslide and flood hazard maps in Ormoc

Source: MGB

In addition, Project NOAH (Nationwide Operational Assessment of Hazards), the flagship disaster prevention and mitigation program of the Department of Science and Technology (DOST), developed GIS based DRM web platform. It allows interactive viewing of various kinds of hazard maps and other relevant information such as rainfall, river water levels, tide levels and so on at the same time. The hazard maps were newly produced in 18 major river basins based on computer simulations that reflect flood-prone areas discernible at a local scale or community level.

Figure 2.7.3: Web GIS based portal site of hazard maps
Source: University of the Philippines (UP-NOAH)

(4) Risk map for drought

Philippines has been ranked as one of the most climate-risk prone countries in the world. The country is facing medium to high water risk (See Figure 2.7.4), especially the parts of the northern and southern provinces. The AQUADUCT Water Risk Atlas of WRI indicate that the country could face even more water related risks in the future by a factor of 1.4 times it is already facing.

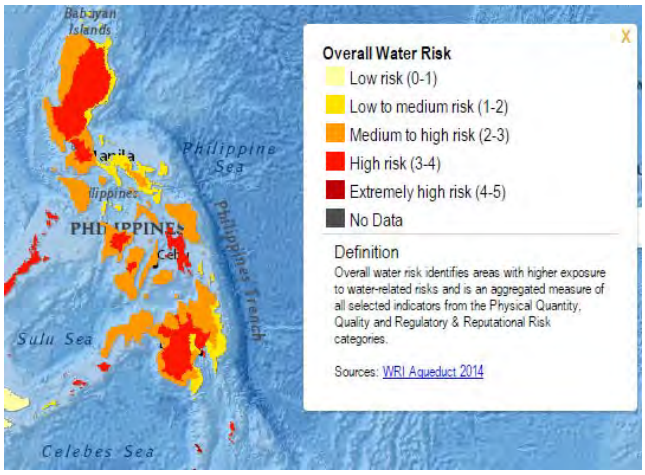


Figure 2.7.4: Water Risk Map of the Philippines

Source: WRI, 2014

Figure 2.7.5: El Nino vulnerability map of the Philippines

Source: PAGASA, 2008

The Philippines is highly vulnerable to El Nino events as a result of which the associated rainfall deficit is felt throughout the country (Figure 2.7.5). However, the southern provinces of the

Philippines are much more vulnerable to El Nino related rainfall deficit than the Northern provinces for the reason of their relative proximity to equator and higher exposure to the related equatorial sea surface temperature changes. Areas highly at risk to El Niño-induced drought are Central and West Mindanao and the Sulu, Basilan, Maguindanao, Lanao Del Sur, Lanao Del Norte, Davao Del Sur, Misamis Occidental, Sarangani and Zamboanga Del Sur provinces are considered as the most vulnerable to El Nino-linked droughts (dark red areas in the Figure 2.7.5).

During 1960-2016, the country has faced 16-week to strong El Nino episodes with serious socio-economic consequences (Tejada et al., 2014). As a result of its exposure to El Nino events, the country has faced 10 major drought events since 1970 with 2015 drought being the most recent. The drought of 1997-98 is considered as the most severe one in the past three decades where 2.6 million people were severely affected (EM-DAT, 2017). El Nino-associated drought events are known to severely impact the paddy production in the country. In addition to the impact on agriculture production, droughts are also known to severely impact the reservoir levels (46% reduction in Angat reservoir during 1991 drought), reduced areas under irrigation (87% reduction in Angat-Maasim River Irrigation System of Angat dam during 1998 drought), and reduction in hydropower generation (74% reduction at overall country level during the 1998 drought) (Guzman, 2009).

2.7.3 Planning and implementation

There are planning and designing guideline for flood control structures including climate change. These values of climate change impacts are necessary to be reviewed and confirmed from technical and economic viewpoints to make practical application. There are some examples of flood control facilities with climate change impacts such as sea water level rise. Landuse management in rain induced landslide risk areas is the existing major countermeasures against landslide. Combination with structural measures against landslide is also to be considered for more effective landslide risk management.

(1) Flood and storm risk management

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

The Department Order of Department of Public Works and Highways (DPWH) “Upgrades on Flood Control and Road Drainage Standards” considering adaptation to climate change was issued in June 2011. This Department Order sets the minimum flood return periods to be used for the design of flood control and road drainage facilities. For rivers, it stipulates a) for principal and major rivers (40km^2 drainage area and above), shall be 50-year return period of flood with sufficient freeboard to contain the 100-year return period of flood, b) for small rivers (below 40km^2 drainage area), shall be 25-year return period of flood with sufficient freeboard to contain the 50-year return period of flood.

In addition, among the Design Guidelines, Criteria and Standards of DPWH in 2015, climate change impacts on rainfall and sea water level rise for planning and designing flood control structures is considered. It states in general that 10% increase of rainfall intensity should be added for climate change impacts. In addition, 0.3m of sea water level rise by 2050 is to be considered. According to the Bureau of Design of DPWH, the 10% increase of rainfall intensity is set by referring the study results of some recent JICA flood control projects. The sea water level rise of 0.3m is based on IPCC 5th Assessment Report (AR5) and PAGASA’s report on “Climate Change in the Philippines” in 2011.

2) Flood control in Ormoc City in Leyte Province

In November 1991, by Typhoon Uring, destructive flash flood occurred from the two rivers in Ormoc City in Leyte Province, which caused tremendous damage with 4,922 dead and 3,000 missing persons. The reasons of the flooding were large amount of rainfall, clogging of the bridge openings by large amount of floating debris including logs and insufficient discharge capacity of the Rivers.

In order to solve flood problem, slit dams were constructed in the upstream reaches to catch floating logs etc. and river trainings with flood safety level of 50-year return period were conducted. Flood Management Committee (FMC) composed of Ormoc City and the District Office of DPWH was established. Under the FMC, maintenance of the above slit dams and the improved river stretches including removal of debris and dredging are being conducted well. Furthermore, easement zones along the Rivers were set. The Barangays (communities) along the Rivers are cooperating for maintaining the easement zones for not building illegal houses inside the easement zones. By these efforts, floods have not been occurring in these rivers even in the case of similar size of typhoons in 2003 and 2013 as Typhoon Uring in 1991.

Slit Dam in the Anilao River Upstream Reach

River Improvement in the Mid-streamto Downstream Reaches of the Anilao River

Figure 2.7.6: Flood control facilities in Ormoc City in Leyte Province

Photos: JICA Project Team

3) Polder wall for protecting Valenzuela–Obando–Meycauayan (VOM) area from inundation by high tide and river flood, Metro Manila, the Philippines

The VOM Area is a coastal wetland area and many houses in the low-lying area are affected by recurrent inundation during high tide and by floodwater from the Meycauayan River. The design highest water level (HWL) is set at the recorded maximum tide water level. The polder walls include additional 30cm for sea water level rise by climate change. Above the design high water level including sea water level rise of 30cm, 60cm of freeboard is added to set the top of the polder walls.

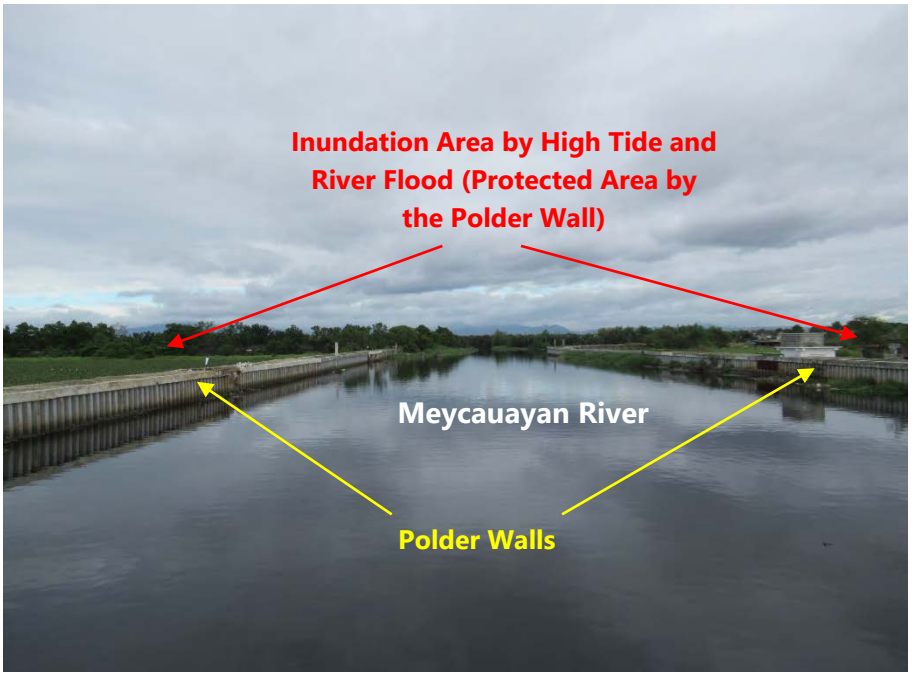


Figure 2.7.7: Polder wall including height for sea water level rise in VOM Area, Metro Manila

Photos: JICA Project Team

4) Other Investigated Sites for FRM

Natural retarding basin in the upper Marikina River: Important for conservation the retarding functions as non-structural measures for FRM.

(2) Landslide risk management

1) Guinsaugon landslide area in Saint Bernard Municipality in Southern Leyte

Large deep sliding of the mountain slope with debris flow occurred in Guinsaugon in Saint Bernard Municipality in Southern Leyte Province on Feb. 17, 2006 by the prolonged heavy rainfall. This landslide disaster caused 1,100 dead persons including 250 school children learning in the school. After the disaster, people of Barangay Guinsaugon and surrounding 6 Barangays were resettled to safer places near the center of the Municipality, and land use management in the dangerous areas including prohibition of building houses and only allowing farming such as rice cultivation has been conducted by the Municipality.

Rainfall and river water level are monitored around the landslide area manually. Two landslide sensors were installed by the PHIVOLCS (Philippine Institute of Volcanology and Seismology) around the landslide area. Although, the existing measures provided for Guinsaugon Areas don't include CCA, the above orthodox measures are necessary, and will be also effective in the case of climate change impacts.

Deep sliding with debris flow on Feb 17, 2006 in and around Barangay Guinsaugon

Photo: San Bernard Municipality

Current Condition of the collapsed slope (Feb. 1, 2017)

Photo: JICA Project Team

Figure 2.7.8: Landslide disaster area in Guinsaugon in Saint Bernard Municipality

2) Other Landslide Area: San Francisco Municipality in Panaon Island in Southern Leyte

Relocation of the affected people and not building houses in the disaster area has been conducted.

(3) Storm surge risk management

There is some reforestation of mangrove forest in some areas experiencing severe storm surge, but non-structural and structural measures against storm surge are very much insufficient in general.

In Tacloban and surrounding areas in Leyte Province, tremendous damage including 6,300 dead persons was caused by storm and storm surge by Typhoon Yolanda in 2013. To cope with storm surge, JICA formulated a coastal protection plan by constructing sea dikes covered with concrete protection, and they will be constructed from now on.

(4) Drought risk management

At the national level, the institutional and policy mechanisms for risk reduction initiatives are integrated and hence do not have separate mechanisms for drought risk reduction. One significant development in this regard is the Philippines Republic Act of 10121 (entitled "Philippine Disaster Risk Reduction and Management Act of 2010) signed in 2010 which defines the disaster as a serious disruption of community or a society involving widespread human, material and economic or environmental losses and impacts which exceeds the capacity of local people to respond. The Act of 10121 is a generic act covering all types of natural and man-made hazards and do not make any specific references to drought per se. However, the Act stipulates the National Disaster Risk Reduction and Management Council (DRRMC) that brings together all the departments that are pertinent to drought risk reduction including Department of Agriculture and Department of Environment and Natural Resources. Now, the participatory DRM located in section 15 of the Act provides a mechanism that strengthens the disaster risk reduction at the local level (i.e. barangay).

At a barangay level, the barangay development councils serve the role of local disaster risk reduction and management offices. In terms of response, the national disaster response plan (NDRP) for hydro-metrological hazards (June 2014) adopts a clustered approach wherein each cluster conducts response as per the laid out norms for the pre-disaster, during-disaster and post-disaster phases. The National Disaster Risk Reduction and Management Plan (NDRRMP 2011-2028) is comprehensive and do not differentiate between sudden and slow onset disasters. However, it identifies broad thematic projects those need to be promoted and are relevant for drought risk reduction as well which include establishing early warning systems, risk mapping, and post-disaster needs assessment. In terms of

funding for the drought risk reduction, the national level funds available under the National Disaster Risk Reduction and Management Funds (NDRRMF) forms the major funding source for all kinds of disaster risk reduction activities in the country.

The local level counterpart for these funds are Local Disaster Risk Reduction and Management Funds (LDRRMF) and NDRRMC has the jurisdiction to manage, mobilize, monitor and guide governments at different level to be able to procure sufficient funds for risk reduction. The Act 10121 stipulates that the local governments shall set aside not less than 5% of their revenue to the disaster risk reduction. However, the prioritization of these fund allocation to drought depends on the local context and priorities identified by the local governments. Under the Gawad Kalasag program, the government of the Philippines is promoting the recognition of good practices for disaster risk reduction (Please refer to the good practices section of this report for more information).

To address the drought risks, various drought risk reduction initiatives have been put in place in the Philippines which include: 1) Climate field schools, farmer field schools and agro-met observatory stations; 2) Agriculture insurance including the pilot project on weather index insurance; 3) Small water Impounding projects; 4) Initiative on cropping zones integrating the weather, economic, soil and climate parameters; 5) National colour coded agricultural guide map with multi-hazard vulnerability and risk mapping; 6) Sustainable land management; 7) Change in cropping calendars to avoid coincidence with the typhoon season; 8) Formation of geographic insurance units (GIUs) for facilitating the crop insurance; 9) Climate risk and vulnerability assessment as a part of climate smart/resilient agriculture/good practices; 10) Strategic Plan for Agriculture and Fishing; 11) El Nino and La Nina Action Plan; and 12) development of sea water intrusion and salt tolerant varieties (some of these initiatives such as climate field schools, insurance, organic farming etc. are elaborated in the good practices section of this report). In addition to these initiatives, the Department of Agriculture and Department of Irrigation have been implementing several programs that provide complementarity with drought risk reduction benefits (Table 2.7.3).

Table 2.7.3: Programs implemented by the Department of Agriculture and Department of Irrigation that have drought risk reduction benefits

Initiative	Description
El Nino vulnerability maps	Vulnerability maps for El Nino for specific crops to help target specific crops to specific agro-climatic conditions
Livelihood Credit Assistance Program	The program provides microfinance assistance to small farmers and marginalized sections of the society to promote livelihoods
Small scale irrigation projects	Includes small diversion dams, shallow tube wells, small scale water impounding project in terms of integration of climate change harvest water during the rainy season and use during the dry season.[21]
Enhanced farmer field schools	Involves installation of agro-met stations in vulnerable areas in partnership with PAGASA, DOST ASTI. Within the influence of each agro-met station, the farmers are taught how to collect and use the data.
Climate resilient agriculture	Comprises of promotion of agronomic practices that will have both adaptation and mitigation benefits to farmers and the agriculture sector as a whole.
Hazard mapping	Multi-hazard maps are being prepared by DA to help enable farmers and local governments in appropriate crop selection and management
El Nina and La Nina taskforce	This taskforce in DA helps in interpreting the weather forecast provided by PAGASA and its appropriate use.
Water user associations	Farmers are formed into associations under specific canal systems for proper irrigation management and maintenance of infrastructure.
Small water impounding projects	These projects involve identifying unused land for impounding flood water and for use during the dry season.

Source: Authors

[21] http://www.bswm.da.gov.ph/successstory/002/small-scale-irrigation-systems

To help target the crops to specific geographical and climatic conditions and to reduce the weather-related risks, the PAGASA has developed crop-specific El Nino vulnerability maps for rice and corn. In addition, PAGASA has developed a Standardized Precipitation Index-based drought monitoring system (SPI) and PAGASA is currently working on drought monitoring through remotely-sensed MODIS (Moderate Resolution Imaging Spectroradiometer) normalized difference vegetation index (NDVI) wherein comparing the NDVI values between normal and drought years will reveal the progression of extent of drought. Livelihood Credit Assistance Program (LCAP) implemented by the National Livelihood Development Corporation is designed to help small scale farmers and members of marginalized sectors to access microcredit.

During the 2015 drought, to help paddy farmers with the drought, water pumps were distributed through farmer associations and they guideline were provided for members on how to borrow and use the pumps so the farmers do not indulge in over irrigation. The small-scale irrigation project is one where the height of the dam is 15m or below and has min of 1 ha service area. There are about 500 small scale irrigation projects nationwide and per ha cost for these is 300,000 peso depending on the nature of the small scale irrigation project.

Enhanced farmer field schools are funded by the Public Law 480 Program through the assistance of PCAF. Climate change related elements are integrated in the farmer field schools and hence are called enhanced farmer field schools. In terms of climate resilient agriculture, after the first phase of policy and capacity building, the Department of Agriculture is focusing on-the-ground communities. The DA has conducted climate risk and vulnerability assessment and targeting with a goal to implement CRVA technologies in targeted communities.

In terms of drought risk and hazard mapping, the DA has developed an integrated multi hazard map which is being converted to interactive format to be available online in the future. The DA has distributed the same to regional offices, bureaus and other agencies. The National Color-Coded Agriculture Guide-Map (NACCAG) was developed which will help farmers to understand the type of soil they have, nutrient status, crops that can be cultivated etc. The Field Program Operation Division of DA is drafting DRR operations manual and it will have intervention measures in relation to DRR to be taken up in the agriculture sector. In 2016, the DA has established a DRR operations center with the support of FAO housing technical officers of climate information, national quick response office and rehabilitation offices.

An El Nino La Nina taskforce was established to enhance the preparedness levels. PAGASA also conducts monthly Monsoon Outlook Forum where the forecasts produced by PAGASA is introduced to the concerned agencies to fine tune, understand and respond to the forecast. Cloud seeding has assumed special significance among the drought risk reduction arsenal of the government of the Philippines. When PAGSA forecasts deficit rainfall in particular month, PAGASA, DOA and NIA work as team and conduct cloud seeding operation in coordination with the private corporations in drought prone areas.

Water user associations are being promoted to enhance water use efficiency at the farmer level. The Irrigation Management Transfer program enables farmers to have responsibility to collect funds and maintain canals. Small Water Impounding Project[22] is nationwide implemented depending on the budget of the national government and some of the projects are already implemented and it is ongoing in some regions on adapting the effects of climate change through the construction of water impounding facilities under the SRIP project (water is diverted from rivers).

The People's Survival Funds forms important source of funding for integrating climate change considerations into disaster risk reduction and other governance areas including drought risk reduction.

[22] http://www.bswm.da.gov.ph/successstory/002/small-scale-irrigation-systems

For climate change information, the main role of PAGASA with regard to Climate Change scenario is downscaling global models for the Philippines through different projects and through different downscaling techniques. The World Bank project on Philippine climate change adaptation program,[23] which is an inter-agency project where PAGASA is providing climate change scenario related information and seasonal climate forecasts. The CLUP act is being debated in the lower house of the parliament. The NEDA has released guidelines for mainstreaming DRR into development planning in 2008.[24]

2.7.4 Capacity building

The Philippines has adopted river basin management (RBM) approach which is important for DRR and CCA integration. A lot of lessons could be learnt from it by improving coordination mechanism at different level. Considering the uncertainty of the future projection of climate change impacts, stage-wise approach could be adopted for incorporating climate risks into projects and programs. Similarly, improvement in hydro-meteorological information system along with the use of climate models could help in the development of hazards and risk maps with climate change impacts that would be a good local level decision-making tool. In addition to that Disaster Risk Reduction and Management (DRRM) plans and DRRM offices at all administrative levels of National–Regional–Provincial–Municipal–Barangay are strongly supported by the Office of Civil Defence's (OCD's) nationwide vertical network. In addition to that the Philippines have established different financial mechanism for DRM and CCA such as Local DRRM funds, People's Survival Fund, Climate Change Expenditure Tagging (CCET).

2.8 Singapore

2.8.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

There is no single overarching law that governs disaster management in Singapore. The main legislations supporting emergency preparedness and disaster management activities in Singapore are the Civil Defence Act (1986), Fire Safety Act (1993) and Civil Defence Shelter Act (1997). The Civil Defence Act provides the legal framework for the declaration of a state of emergency. The Act was amended in 2011 to update the functions of the SCDF, to provide a legal framework for overseas humanitarian assistance and disaster relief deployments, and to update the provisions relating to the administrations of the Force.

The legislative and institutional framework regarding climate change in Singapore is also diverse, extending over a number of legal documents. There is no stand-alone legal document concerning climate change, and a complex legal and institutional regime is spread over various acts and regulations such as Environmental Protection and Management Act (Chapter 94A) (2000) and its relevant Regulations [Environmental Protection and Management (Air Impurities) Regulations (2000), Environmental Protection and Management (Vehicular Emissions) Regulations (1999), Environmental Protection and Management (Off-Road Diesel Engine Emissions) Regulations (2012)], Energy Conservation Act (Chapter 92C) (2012), National Environment Agency Act (Chapter 195) (2002), Electricity Act (Chapter 89A) (2001), Energy

[23] http://projects.worldbank.org/P101076/climate-change-adaptation-program?lang=en&tab=overview
[24] http://www.neda.gov.ph/wp-content/uploads/2013/10/Guidelines-on-Mainstreaming-DRR-in-Subnational-Development-Land-Use-Planning.pdf

Market Authority of Singapore Act (Chapter 92B) (2001), Gas Act (Chapter 116A) (2001) and Building Control Act (Chapter 29) (1989).

In 2012, the Singapore Government prepared the National Climate Change Strategy (NCCS 2012), which outlines Singapore's plans to address climate change. Entitled 'Climate Change and Singapore: Challenges. Opportunities. Partnerships', the document reflects the key elements of Singapore's climate strategy. They include reducing emissions across sectors, building capabilities to adapt to the impact of climate change, harnessing green growth opportunities as well as forging partnerships on climate change action. Especially, Singapore started to integrate long-term adaptation planning into national policies. Some key adaptation measures include food security, infrastructure resilience, public health, addressing flood risks, enhancing water security, protecting the coastline, safeguarding biodiversity and regional climate modelling.

In 2016, Singapore also released the "Climate Action Plan: Take Action Today, for a Sustainable Future", which comprises of two complementary publications detailing the country's strategy to reduce greenhouse gas emissions and adapt to the effects of climate change. The first publication, "Take Action Today, for a Carbon-Efficient Singapore", includes information on how Singapore intends to reduce greenhouse gas emissions and increase energy efficiency to meet the country's 2030 pledge under the Paris Agreement. The second publication, "A Climate-Resilient Singapore, for a Sustainable Future", explains how Singapore may be affected by climate change and outlines the adaptation strategy to prepare for these impacts. Taken together, the Climate Action Plan outlines Singapore's whole-of-government approach in tackling climate change. (The image of the Singaporean Climate Change Action Plan is shown on the left. The image is taken from https://www.nccs.gov.sg /news/climate-action-plan-crucial-milestone-singapore's-climate-journey.)

The Government of Singapore set aside funds for various sectors and agencies to build up capabilities in climate resilience and look at how the Government can develop more cost-effective solutions. For example, the Government issued a call for proposals, under the Land and Liveability National Innovation Challenge, for researchers to propose innovative solutions to reduce the ambient temperature in residential estates by 4 degrees Celsius. The Government is also working to determine the required adaptation plans and financing requirements of climate change adaptation measures. These studies are in progress.

On the other hand, the Singapore Civil Defence Force (SCDF) organises the emergency preparedness programmes and disaster management activities. The SCDF's role during peacetime is to provide emergency services, such as fire fighting, rescue and ambulance services. In addition, the SCDF builds up and maintains its operational capability and readiness, strives to increase public awareness and participation in civil defence activities, and is also responsible for formulating and enforcing regulations on fire safety and civil defence shelter matters.

The assessments on the current DRM and climate change institutional setting of Singapore are summarised as below.

- The legislative and institutional framework regarding DRM and climate change in Singapore is diverse, extending over a number of legal documents. There is no stand-alone legal document concerning DRM and climate change, and a complex legal and institutional regime is spread over various acts and regulations
- The Singapore Government released the National Climate Change Strategy (NCCS) 2012 document, which outlines Singapore's plans to address the sector-wise CCA and mitigation. In this way, incorporating CCA into sector-wise policies and strategies has significantly progressed in Singapore. In addition, Singapore's disaster risk management measures are coordinated across multiple government agencies. These agencies take into consideration the projected impacts of climate change in their planning.

(2) Organisational Structure

The Singapore Civil Defence Force (SCDF) is a uniformed organisation which provides emergency services to the country both during peacetime and under crisis. It serves not only as a fire-fighting authority but also provides ambulance and rescue services and acts as an educator on fire safety procedures. Following the enactment of the Civil Defence Act in 1986, the SCDF established itself as an independent organisation under the Ministry of Home Affairs.

In 2007, the Inter-Ministerial Committee on Climate Change (IMCCC) was set up to ensure coordination on Singapore's approach in coordinating climate change policies.

The National Climate Change Secretariat (NCCS) was established as a dedicated unit in 2010 under the Prime Minister's Office (PMO) to ensure effective coordination on Singapore's domestic and international policies, plans and actions on climate change. The positioning of NCCS stresses the importance of CCA on which Singapore puts priority. IMCCC is chaired by DPM Teo Chee Hean. Members include: (i) the Minister for the Environment and Water Resources, (ii) the Minister for Finance, (iii) the Minister for Foreign Affairs, (iv) the Minister for National Development, (v) the Minister for Trade & Industry (Trade), (vi) the Minister for Trade & Industry (Industry), and the Minister for Transport.

(3) Funding Structure

A large portion of the budget for the prevention and mitigation for disasters in Singapore is currently covered by development funds generated from the regular state budget. The financial sources for the prevention and mitigation of disasters to be mobilized are scattered among line ministries. Apart from the regular state budget of Singapore, the domestic DRM fund includes Community Safety and Security Programme (CSSP) and Community Emergency Preparedness Programme (CEPP).

Although the Singapore Government does not access to the Adaptation Fund, the below 2 CCA projects are currently funded by the following domestic funding sources.

Table 2.8.1: List of Funding Sources for Climate Change Adaptation Project (Singapore)

Project Name	Funding Source	Duration
Impact of Climate Change on Extreme Rainfall and Drainage Design	Cooperative Research Center for Water Sensitive Cities (CRCWSC)	2014-2016
Coastal Adaptation Study (CAS)	Singapore Government	2013-2017

Source: Asia Pacific Adaptation Network 2016

The assessments on the funding system for DRM and climate change of Singapore are described as below.

- A large portion of the DRM and climate change response is currently funded with development funds generated from the regular state budget of Singapore. The financial mobilization is scattered in line ministries.
- Climate change relevant projects are not clearly identified or linked to specific climate change objectives under the present planning and budgeting system. Challenges encountered in the collection of information regarding capital and recurrent expenditures on CCA across ministries, departments and provinces underscore the need for a consolidated tracking system.

(4) River Basin, River and Forest Management Systems

- River Basin Management System: No RBM System, because of the City-state.
- River Management System: No clear information about River Management yet. Public Utilities Board (PUB, Singapore's National Water Agency) of the Ministry of Environment and Water Resources relates to the rivers such as flood control.
- Forest Management System: The National Parks Board (NParks) plans, develops and manages parks and greenery, including forest areas under its jurisdiction.

2.8.2 Risk assessment

Downscaling from GCMs has been conducted. Also, sea water level rise is taken into account for coastal protection.

(1) Disaster database

In Singapore, droughts and flash floods caused by intense rainfall are some of the challenges due to climate change.

(2) Meteorological data management and downscaling from global climate models

Meteorological Observation System:
Meteorological Service of Singapore (MSS) of National Environment Agency (NEA) is the responsible agency for meteorological observation and the meteorological data management. MSS conducts 2 hour, 24 hour up to 4 days weather forecasts as well as marine weather, wind and wave forecasts. MSS also make warnings and advisories on heavy rain, tropical cyclones, regional earthquake and tsunami, and regional volcanic eruption (source: web-page of MSS).

Downscaling from GCM:
MSS has conducted downscaling from GCM by using Regional Climate Models (RCMs) of IPCC's AR5 Report for all over Singapore with resolution of 12km mesh.

(3) Hazard and risk maps for flood, storm and landslide

Flood Hazard Maps:
Information of flood and storm hazard maps is not available.

2.8.3 Planning and implementation

Coastal protection includes height of reclamation along the coast against sea water level rise by climate change. Marrina Barrage has multiple functions for storage fresh surface water in the River, flood control and recreation.

(1) Flood and storm risk management

The followings are the conditions of guideline and standard of DRR and CCA integration as well as some examples related to flood risk management in Singapore.

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

There is no guideline and standard for DRR and CCA integration against flood and flash floods.

2) Coastal protection including sea water level rise by climate change

Considering sea water level rise, from 2011, it is required in the policy that new reclaimed land along coastal area should be at least four meters above the mean sea level, which is one meter higher than the previous required height. Public Utilities Board (PUB) of Singapore's National Water Agency manages land reclamation in the coastal area. Based on this requirement of the height of coast, coastal protections using geobags, stepped seawall or rock slope are provided.

Geobags

High tide at East Coast Park

Rock Slope

Composite stepped sea wall

Figure 2.8.1: Coastal protection at East Park in Singapore including Height against sea water level rise by climate change

Source: "Singapore's Climate Action Plan: A Climate Resilient Singapore for A Sustainable Future", 2016

3) Singapore Marina Barrage

Marina Barrage (MB) creates Singapore's 15th reservoir, the first in the heart of the city. It was officially opened in Oct 2008. Marina Barrage brings about three benefits: a new source of water supply, flood control and a lifestyle attraction.

Water supply

Marina Barrage is a dam built across the 350-metre wide Marina Channel to keep out seawater, creating the 15th reservoir in downtown Singapore.

Flood Control

Marina Barrage is part of a comprehensive flood control scheme to alleviate flooding in the low-lying areas in the city such as Chinatown, Boat Quay, Jalan Besar and Geylang. During heavy rain, the series of nine crest gates at the dam are activated to release excess storm water into the sea when the tide is low. In the case of high tide, giant pumps can drain excess storm water into the sea.

Lifestyle Attraction

Unaffected by tides, water level in Marina Reservoir is kept constant all year round. This is ideal for all kinds of recreational activities such as boating, kayaking and dragon boating.

Figure 2.8.2: Marina Barrage in Singapore

Photo by JICA Project Team

2.8.4 Capacity building

Singapore has developed a comprehensive water resources management system. Singapore's experiences in successfully managing water stress, flood mitigation, water harvesting, and other water saving measures could be best utilised for training for other Member States. Monitoring and analysis of climate change impacts on rainfall and sea level rise could be continued, while impacts of increasing rainfall (frequency and intensity) which could cause floods and CCA against such condition could be studied.

2.9 Thailand

2.9.1 Institutional and policy development

(1) Laws/Regulations, National Plan, Strategies and Policies

The Disaster Prevention and Mitigation Act 2007 superseded the out-dated Civil Defence Act 1979 and the Fire Prevention and Suppression Act 1999. The Act designated the Department of Disaster Prevention and Mitigation (DDPM) as the principal government department responsible for national disaster management work. The Act provides the basic legal framework for disaster management in Thailand. The core principles in the Act will:

- Establish the DDPM with the responsibility to prevent and mitigate all types of disasters to include accidents and post disaster rehabilitation;
- Extend the disaster management scope to encompass all types of disasters and the definitions of disaster and security threats;
- Designate the National Disaster Prevention and Mitigation Committee to set the policy for the development of the National Disaster Prevention and Mitigation Plan;
- Designate the Department of Disaster Prevention and Mitigation as the national focal point to execute disaster management activities for the country; and
- Formulate three disaster prevention and mitigation plans at the national, provincial, and Bangkok Metropolitan levels.

The Environment Promotion and Quality Preservation Act B.E. 2535 stipulates the requirements for the general environment conservation in Thailand. Although there exist a lot of climate

change related laws, a comprehensive climate change mitigation and adaptation law which stipulates the climate change mitigation and adaptation has not been enacted to date. The existing legal framework related to climate change is as follows.

- Enhancement and Conservation of National Environmental Quality Act (1992)
- Royal Decree on Establishment of a Greenhouse Gas Management Organisation (2007)

The implementation of the 12th National Economic and Social Development Plan (NESDP) 2017-2021 has begun on the October 1, 2016, and will continue until September 30, 2021. The Office of the National Economic and Social Development Board (NESDB) reported that the 12th NESDP was worked out in accordance with the 20-year national strategy 2017-2036.

The 20-year national strategic plan as well as the 12th NESDP consists of 6 areas, 6 primary strategies and 4 supporting strategies. The 6 areas include (1) security, (2) competitiveness enhancement, (3) human resource development, (4) social equality, (5) green growth, and (6) rebalancing and public sector development.

The 6 primary strategies seek to enhance and develop the potential of human capital; ensure justice and reduce social disparities; strengthen the economy and enhance competitiveness on a sustainable basis; promote green growth for sustainable development; bring about national stability for national development toward prosperity and sustainability; and enhance the efficiency of public sector management and promote good governance.

In the 12th NESDP, climate change mitigation and adaptation as well as DRR are stressed in the strategy “promote green growth for sustainable development”. However, there is no clear-cut indication on the integration of DRR and CCA.

The National Disaster Prevention and Mitigation Plan (NDPMP) 2010-2014 is the principal national disaster management plan, which focuses on minimizing disaster risks and loss of life and property. Guidelines are delivered for pre, during, and post disaster management activities. The NDPMP intends to structure the operations and preparedness process across the agencies for all phases of the disaster management cycle. Building capacities of the agencies involved in disaster preparation, prevention, response and mitigation and rehabilitation is the major key objective. The National Disaster Risk Management Plan (2015) is the replacement of the National Disaster Prevention and Mitigation Plan 2010-2014.

The Strategic Plan on Climate Change was approved by the Cabinet in 2008 and provided a framework for national responses to climate change, outlining 6 strategies: (1) build capacity to adapt and reduce vulnerabilities to climate change impacts; (2) promote GHG mitigation activities based on sustainable development; (3) support research and development to better understand climate change, its impacts, and adaptation and mitigation options; (4) raise awareness and promote public participation; (5) build capacity of relevant personnel and institutions and establish a framework of co-ordination and integration; and (6) support international co-operation to achieve the common goal of climate change mitigation and sustainable development.

In 2009, the Office of Natural Resources and Environmental Policy Planning (ONEP) developed a policy titled the National Master Plan on Climate Change (NMPCC) 2010-2019, later replaced by the Climate Change Master Plan (CCMP) 2012-2050. The CCMP outlines strategies for CCA, mitigation, and capacity building for climate change management as well as policy

recommendations in several key areas, including urban areas, costal zones, inland freshwater ecosystems, public health, agriculture, forest ecosystems, and public infrastructure.

CCA has been highlighted in national policy frameworks, and national and sectoral plans such as the 12th NESDP, the National Strategies for Climate Change (2008-2012), the National Master Plan on Climate Change 2010-2019, and Strategic Plan on Climate Change for the Agriculture Sector 2012-2016 etc. The overarching aim of these policies and strategies for CCA is to build capacities on adaptation to respond and reduce vulnerabilities to the adverse impact of climate change.

The Master Plan on Climate Change 2015-2050 (CCMP) is the most recent integrated framework of policies and actions related to climate change and mitigation in Thailand. There are 3 key approaches in the CCMP such as:

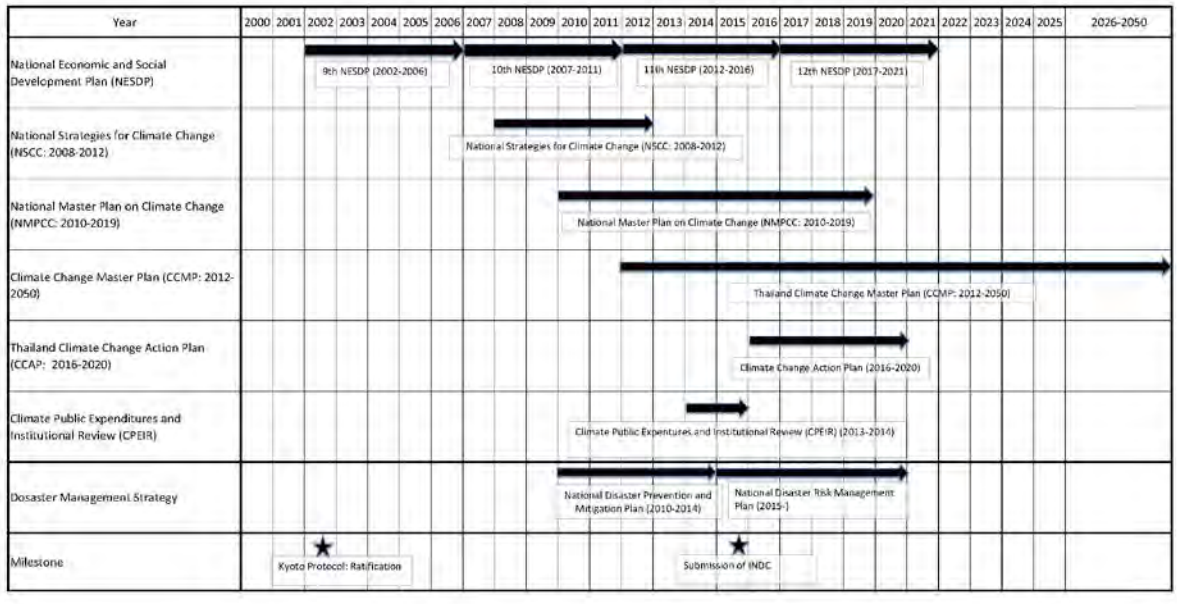
- Adaptation to Climate Change Consequences;
- Green House Gas Mitigation and Low-Carbon Development; and
- Capacity Building for Planning and Implementation of Mitigation and Adaptation of Climate Change

The Master Plan is divided into three phases: short (2016), medium (2020), and long terms (2050 and beyond).

Meanwhile, with the assistance of UNEP and UNDP (NAP-GSP), Thailand is implementing a two-year (2015-2016) project of developing its National Adaptation Plan (NAP) in two phases. The first phase (2015) included the activities on drafting assessment of vulnerability database and vulnerability maps, and suggestion of drafting NAP based on gaps and needs, priority list and methodologies. The second phase (2016) included the formulation of the national database of adaptation measures based on the review of the first phase.

The timeframe for strategies and policies on climate change and disaster management of Thailand is tabulated as below.

Table 2.9.1: Timeframe for Strategies and Policies on DRM and Climate Change (Thailand)



(2) Organisational Structure

The Department of Disaster Mitigation and Prevention (DDPM), established in 2002, has been designated as national focal point to carry out disaster management activities in Thailand. The National Disaster Prevention and Mitigation Committee (NDPMC) has formulated the National Disaster Prevention and Mitigation Plan (NDPMP) to provide frameworks and guidelines to facilitate and ensure the systematic, integrated, synergized and harmonious among concerned agencies of all sectors and levels in handling disaster.

The DDPM is tasked to provide disaster relief assistance to the affected population, organize disaster management training courses, and monitor the performance of agencies in accordance with the national plan. One of the major responsibilities of the DDPM is to formulate policy, guideline and measures on disaster prevention and mitigation.

Regarding the overall institutional setting, the National Disaster Prevention and Mitigation Committee (NDPMC) has been established to formulate national disaster management policy, to integrate public-private partnerships for the development of efficient and effective disaster management system, as stipulated under the provisions of Article 6 and 7 of Disaster Prevention and Mitigation Act (2007).

At the operational level, the National Disaster Command Headquarters (NDCH), the Central Disaster Management Centre (CDMC) and the Provincial Disaster Management Centre (PDMC) are tasked to direct, control, provide support for and coordinate DRM efforts within the respective jurisdictions.

Thailand has established a number of institutional arrangements to address climate change response at the national level. The National Committee on Climate Change (NCCC) was established in 2007. Chaired by the Prime Minister, the NCCC serves as an important forum for formulating climate change policies, consisting of the permanent secretaries general from line ministries, together with representative members from the Bangkok Metropolitan Region and the National Economic and Social Development Board (NESDB).

Under the MONRE, the Office of the Natural Resources and Environment Policies and Planning (ONEP) is the responsible organisation for climate change planning, making strategies and actions at national level, and cooperation and negotiation at international level.

At the same time, the Climate Change Coordination Office (CCCO) was set up under the ONEP to act as the Secretariat of the NCCC. The CCCO is subject to be strengthened to deliver effective performance on policy coordination, international negotiation, national strategy development, and capacity building.

Another important mechanism is the Greenhouse Gas Management Organisation (TGO). Established in 2007, the TGO serves as the Designated National Authority (DNA) for Clean Development Mechanism (CDM) projects. It reviews CDM projects for approval, provides technical assistance, plays an important the role in development of a GHG database, engages in capacity building, and promotes low carbon activities.

(3) Funding Structure

One of major available international funding sources for Thailand is the Integrated DRM (IDRM) Fund which was established by the ADB in 2013 to assist the development of ADB developing member countries in Southeast Asia.

Domestically, the Government of Thailand created the National Catastrophe Insurance Fund (NCIF) to offer insurance coverage against natural disasters. The NCIF will cover floods, earthquakes and storm damages. The limit of cover is classified into three categories as follows.

- Private Dwellers: limited to THB 100,000, premium rate 0.5 per cent of the limit
- Small and medium-sized industry: total property sum insured not exceeding THB 50 million, cover limited to 30 percent of property sum insured, premium rate 1.0 percent of limit
- Large industries: total property sum insured over THB 50,000,000, cover limited to 30 percent of property sum insured, premium rate 1.25 percent of limit
- The prevention and mitigation for disasters such as adaptation activities have no clear-cut boundaries with general economic and social development. However, the financial sources for the prevention and mitigation of disasters to be mobilized are scattered among line ministries. According to the Climate Public Expenditure and Institutional Review (CPEIR) database of Thailand, the climate change spending related to the prevention and mitigation of disasters occupied 2.72 percent of the total government expenditure for the financial year 2011-2012.

Although the Government of Thailand currently does not access to the Adaptation Fund, the CCA projects below are recently and currently funded by the international funding sources. The list of the funding sources for the CCA projects funded by the international funding sources is tabulated as below.

Table 2.9.2: List of Funding Sources for Climate Change Adaptation Project (Thailand)

Project Name	Funding Source	Duration
USAID Mekong Adaptation and Resilience to Climate Change Project	USAID's Regional Development Mission for Asia (RDMA)	2011-2016
USAID Adapt Asia-Pacific Program	USAID's Regional Development Mission for Asia (RDMA)	2011-2016
Improved management of extreme events through ecosystem-based adaption in watersheds	German Federal Ministry for the Environment, Natural Conservation, Building and Nuclear Safety (BMUB)	2013-2016
Mainstreaming CCA and DRR (MADRID) Project	UNDP, Bureau for Crisis Prevention and Recovery (BCPR), ADB, GEF- Special Climate Change Fund (SCCF)	2014- 2018
Risk-Based National Adaptation Plan (Risk NAP)	BMUB	2015-2019
JICA ADAP-T Project	JICA	2016-2021
Global Environment Facility: Small Grants Programme (GEF SGP)	Global Environment Facility (GEF)	On-going since 1993
Mangroves for the Future Small Grants Facility	Mangroves for the Future (MFF) and International Union for Conversation of Nature (IUCN)	On-going since 2006

Source: Asia Pacific Adaptation Network 2016

The assessments on the current funding system for DRM and climate change of Thailand are summarised as below.

- Although there is a wide range of options to mobilize DRM and climate change finance from various domestic and international funding sources, they are not fully utilised.
- There is no built-in funding system as well as the compulsory budgetary allocations that support pre-disaster or stand-by funds for local government units.
- The Government of Thailand is exploring the possibility of adoption of the Climate Change Expenditure Tagging (CCET), enabling consistent assessments of climate spending at the national level.

(4) River Basin, River and Forest Management Systems

The Department of Water Resources (DWR) under the Ministry of Natural Resources and Environment (MONRE) is the agency responsible for coordinating river basin management (RBM) as well as water resources management (WRM) including Drought Risk Management, FRM and Landslide Risk Management (LRM). FRM by the DWR is for the areas other than the irrigation areas. However, the DWR is still based on the Governmental Regulation, and Water Law (Act) is being prepared. Hence, the mandate of the DWR is still not clear. For RBM, under the National Water Resources Committee chaired by the Prime Minister, River Basin Committees composed of various stakeholders are set-upped for the 25 major river basins, which are divided into 8 groups.

The DWR formulated the “The Strategic Plan on Thailand's Water Resources Management” in 2015, which is already approved by the Government. The Strategic Plan of WRM has 6 Strategies including 1) Water management for domestic use, 2) Water security for agriculture and industry, 3) Flood management, 4) Water quality etc. Based on the Strategic Plan, related agencies such as the Royal Irrigation Department (RID) etc. will cooperate for formulate RB master plans for each strategy in the future. For this, approval of the Water Act is basically necessary.

Consistent management of river courses (River Management: RM) including surrounding areas (easement zones) from upstream to downstream is lacking. Management of a river is divided into Local Government Units (LGUs), Royal Irrigation Department (RID) for the areas irrigation areas etc. It is necessary to manage rivers by one agency or to develop coordination mechanism for RM.

The Royal Forestry Department of MONRE and Marine and Coastal Resources Department, MONRE are in charge of upland forest management and mangrove forest in the coastal areas respectively. These forest managements are actively conducted by involving communities.

2.9.2 Risk assessment

Disaster database has been developed. Downscaling from GCMs have been conducted by some research institute. Flood and landslide hazard maps are prepared for the country and provinces.

(1) Disaster database

Department of Disaster Prevention and Mitigation (DDPM) has developed the database system of disasters, which is opened in the web-page of DDPM. In the database, historical disaster data by area and country is available with table format as well as in graphs and maps, which is very useful for decision making of DRM.

(2) Meteorological data management and downscaling from global climate models

Meteorological Observation System:

Thai Meteorological Department (TMD) is responsible for weather observation and forecast. Radar rain gauges are owned by TMD (4 nos.) as well as by the Bangkok Metropolitan Administration (BMA).

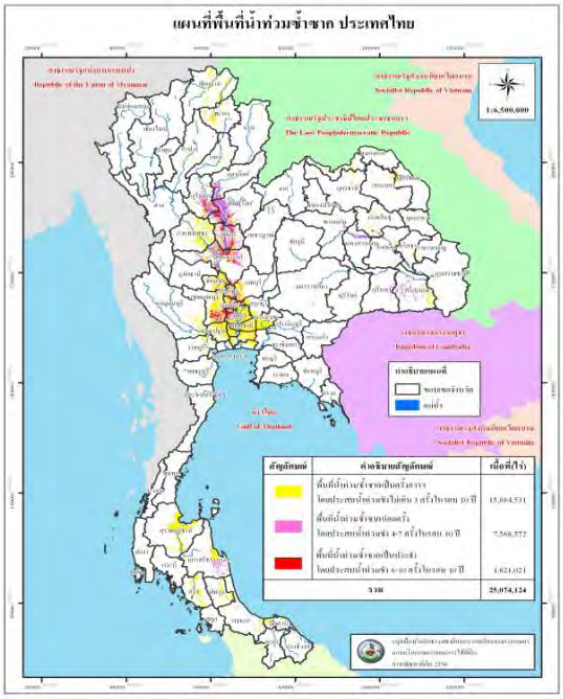
Downscaling from GCM:

Downscaling from GCMs is conducted not by government agency but by research institute such as the Southeast Asia START Regional Center (SEA START RC). JICA also supports downscaling from GCM.

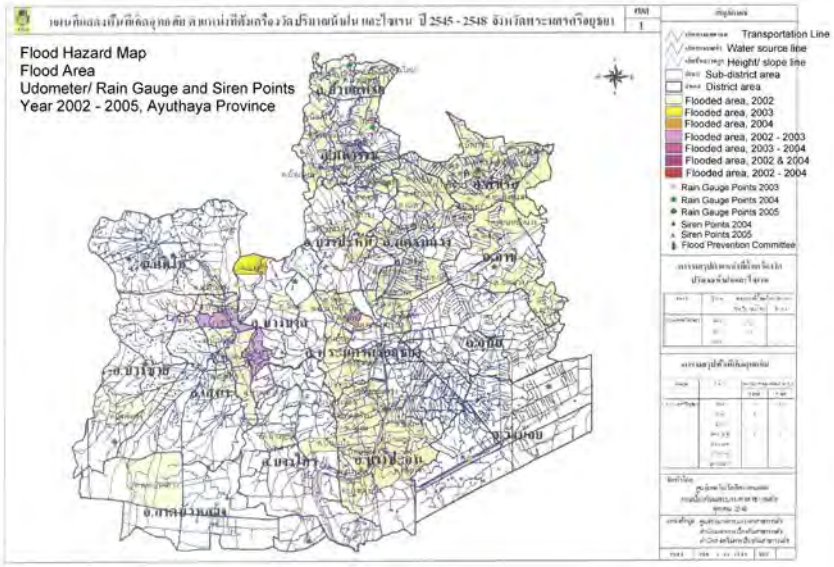
(3) Hazard and risk maps for flood, storm and landslide

Flood hazard maps:

DWR has prepared flood hazard maps in the country and in the regions and provided to DDPM. Also, flood hazard maps are made by specific projects.



Country Level



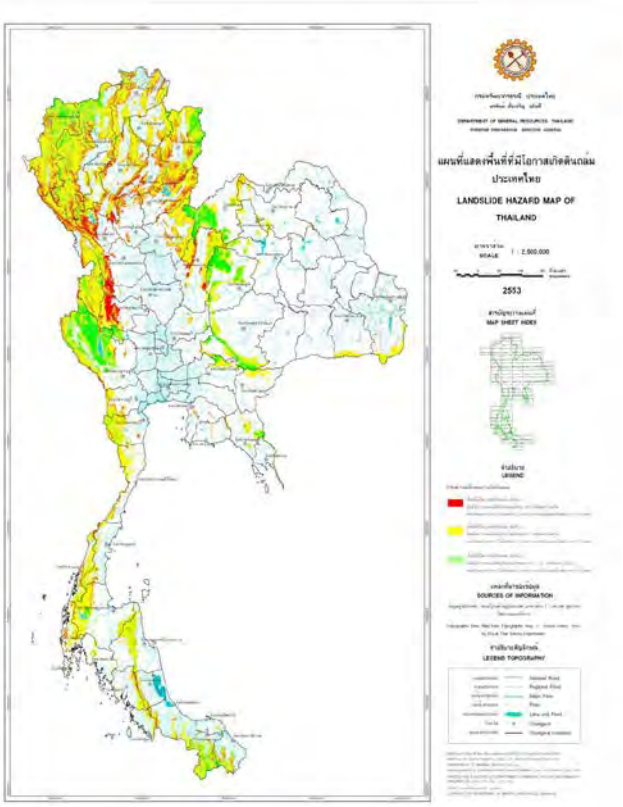
Province Level (Ayuthaya)

Figure 2.9.1: Examples of flood hazard maps in Thailand

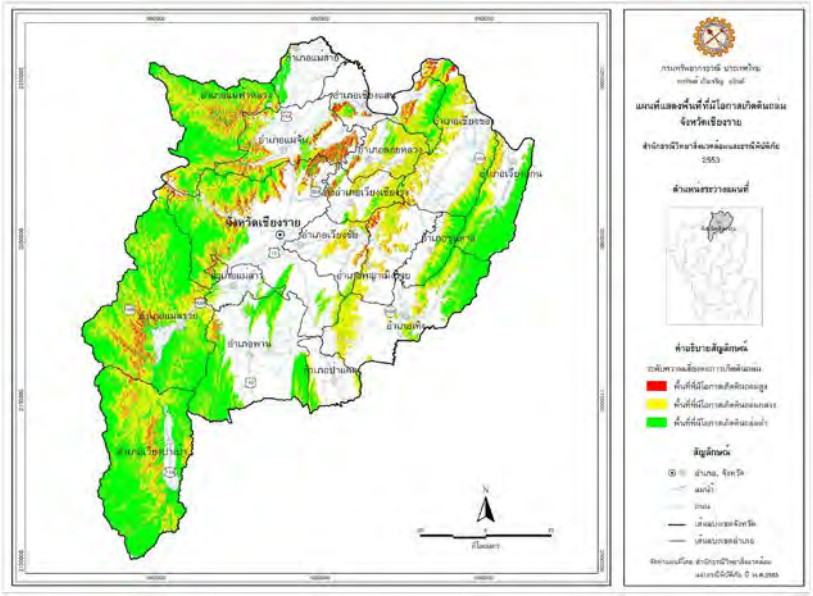
There are no floods hazard maps and risk maps with climate change impacts.

Landslide hazard maps:

The Department of Mineral Resources (DMR) under MONRE has prepared landslide hazard maps in the country and in provinces. Also, DMR has prepared landslide susceptibility maps in the country and in the provinces. Landslide risk maps have not been prepared yet.



Country Level



Province Level (Chiang Rai)

Figure 2.9.2: Examples of landslide hazard maps in Thailand

(4) Risk map for drought

Drought is a serious problem in Thailand mostly affecting the northeast part of Thailand (

3.9.3) during dry season (January to May). The causal factors of drought include (NDPMC, 2015)[25]: (1) Rainfall shortage/Dry spell: A drier than normal condition with abnormally low rainfall or no rainfall in the locations regularly receiving substantial seasonal rainfall, and (2) Break of downpour: A period during which the daily amount of rainfall is less than 1mm for 15 consecutive days during normal monsoon season. June and July are most likely to experience the break of downpour.

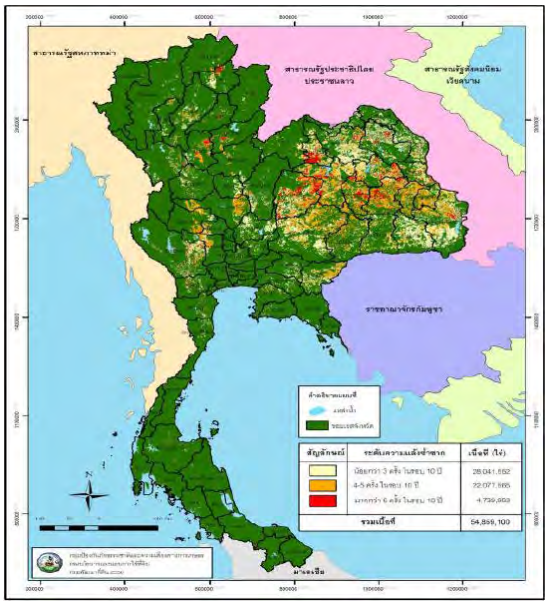


Figure 2.9.3: Drought Hazard Map

Source: NDPMC, 2015

During dry periods or drought, flow of major 25 river basins in Thailand reduce drastically to less than 16%, while rest of the flows occur during the rainy season of the total discharge of 199,627 m^3 (Marpraneet, 2014)[26]. There were nine severe droughts in the period of 1989-2011 (DWR, 2016)[27]. Over 8.7 million hectares – majority of them in the northeast region– are frequently affected by drought. In between 2007 and 2013, there has been significant increase in impact of drought.

Drought monitoring in Thailand is the main responsibility of Weather Observation Bureau of the Meteorological Department which manages 125 rainfall stations, 36 water level stations, 123 meteorological stations and 20 radar stations. Thailand provides short-term (daily), medium-term (weekly and monthly) and long-term weather (seasonal) forecasts for the applications of agriculture and water resources management. Thailand assesses its short-range weather forecast capabilities at a medium level and identifies that its long-range weather forecasting capabilities need improvements in numerical modelling techniques. The provincial emergency operations center responds to drought by providing regular updates on drought situation to the national level agencies and other stakeholders, mobilize water pumps, make requests for artificial rain and conduct surveys for drought assessment.

[25] NDPMC. (2015). *The National Disaster Risk Management Plan 2015.* National Disaster Prevention and Mitigation Comittee.

[26] Marpraneet, V. (2014). Drought conditions and management strategies in Thailand. Regional Workshop for Asia-Pacific on Capacity Development to support National Drought Management Policies. 6-9 May 2014 Hanoi, Vietnam: http://www.ais.unwater.org/droughtmanagement.

[27] DWR. (2016). Water Management. Bangkok: Department of Water Resources (DWR), Thailand.

2.9.3 Planning and implementation

There are general guidelines for DRM and FRM, but concrete guideline for FRM has not been prepared yet. Although CCA is not included up to now, there are examples of formulating FRM plans for the rivers. As for landslide, mainly land use management in landslide risk areas and tree planting on the slope have been conducted. There are some examples of coastal protection by planting mangrove.

(1) Flood and storm risk management

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

National Disaster Prevention Committee chaired by the Deputy Prime Minister of Thailand formulated the "Natural Disaster Risk Management Plan 2015", which is like a guideline of DRM in the country, focuses proactive approach against disasters from Prevention and Mitigation. However, the reality of the activities of DRM system is still mainly focused on Preparedness such as warning and evacuation and Response.

Relating to the above, DDPM formulated "The Master Plan for Prevention and Mitigation on Floods, Storm and Landslide" in 2007, which is being updated in the present. This Master Plan proposes basic strategies or directions against floods, storm and landslides disasters from Prevention and Mitigation, Preparedness, Emergency Response and Post-disaster Management. The Strategy of Prevention and Mitigation mentions followings:

Strategy 1: Prevention and Mitigation

- To formulate Integrated disaster prevention and mitigation plan
- To develop forecast and warning system
- To standardize hazard maps
- To develop database system
- To develop capacities of community, volunteer and local networks
- Others

The above Master Plan is a useful reference for the direction of formulating management plans against floods, storm and landslide. However, until now, concrete technical guideline or standard for DRR and CCA integration has not been formulated yet.

2) Flood Risk Management (FRM)

Royal Irrigation Department (RID) under the Ministry of Agriculture and Cooperatives (MoAC) is responsible for FRMfor the river reaches inside the irrigation areas., which is less than 10% of the country area. RID is also conducting hydrological observation such as rainfall, water level and discharge of the rivers. Based on the assistance of JICA, RID is now conducting feasibility study on the structural measures (a floodway) for the Chao Phraya River downstream reach.

Local Government Units (LGUs) are responsible for FRM in the river reaches other than the irrigation areas.

Private sectors such as industrial parks or sub-divisions of residential areas often have to construct flood control facilities such as polder dikes by themselves to protect their areas against floods, even though their lands are surrounded by irrigation areas.

The Department of Water Resources (DWR) under the Ministry of Natural Resources and Environment (MONRE) is the agency responsible for coordinating River Basin Management (RBM) as well as water resources management (WRM) including Drought Risk Management. FRM by DWR is for the areas other than the irrigation areas. However, DWR is still based on the Governmental Regulation, and Water Law (Act) is being prepared. Hence, the mandate of DWR is

still not clear. In terms of CC or CC Adaptation (CCA), DWR has just set-up a working group, and will start discussion about strategy of CC and CCA from now on.

(2) Coastal management

Mangrove forests are being recovered against erosion of the coastal areas in the pilot area around the coast (Bang Khum Thian in northern part in the Gulf of Thailand since 2007). Bamboo fences have been installed to make sand deposition inside the bamboo fence together with reforestation of the mangrove forest. By this, mangrove forests are being recovered in the eroded coastal areas before.

Figure 2.9.4: Mangrove reforestation by local knowledge with Bamboo Fences

Source: Marine and Coastal Resources Department, MONRE

(3) Landslide Risk Management (LRM)

DMR advices to LGUs and communities about small size structural measures as well as non-structural measures such as landuse management considering risks of landslide.

(4) Drought risk management

Drought management in Thailand comprises of drought monitoring system, a combination of drought mitigation measures implemented by the line ministries and the relief oriented drought response mechanism. At the national level, the drought management in terms of long-term risk mitigation sits with the line ministries while the relief and response is handled by the Ministry of Interior in association with the Department of Disaster Prevention and Mitigation, Ministry of Agriculture and Cooperatives. Committee for Water Allocation, which consist of ten agencies, including RID, DDPM, TMD, EGAT, has also set priority for water allocation during drought or water shortages. According to officials from RID, currently practiced water allocation priority in drought situation is domestic consumption, ecosystem, industrial use, and lastly for agriculture, respectively.

Drought has been identified as a disaster in the Disaster Prevention and Mitigation Act B.E. 2550 (2007). National Water Resources Management Strategy (2014) has identified seven tactics for drought resolution (DWR, 2016). Those are: Water management for domestic and consumption uses, watershed rehabilitation and increase cover crop planting, natural water courses rehabilitation (for both drought and flood mitigation), existing project efficiency improvement, water resources project development, water demand management, and increasing available water volume.

There are also roadmaps for immediate (2014), short term (2015), medium term (2016-2021) and long term (2020 beyond) actions (DWR, 2016). Drought is identified as a major disaster in policy

documents such as Disaster Prevention and Mitigation Act B.E. 2550 (2007) and National Water Resources Management Strategy (2014). Development of groundwater resources for domestic and agricultural sectors, rehabilitation of degraded forest areas, improvement of irrigation efficiency, dams/weirs management for water allocation, natural ponds development and rehabilitation, and demand side management (cropping pattern, rules adjustment for water allocation) are the identified drought mitigation actions in the National Water Management Strategy 2014 (DWR, 2016). The long-term plan is essentially similar except that it also mentions about trans-boundary river basin study but did not include the demand side management.

Under the Guideline for Disaster Prevention and Mitigation there are two identified approaches for drought mitigation. First is adjusting agricultural plan for the purpose of risk – sharing by means of reforestation, tree planting, growing ground cover plants to protect soil erosion, contour planting, introduction of disease resistant and drought – tolerant plants, as well as encouraging the cultivation of crops suited to local climate and soil conditions, etc. Another is development of deep and shallow wells.

The National Water Resources Committee (NWRC) is the apex body for managing country's overall water resources management, including droughts, such as supervising and monitoring projects, and advising the cabinet on policies and regulations (NEB, 2016)[28]. It functions on ad-hoc basis, and has no mechanism on its disposal to monitor the implementation of policies (ibid). At river basin level, Twenty-five River Basin Sub-committees (RBCs) under the NWRC are in-charge of managing water resources but RBCs have not so well defined roles and lacks authority for water allocation due to absence of National Water Law (ADB, 2013)[29]. The Royal Irrigation Department (RID), Department of Water Resources (DWR), and Department of Groundwater Resources (DGR) are mainly involved in Drought Management (NEB, 2016). The provincial emergency operations center (EOC) takes main responsibility in responding the droughts at the provincial level which is chaired by the provincial governor.

2.9.4 Capacity building

Thailand could adopt a step-wise integration of DRR and CCA. Generation, analysis and dissemination of climate information is a key for that. Climate information system, such as Thailand Drought Monitoring System, Thailand Flood Monitoring System or Flood Management System could be further promoted to provide appropriate types of information to planning, operational (project level) and community/public level such as real-time information provision with recommendations. Capacity building programs on river basin management may be considered with approaches such as conjunctive use of water, integrated dam operation, and improving communication mechanism about climate awareness at the community level. The government may also consider closing the gap between the information holders (supply) and the information uses/users (demand). In the meantime, initial experiences of CCA integration from other countries such as the ones in Indonesia, the Philippines or Viet Nam could also be shared. Thailand could also share its experience of introducing Weather Index Insurance for Agriculture (WIIA) to other member states.

[28] NEB. (2016). The Water Sector in Thailand. Bangkok: Netherlands Embassy in Bangkok (NEB). Retrieved from http://thailand.nlembassy.org/binaries/content/assets/postenweb/t/thailand/embassy-of-the-kingdom-of-the-netherlands-in-bangkok/import/factsheet-the-water-sector-in-thailand-3.pdf

[29] ADB. (2013). Sector Assessment (Summary): Water Resources Thailand. The Asian Development Bank (ADB). Retrieved from https://www.adb.org/sites/default/files/linked-documents/cps-tha-2013-2016-ssa-04.pdf

2.10 Viet Nam

2.10.1 Institutional and policy development (Ogawa)

(1) Laws/Regulations, National Plan, Strategies and Policies

The legislative and institutional framework regarding DRM in Viet Nam has been historically diverse. Since a stand-alone legal instrument on disaster management does not exist, prevention and response to different kinds of natural disasters is dealt with in different legal documents. For instance, floods are covered under the Ordinance on Prevention and Control of Floods and Storms (1993).

In order to solve this constraint, the Law on Natural Disaster Prevention and Control No. 33/2013/QH13L took effect in May 2014. The 47-article Law provides for DRR, CCA and mitigation measures, from national, local and community levels. Article 4 of the Law states the basic principles of natural disaster prevention and control in Viet Nam. According to Article 4, the natural disaster prevention and control contents must be integrated into national and local socio-economic development master plans and sectoral development master plans.

In order to substantiate the basic principles under Article 4 of the Law, the following documents were recently issued by the Government of Viet Nam.

- Circular to guide on how to implement the integration
- Guideline on how to implement the integration

Nevertheless, the current legislation system of disaster control and prevention in Viet Nam is quite bulky. There are more than 150 documents related to flood prevention, but most of them are regulations and by-laws which are not adequate to address the major concerns related to disaster control and prevention and mitigation.

The legislative and institutional framework regarding climate change in Viet Nam is also diverse, extending over a number of legal documents, and a complex legal and institutional regime is spread over various laws and regulations of different agencies in Viet Nam. Nevertheless, the following law and resolution are the basic legal basis for climate change in Viet Nam.

- Law on Environmental Protection (No. 55/2014/QH13): The Law specifies that environmental protection should be in harmony with economic development, social protection, biodiversity protection and adapting to climate change.
- Resolution (No. 60/2007/NQ-CP): The Resolution stipulates that the Government has assigned the MONRE to be in charge in collaboration with other related ministries and sectors to develop the NTP-RC for coping with global climate change.

The Government of Viet Nam is trying to enact the climate change law, and it is expected that the climate change law will be legalised by 2020 based on the draft of the MONRE.

In the Socio-economic Development Plan (SEDP) 2016-2020, DRR and CCA are considered in the priority areas. Through the SEDP 2016-2020, the Government of Viet Nam plans to improve regulations, policy and coordination for climate change, DRR, natural resource management, environmental protection and land use. More concretely, the DRR policies are stated in Output 2 of Outcome 3, while the CCA policies are stated in Output 1 of Outcome 3. However, there are no clear-cut indication of the integration of DRR and CCA in the SEDP 2016-2020.

Over the last decade, Viet Nam has shifted from ex-post disaster relief and response to ex-ante risk reduction through preparedness and resilience. In 2007, the government approved the National Strategy for Natural Disaster Prevention, Response, and Mitigation to 2020. To further advance the DRM agenda, the government's priorities include:

- Integrating disaster and climate risk into development planning;
- Developing a financing platform for DRM investments;
- Promoting community-based DRM;
- Developing GIS and spatial databases, and data formatting standards for DRM; and
- Establishing risk-financing mechanisms to mitigate the impact of natural hazards.

The National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020 approved by the Prime Minister in 2007 is a milestone in Viet Nam's disaster prevention, response and mitigation and sustainable development. The major objectives of the Strategy include:

- To enhance the capacities of forecasting flood, storm, drought, seawater intrusion, of informing earthquake, of warning tsunami and extreme hydro- meteorology phenomena, of which the focus is given to increase the early warning of storm and tropical depression to 72 hours in advance;
- To ensure that the development planning and building codes of socio-economic structures and residential areas in places frequently affected by disaster suit to regional standards for flood and storm control; and
- To ensure that socio-economic development plans and sectoral plans are integrated with the strategy and plans of disaster prevention, response and mitigation for a sustainable development.

The National Target Programme to Respond to Climate Change (NTP-RCC) was promulgated in 2008 and requires the mainstreaming of activities in response to climate change in all sectors and fields. The NTP-RCC set up action plans to respond to climate change in the short and long term. (The photo of the Seminar on Support Program to Respond to Climate Change Impact Analysis Study sponsored by JICA is shown on the left. The photo is taken from https://www.jica.go.jp/vietnam/office/information/press/ku57pq000021ivp3-att/201404_01e.pdf.)

In 2011, the Prime Minister approved the National Strategy on Climate Change, which sets out four specific objectives: 1) to ensure food security, energy security, water security, poverty reduction, gender equality, social security, public health, improved living standards and natural resource protection; 2) the development of a low-carbon economy; 3) improved public awareness including popularising climate-friendly ways of living and modes of consumption; and 4) enhancing international co-operation.

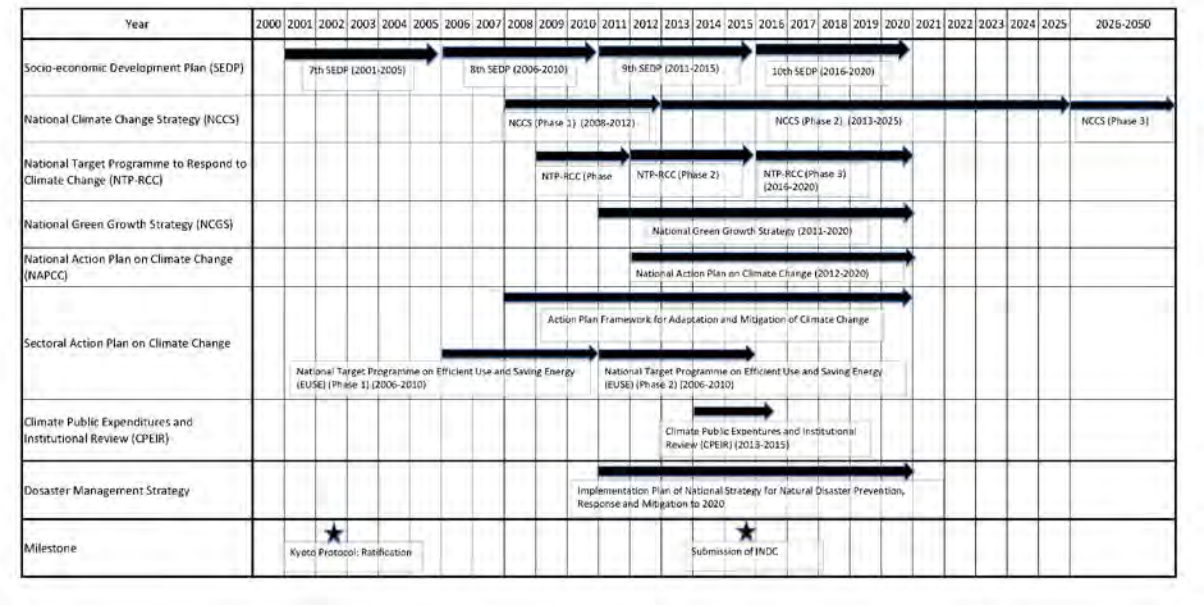
To implement the National Strategy on Climate Change, the National Action Plan on Climate Change (2012–2020) was issued in 2012. The Action Plan sets out its objectives and lists 65 programmes, projects and proposals, the timeline for their implementation and the agencies responsible for their implementation.

The National Action Plan for the Implementation of the 2030 Sustainable Development Agenda issued in conjunction with Decision No. 622/QĐ-TTg dated 10th May 2017 by the Prime Minister stipulated Viet Nam's sustainable development goals to 2030 consists of 115 targets, corresponding to the global sustainable development goals elaborated in the document "Transforming our world: The 2030 Agenda for Sustainable Development" adopted by the United Nations General Assembly in September 2015.

Regarding the monitoring and evaluation regime for the National Strategy, in order to develop and approve a set of monitoring and evaluation indicators for the National Strategy, the MARD developed a set of monitoring indicators including Indicator 13, the ratio of communes to develop a natural disaster prevention and control plan and integrate into a local socio-economic development plan.

The timeframe for strategies and policies on climate change and disaster management of Viet Nam is tabulated as below.

Table 2.10.1: Timeframe for Strategies and Policies on DRM and Climate Change (Viet Nam)



The assessments on the current DRM and climate change institutional setting of Viet Nam are described as below.

- Although there are the Law on Natural Disaster Prevention and Control (2013) and the Law on Environmental Protection (2015), the legislative framework on DRM and climate change in Viet Nam is diverse, extending over a number of legal documents. There is no stand-alone legal document concerning climate change. A complex legal and institutional regime is spread over various laws, decrees, ordinances, and decisions in Viet Nam.
- The National Target Programme to Respond to Climate Change (NTP-RCC) was promulgated in 2008 and requires the mainstreaming of activities in response to climate

change in major sectors. In this way, incorporating CCA into sector-wise strategies and policies has significantly progressed in Viet Nam. However, the integration of DRR and CCA remains unachieved in every sector.

- Several cities in Viet Nam prepared the city-wise local action plan for CCA for the purpose of the comprehensive formulation of CCA strategies and policies for these cities. In this way, although incorporating CCA into area-wise strategies and policies has progressed in Viet Nam, the area-wise integration of DRR and CCA also remains unachieved.

(2) Organisational Structure

At the national level, the Central Committee for Natural Disaster Prevention and Control (CCNDPC) was established with an aim of coordinating inter-ministries, agencies in organizing and directing the works of natural disaster prevention and control as well as the recovery works after natural disasters.

The Minister of the MARD is the chairman of the CCNDPC and is responsible for reporting to the Prime Minister. Two Vice-Chairmen are the Minister of National Defence and the Chairman of the Government Office. The DNDPC (Department of National Disaster Prevention and Control) of the MARD is responsible for coordinating the implementation of the disaster prevention response and mitigation plan as a secretariat of the CCNDPC with the following tasks:

- Monitoring, checking and promoting the implementation of ministerial, sectoral and local disaster management plans;
- Acting as national focal point for international cooperation to mobilise resources for natural disaster prevention, response and mitigation;
- Consolidating and assessing the implementation of the sectoral and local plans and submit to the Prime Minister ; and
- Directly steering programmes and projects under scope of responsibilities of the Ministry

The local-level Committee for Natural Disaster Prevention and Control exist in each province, district, and commune as follows.

- The Provincial Level: Provincial Committee for Natural Disaster Prevention and Control (PCNDPC)
- The District Level: District Committee for Natural Disaster Prevention and Control (DCNDPC)
- The Commune Level: Commune Committee for Natural Disaster Prevention and Control (CCNDPC)

The Disaster Management Centre (DMC) operates under the auspices of the Directorate of Water Resources of the MARD, and the main responsibilities of the DMC are to cooperate with the Department of Dyke Management, Flood and Storm Control ensuring the operation of the Standing Office for the Central Committee for Natural Disaster Prevention and Control (CCNDPC).

The main responsibilities of the DMC are to co-operate with the the DNDPC (Department of Natural Disaster Prevention and Control) ensuring the operation of the Standing Office for the Central Committee for Natural Disaster Prevention and Control (CCNDPC). The DMC consults the Directorate of Water Resources undertaking state management functions on natural disaster

reduction and CCA. At the same time, the DMC works as a focal point to coordinate all efforts for a long-term development disaster management at all levels.

The Ministry of Natural Resources and Environment (MONRE) has the principle responsibility for managing response to climate change. Within the mandates of MONRE, the Department of Meteorology, Hydrology and Climate Change (DMHCC) is assigned to coordinate climate change related activities while the Department of Legal Affairs (DLA) advises on the legal aspects of climate change. The DMHCC of the MONRE is also the national focal point to implement the UNFCCC and the Kyoto Protocol.

The Government of Viet Nam also established the National Committee on Climate Change (NCCC) in 2012 to lead, coordinate, harmonize, and monitor climate change. Chaired by the Prime Minister, with ministers of all key ministries as members, the NCCC is responsible for coordination between ministries and oversight of the implementation of the NCCS and other related programmes. The Ministry of Natural Resources and Environment (MONRE) supports the NCCC through the DMHCC and is the technical focal point for the climate change response policies.

The Prime Minister heads the NCCC, which includes ministers of the MONRE, the Ministry of Planning and Investment (MPI), the Ministry of Finance (MOF), the Ministry of Agriculture and Rural Development (MARD), and the Ministry of Transport (MOT) etc. as committee members. The DMHCC of the MONRE provides secretariat functions for the NCCC and coordinates related stakeholders such as ministries and provincial governments for developing and revising the National Target Programme to Respond to Climate Change (NTP-RCC).

In Viet Nam, there are some knowledge sharing mechanisms to share skills, knowledge and data on disaster risk reduction and climate change adaptation such as *National forum on Natural disaster risk reduction and climate change adaptation and the relevant website.*

The assessments on the current DRM and climate change organisational arrangement of Viet Nam are summarised as below.

- In Viet Nam, the Climate Change Bureau (CCB) and the Climate Change Coordination Office (CCCO), local focal points of climate change were set up in Ho Chi Minh City and Danang City, respectively. Local climate change adaptation plans were prepared by those local points, which are customized based on the integrated local situation of disaster risks and climate change scenario.
- The vertical coordination of the nation-wide 4-layer administrative levels of the National–Provincial–District–Commune Committee of is relatively weak in light of:
  - collecting, sharing and feedback the information on disaster management;
  - preparing and updating a disaster preparedness plan;
  - implementing risk identification and assessment;
  - carrying out a rapid damage assessment after disasters;
  - mobilising financial resources; and
  - monitoring and evaluation on implementing disaster management activities.

- Horizontal coordination between a DRM focal point and line ministries is insufficient.
- Opportunities for training and knowledge sharing on mainstreaming and integration of DRM and climate change at all local levels are not sufficient.

(3) Funding Structure

A large portion of the DRM is currently funded with development funds generated from the regular state budget of Viet Nam. The Government spending on the DRM is scattered over line ministries such as MARD, MONRE, MOT, MOC, MOIT, etc., and a growing amount of financing from the recurrent budget has been directed towards mitigation. The funding for DRM is not enough to meet its needs.

According to the Climate Change Public Expenditure and Institutional Review (CPEIR) database of Viet Nam, during the financial year from 2010 to 2013, the government of Viet Nam allocated about 88 percent of climate change response financing for projects related to DRM and CCA.

Article 10 of the Law on Natural Disaster Prevention and Control stipulates the natural disaster prevention and control funds with the following characteristics.

- Natural disaster prevention and control funds are set up at the provincial level and managed by provincial-level People's Committees. Natural disaster prevention and control funds neither include state budget funds nor originate from the state budget.
- Financial sources of natural disaster prevention and control funds:
  - Compulsory contributions of domestic and foreign economic organisations based in localities, and Vietnamese citizens aged from full 18 years and in the working age as prescribed by law; and
  - Other lawful sources.
- Natural disaster prevention and control funds are used to support natural disaster prevention and control activities, with priority given to the following activities:
  - Providing emergency relief in food, drinking water, curative medicines and other essentials to those suffering from damage caused by natural disasters;
  - Supporting the repair of houses, health establishments and schools. and
  - Handling environmental sanitation issues in natural disaster-hit areas.
- Natural disaster prevention and control funds must be managed and used in a proper, timely, public, transparent, equal and effective manner.
- The Government shall specify the setting up of natural disaster prevention and control funds, the levels of contributions, subjects eligible for exemption from, reduction or suspension of payment of, contributions, and the management, use, payment and finalization of those funds.

Fifty (50) provinces out of 63 provinces established the provincial natural disaster prevention and control funds, while 37 provinces out of 50 provinces actually do the collection of the funds.

In Viet Nam, at present, 41 provinces out of 63 provinces established the Forest Protection and Development Fund with the following objectives.

- Soil protection, erosion control and sedimentation of reservoir, river bed, stream bed;
- Regulate and maintain water sources for production and social life;
- Absorb and store carbon, reduce greenhouse gas emissions by measures to prevent forest degradation, reduce forest area and sustainable forest development;
- Protect the natural landscape and preserve the biodiversity of forest ecosystems for tourism services; and
- Services to provide spawning grounds, feed sources and wild animals, using water from forests for aquaculture.

After 8 years of the operation of the Forest Protection and Development Fund, there were 322 hydropower companies, 88 clean water companies and 59 tour operators signed the contracts.

Viet Nam has not been accessing to the Adaptation Fund so far, and the list of international funded climate change adaptation project is tabulated as below.

Table 2.10.2: List of Funding Sources for Climate Change Adaptation Project (Viet Nam)

Project Name	Funding Source	Duration
Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project	World Bank	2016-2022
Viet Nam Urban Water Supply and Wastewater Project	World Bank	2016 -
Can Tho Urban Development and Resilience	World Bank	2016-2022
Exploiting Synergies between Sustainable Urban Drainage System (SUDS) and Urban Farming	Nordic Development Fund (NDF)	2016-2019
Mekong Adaptation and Resilience to Climate Change (ARCC)	USAID	2011-2016
Integrated Coastal Management Programme	BMZ	2011-2017
Conservation and Sustainable Use of Forest Biodiversity and Ecosystem Services	BMZ	2014-2017
Strategic Mainstreaming Ecosystem-Based Adaptation	BMUB	2014-2018
Improving flood protection and drainage in medium-sized coastal towns and cities to help them adapt to climate change	BMZ	2012-2017
Integrated nature conservation and sustainable management of natural resources	BMZ	2007-2016
Innovative and Climate Resilient Housing in the Mekong Delta	NDF and ADB	2014-2016
Integrating CCA to Transport	NDF and ADB	2012-2017
Building Resilience and Inclusion (BRIGHT)	AusAID	2011-2017
Scaling up Community-Based Adaptation	AusAID	2009-2017

Source: Asia Pacific Adaptation Network 2016

The assessments on the current funding system for DRM and climate change of Viet Nam are summarised as below.

- In Viet Nam, a growing amount of financing from the recurrent budget has been directed towards mitigation. Therefore, although there is a wide range of options to mobilize DRM and climate change finance from various domestic and international funding sources, they are not fully utilized for CCA projects.
- The Climate Public Expenditure and Institutional Review (CPEIR) has been implemented by UNDP to effectively mobilise the limited financial sources.
- There is no built-in funding system as well as the budgetary allocations that represent pre-disaster or stand-by funds for local government units.
- The Government of Viet Nam has not yet introduced the Climate Change Expenditure Tagging (CCET).

(4) River Basin, River and Forest Management Systems

Department of Water Resources Management (DWRM) of the Ministry of Natural Resources and Environment (MONRE) is the responsible agency for Water Resources Management (WRM) and River Basin Management (RBM). However, law for RBM including WRM has not been enacted yet, and WRM and RBM have not been functioned well. DWRM is going to propose improvement of RBM systems including strengthening mandates of the River Basin Committee and River Basin Offices. It is expected successful improvement of the RBM System as the supporting system for water related DRR as well as CCA.

DWRM has the responsibility for River Management (RM). The RM includes management of permissions for constructing river related structures and management of easement zones along

the rivers for not building houses inside the easement zones. However, as the law for RBM and WRM has not been enacted yet, RM is also not conducted well. It is necessary to improve and implement the RM System as the supporting system for DRR and CCA.

VN Forest Administration Office is the responsible agencies of forest management including conservation of forest and reforestation for upland forest and mangrove forest in the coastal areas. There is a fund for forest management from hydropower, water supply and eco-tourism sectors, which is use for supporting communities for reforestation.

2.10.2 Risk assessment

Disaster databases have been developed such as disaster database showing disaster situation and risk areas based on administration boundary, and the disaster database showing inundation areas. Downscaling from GCMs has been done for all over the country. There are flood hazard maps without and with climate change covering Viet Nam Mekong Delta. Landslide risk maps are being prepared in the northern mountainous areas.

(1) Disaster database

The Department of Natural Disaster Prevention and Control (DNDPC) under the Ministry of Agriculture and Rural Development (MARD) is developing a disaster database. The Database shows on-going situation of disasters and disaster risk areas based on administration boundary.

DMC's role is technical support Directorate of Water Resources (DWR) of MARD. As one of the disaster data, the DMC and the Spatial Technology Institution (STI) of Viet Nam developed inundation map by heavy rain in Quang Ninh Province, which occurred on July 26, 2015, using satellite image of Sentinel 1 (SAR) (see figure below).

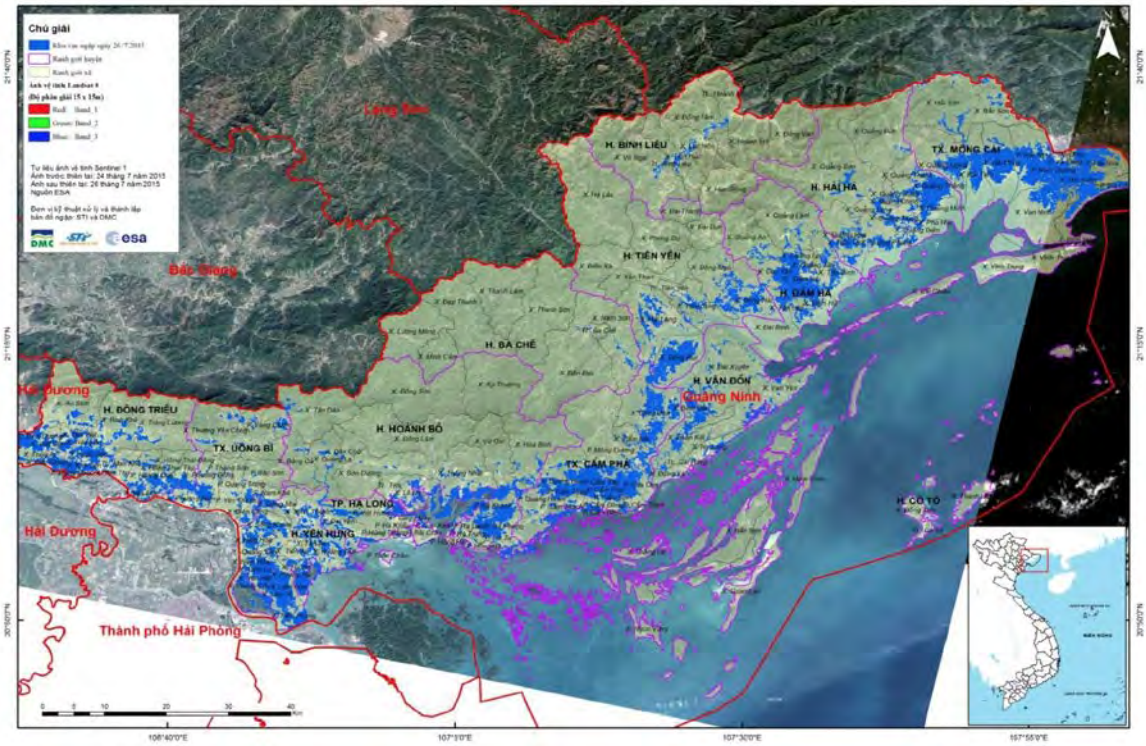


Figure 2.10.1: Flood map in Quang Ninh Province based on SAR Satellite Image

Source: DMC of MARD

In addition, in order to develop database system based on past satellite images in Viet Nam, to exchange satellite data when disaster happens, and to strengthen the capacity of application of remote sensing and Geographical Information System (GIS) technology for disaster prevention in Viet Nam, an agreement was signed between the DWR of MARD, Japan Aerospace Exploration Agency (JAXA) and the Viet Nam Academy of Science and Technology (VAST) in September 2015, and the works have started.

The DMC is developing inundation maps based on space-based technology under cooperation by AIT (The Asian Institute of Technology), UN-SPIDER (United Nations Platform for Space-based Information for Disaster Management and Emergency Response) and Tokyo University of Japan.

(2) Meteorological data management and downscaling from global climate models

Meteorological observation system:

The National Hydro-Meteorological Service (NHMS) under the Department of Meteorology, Hydrology and Climate Change (DMHCC) in the MONRE is the responsible agency for meteo-hydrological observation.

The NHMS also conduct flood forecast based on the observed meteo-hydrological data, data of radar rain gauges and real-time flood simulation by using MIKE11 software of Danish Hydraulic Institute (DHI). Forecast of meteorological condition (rainfall etc.) is conducted based on the results of Global Climate Models (GCM). The results of the forecast are utilized for flood warnings through media and Department of Natural Disaster Prevention and Control (DNDPC) of MARD to the concerned LGUs.

Downscaling from GCM:

The Institute of Meteorology, Hydrology and Environment (IMHEN) under MONRE conducts downscaling of GCMs, such as the AGCM of MRI (the Meteorological Research Institute, Japan), the PRECIS of Hadley Center (the United Kingdom) and the CCAM of CSIRO (Commonwealth Scientific and Industrial Research Organisation, Australia) with donors' help.

(3) Hazard and risk maps for flood, storm and landslide

Hazard maps and risk maps covering the whole country for storm, floods and landslides have not been prepared yet. Flood maps based on satellite images by DMC and forecasted flood maps by NHMS are one of the kinds of hazard maps. These flood hazard maps don't include climate change impacts.

Probable flood maps (2000 Flood with 100-year return period) as well as saline water intrusion maps due to drought are prepared by th Southern Institute for Water Resources Planning (SIWRP) in the Mekong Delta for without and with sea water level rise by climate change.

Landslides risk maps for north mountainous is being developed.

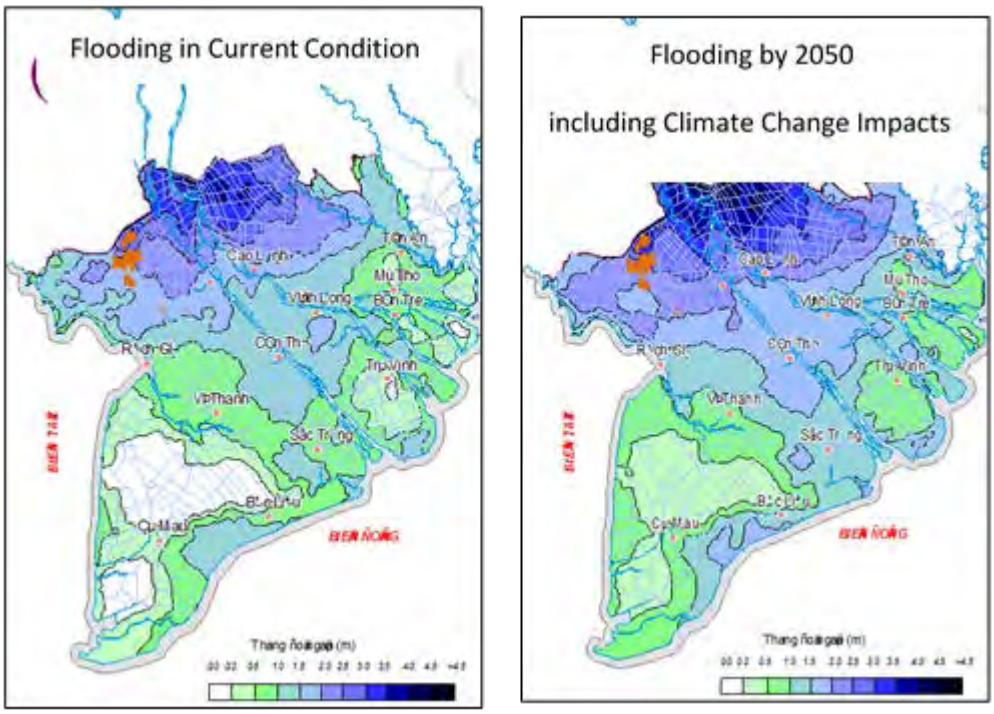


Figure 2.10.2: Simulated flood maps in the Mekong Delta in Viet Nam with sea water level rise by climate change

Data source: SIWRP of MARD

(4) Risk map for drought

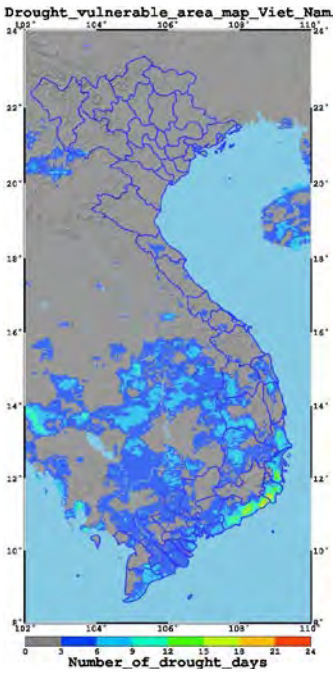


Figure 2.10.3: Drought vulnerability map of Vietnam

Source: University of Tokyo, 2016

Vietnam can be considered as one of the most drought-prone countries among ASEAN countries. During the past 50 years, droughts have taken place in 40 years in different extents and locations across Vietnam (UN Water, 2014)[30]. The most drought-prone areas in Vietnam are located in the southern Vietnam and important provinces that are affected by drought are Ninh Thuan, Binh Thuan, Khanh Hoa, Dak Lak and Binh Phuoc (Figure 2.10.3).

A combination of factors are being attributed to the severe drought impacts in Vietnam which include highly variable monsoon system that is directly affected by the El Nino conditions, lack of sufficient irrigation infrastructure, and ineffctive natural resource management including that of deforestation and depletion of water resources due to improper management and overexploitation (UN Water, 2014). While the 2015-16 drought is a recent one, Vietnam is historically vulnerable to droughts as the country was affected by major droughts in the past. Vietnam has faced the worst drougth in 100 years durign 2015-16. As a result, it has been expected that the major agriculture and other export commodities from the country including rice, coffee and sea food are expected be negatively affected as the water levels in the Mekong

[30] UN Water. (2014). National reports: Vietnam. Capacity Development to Support National Drought Management Policies. Regional workshop for Asia-Pacific region (p. 125). Hanoi, Vietnam: UN Water.

river reached lowest since 1926. The real GDP growth fell to 5.5% on year on year basis in the first quarter of 2016 from 7.01% from the last quarter of 2015. As a result of the drought and damage to agriculture fields due to combined pressure of salinization (IMF, 2016)[31]. A total of 659,476 ha of crops have been damaged, 69,009ha of aquaculture have been affected and over 8,337 animals died. The Government estimates the total economic loss at VND 15,032 billion (approx. US$ 674 million) or 0.35% of the national GDP, with for the first time in decades a negative agricultural growth of 0.18 percent (UNDP, 2016)[32]. Though these severe impacts are attributed to the severe El Nino conditions, significant part of the drought impacts were also compounded by the saline water intrusion in the drought affected regions impacting the use of limited available freshwater for drinking and agricultural purposes. As a result, 11 provinces in the Southern Vietnam were affected by saline water intrusion in various degrees.

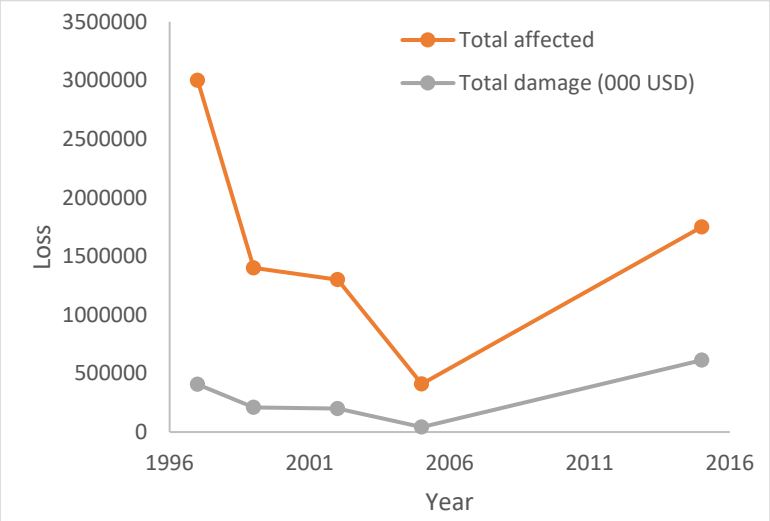


Figure 2.10.4: Impact of major droughts in Vietnam

Source: EM-DAT, 2016

2.10.3 Planning and implementation

Concrete guideline and standard for DRR and CCA integration against floods, storm and landslide has not been prepared yet. There are some examples of planning of FRM including structural and non-structural measures with sea water level rise by climate change impacts in Viet Nam Mekong Delta. There are some examples of coastal dikes including height against sea water level rise by climate change.

(1) Flood and storm risk management

1) Guideline and standard for DRR and CCA integration against floods, storm and landslide

There is no guideline and standard for DRR and CCA integration against storm and storm surge, floods and landslide disasters yet.

[31] IMF. (2016). Staff Report for the 2016 article IV Consultation. Washington D.C., USA: IMF.
[32] UNDP. (2016). Vietnam Emergency Response Plan 2016-17. Hanoi, Vietnam: UNDP.

2) Flood control in Ben Tre Province in Mekong Delta

Ben Tre Province is one of the provinces in Mekong Delta, where floods from the river and sea during high tide and drought are the problems. Agriculture such as paddy and coconuts plantation as well fish culture are widely conducted in the Province.

In order to solve the flooding problems, coastal dikes with sluice gates have been and being constructed to form as polder system for protecting the agricultural areas against floods by Viet Nam itself as well as by the World Bank etc. The height of the coastal dikes is set considering sea water level rise by climate change.

Salinity intrusion into the agricultural areas during dry season is also a problem. Diversification of rice to coconut trees with more resistance against salinity have been initiated by the farmers and have been supported by the foreign assisted projects such as DANIDA (Danish International Development Agency).

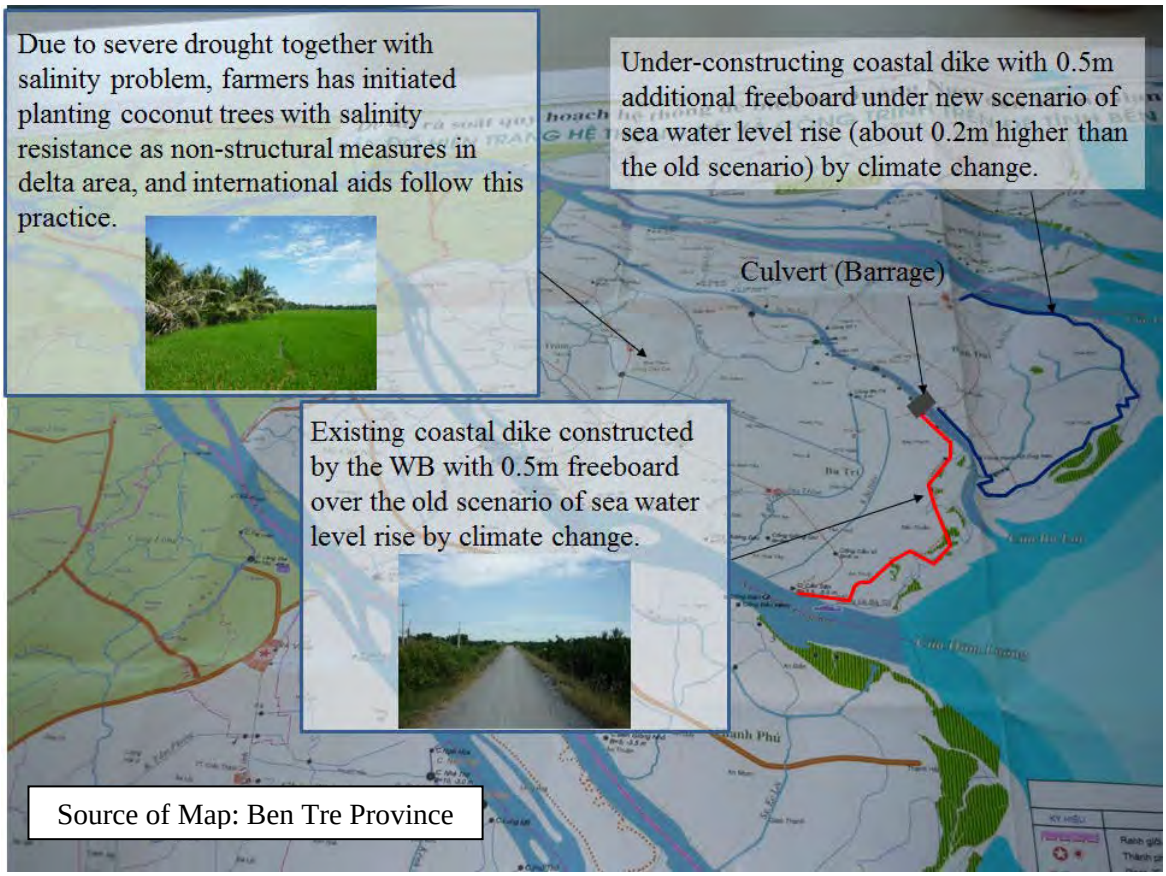


Figure 2.10.5: Ben Tre Province: Structural and non-structural measures against floods and drought

Photos: JICA Project Team

3) Flood control plan in Mekong Delta

Mekong Delta has experienced serious floods in 2000 with 100-year return period. This area also has experienced serious drought in 2015, which may have caused by natural phenomena of small rainfall as well as by artificial reason of the dams in the upstream basin of the Mekong River.

In order to solve the flooding problem, based on the target 2000 Flood with 100-year return

period, the SIWRP formulated a FRM plan with the sea water level rise by climate change as well as for not making worse the flooding condition in the upstream side (Cambodian side). For the FRM Plan, sea water level rise in 2050 is set at + 30cm from the present sea water level based on the medium emission scenario (by MONRE). In the FRM Plan, not only structural measures such as road cum dikes, channel improvements and sluice gates, but also non-structural measures for retarding flood water in some areas are proposed.

Figure 2.10.6: Plan of the "Flood Control Planning in the Mekong Delta by 2020, Vision to 2030"

Source: SIWRP of MARD

4) Other investigated Sites for FRM

a) Red River Flood Control System in and around Hanoi: Flood control by dikes or river walls along the Red River with flood safety level of 100 to 50 year return period. There is a possibility of heightening the dikes and river walls for climate change. However, there are many houses on the high water channel areas in the river sides.

b) Can Tho City Urban Development Plan including FRM Plane in Mekong Delta: Flood control plan is formulated for resilience of the City against climate change impacts.

(2) Drought risk management

In Vietnam, the institutional arrangements for drought risk reduction have been integrated with the overall risk reduction initiatives with the creation of central level National Committee that coordinates disaster risk reduction efforts among the line ministries. Though the Committee has multi-hazard

focus, the priority is often given to the sudden onset disasters due to their importance at the national level. The task of drought risk reduction is spread across the line ministries who handles the drought risk related emergencies and contingency plans for the constituents falling under their domain (Table 2.10.3). Currently, the roles and responsibilities for drought risk reduction are significantly response-oriented.

Table 2.10.3: Roles and responsibilities of various ministries for drought risk reduction in Vietnam

Ministry	Role in drought risk reduction
Ministry of Agriculture and Rural Development	Overall focal point for drought in the country, in specific focus on agriculture sector, developing drought management strategies for agriculture and rural areas, approve master plans for hydraulic works for drought risk reduction, mobilize material and tools for drought risk reduction, and issue, monitor and inspect water resources
Ministry of Health	Respond to health related emergencies during drought, capacity building of rural health professionals on related aspects
Ministry of Labour and Social Affairs	Address unemployment issues during drought periods by working with local provinces and implementing food for work programs
Ministry of Finance	Work with line ministries to assess drought impacts and provide financial relief and recovery plans and packages

Source: Authors

Community-based disaster risk management plans (CBDRM) have been well promoted in Vietnam with nearly 1700 communes completed these plans with community based risk maps. Drought monitoring and early warning has been continuously improved in Vietnam by the Hydro-meteorological and environmental station network center, The National Center for Hydro-Meteorological Forecasting (NCHMF) and the Vietnam Institute of Meteorology, Hydrology and Environment (IMHEN). Currently, Vietnam has 170 surface meteorological observing stations, 232 hydrological stations, 142 air and water environment monitoring stations, 393 rain fall points, 5 weather radar stations and 9 upper air meteorological stations with plans to install automated weather stations. The weather forecast in Vietnam is conducted at the national level by the National Center for Hydro-meteorological forecast in association with the regional and provincial centers which issue short term weather forecast (24 and 48 hours), and long-term weather forecast including 5 days, 10 days and monthly and seasonal forecasts.

The Table 2.10.4 lists some of the ongoing interventions in drought risk reduction in Vietnam in a project mode. In addition, the government of Vietnam is also promoting various programs including the National Community-based Disaster Risk Management Program that has significant implications on the effectiveness and sustainability of drought risk reduction projects implemented on the ground.

Table 2.10.4: Various ongoing disaster risk reduction projects with implications for drought risk reduction in Vietnam

Project	Agency	Purpose
Managing natural hazards	GFDRR/World Bank	Best practices for disaster risk management with support to CBDRM towards 2020
Strengthening institutional capacity for disaster risk management In Viet Nam including climate change related risks (SCDM Phase II)	UNDP and AusAid	Enhanced national and sub-national institutional capacities and evidence based actions
Greater Mekong sub-region flood and drought risk management and mitigation project	ADB	Reduce economic losses from droughts by upgrading water management infrastructure
Building climate resilience and ensuring	World Bank	Build climate resilience and ensure

Project	Agency	Purpose
sustainable livelihoods of farmers in the Mekong delta		sustainable livelihoods
Improved land governance and databases (VILG)	World Bank	Improve the efficiency and transparency of land administration
Sustainable agriculture transformation	World Bank	improve farming practices and value chains and capacity development of government agencies

Note: More efficiency related projects are listed in Table 2.10.5. Source: Authors

In terms of drought risk reduction and DRR, the Institute for Social and Environmental Transition (ISET) is working Salinity intrusion project in Can Tho city where they are applying the urban resilient framework developed by ISET and Arup. According to this framework, the vulnerability assessment and resilience building should run parallel so that the stakeholders engaged in interventions gain resilience. Salinity is an important problem in the Mekong during the drought season since there is little flow of water from the upstream and the high tide in the downstream leads to salt water intrusion. To address this issue, several NGOs are implementing interventions through infrastructural and soft measures. Major interventions to alleviate drought and seawater intrusion in Vietnam are focused on constructing reservoirs for irrigation purposes and constructing dams to prevent sea water contamination in the upstream water intake points of a river. Recognizing the importance of regular monitoring of salinity levels and relaying that information to various stakeholders, ISET-Vietnam has developed a salt water intrusion early warning system that provides an early warning to canal and reservoir gate operators to operate gates in such a way to mitigate the salt water intrusion. ISET has installed a salinity sensor that measures salinity in the river streams and sends the SMS to communities, scientists and other related agencies alerting about the salinity levels (More information on this can be found in the good practices section of this report). The Belgium government is implementing a study to understand the early warning needs and to develop a drought early warning system. In addition, due to improper management of reservoirs in the good years (i.e. release of excess water), the drought years are being severely affected. Hence, the Belgium government working on improving the seasonal weather forecasts and use those forecasts for proper management of reservoirs by the irrigation water companies.

The irrigation management companies keep close association with the water user groups formed under the catchment area of water supply systems. Irrigation companies are responsible for distributing water for agriculture production based on the cropping calendar made by the department of agriculture. Efficiency measures that have drought risk reduction potential have increasingly been promoted in Vietnam (Table 2.10.5). Promotion of drip and sprinkler irrigation has helped farmers to improve their economic status through stable crops during drought years. In the Tuan Tu village of Ninh Thuan province, large number of farmers who migrated to urban areas in search of employment have returned to the village after the introduction of sprinkler irrigation (More information on this can be found in the good practices section of this report). UNDP has supported IMHEN in developing a near real time drought monitoring and forecasting for all provinces/national level using the KBDI index and other hydromet data for rainfall, temperature, precipitation etc.

Table 2.10.5: Promotion of efficiency as a measure of drought risk reduction in Vietnam

Project	Donor	Measure
Viet Nam: Water efficiency improvement in drought affected provinces	ADB	Improving head works and distribution canals, capacity building of irrigation water companies and water user groups
Building a community demonstration model of applying traditional methods and advanced technologies in sustainable use of water	GCF Small Grants UNDP	Water harvesting, reducing evaporation losses and underground water storage
Promoting solar powered groundwater pumps	MCDU, BTC	Solar powered water pumps
Climate-smart agriculture	CCAFS,	SRI, alternative wetting and drying,

Project	Donor	Measure
	FAO, MARD	integrated farming

Source: Authors

Integration of climate change considerations into drought risk reduction is still at beginning stages in Vietnam and most of the agencies are currently trying to understand what implications climate change could have on the drought. One of such initiatives is the integrated water resources and urban development project by the Belgium government which started in 2013 with a 25 million euro grant in three provinces in the central north including Ninh Thuan and Bin Thuan provinces. This project looks at climate change projections and identifies risks and hazards, studies the existing climate change action plans to respond to these risks and integrates those into urban planning. However, in Ninh Thuan the project is also looking into rural areas. In 2014, the Ministry of Agriculture and Rural Development, Veitnam has approved the planning for agriculture land use to improve the readiness to climate change in the Cuu Long River Delta by 2020-2030. This plan envisages to enhance the region's resilience by adding value in agriculture production, increasing the sustainability and readiness to climate change.

2.10.4 Capacity building

River basin management (RBM) and river management (RM) are the basis for systematic DRM against water-related disasters from upstream to downstream. RBM could also be a basis for integrating DRR and CCA. Improvement in information management could be considered along with the use of results from climate models to assist production of readily usable information to address the DRR and CCA concerns. Similarly, information system and effective disaster mitigation measures (construction of dikes, dam regulation, watershed conservation, water savings etc.) could be combined for better decision making on DRR and CCA issues. Also equally important is to find measures to deal with interrelated disasters such as drought, storm surge, floods, and sea water intrusion. Vietnam could share its experiences on the monitoring and prevention of sea water intrusion and payment of forest environmental services to other member countries.

2.11 Status of DRR and CCA Integration in ASEAN

As a reference, an overview of DRR and CCA integration status in ASEAN Member States and relevant names of agencies, laws, regulations, policies and activities are summarised in Table 2.11.1.

Table 2.11.1: Overview of DRR and CCA integration in ASEAN Member States

No.	Item	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
1.	**Laws, regulations and policies**										
	National development plan (with DRR and CCA)	3rd RPJMN 2015-2019	NSDP 2014-2018	RPJPN 2005-2025	8th NSEDP 2016-2020	11th MP 2016-2020	NCDP 2011-2030	PDP 2017-2022	Singapore 2030	11th NESDP 2012-2016	10th SEDP 2016-2020
	Disaster risk management (DRM) law	DMO 2006	Law on DM (2015)	DM Law (2007)	PM Decree 220 (1999); NPDM (2001)	*Being developed;* NSC Directive No.20	NDM Law (2013)	RA10121 DRRM Act (2010)	Civil Defence Act (1986)	DPM Act (2007)	Law on DPC (2013)
	National DRM policy	SNAPDRR (2012)	NAP-DRR (2014-2018)	RENAS PB (2010)	NSPDRM (2003)	NPDRR (2013)	MAPDRR (2016)	NDRRMP (2012)	SCDF EPP	NDRMP (2015)	NSNDPRM to 2020
	Responsible agency for DRM	NDMC	NCDM Secretariat	BNPB	NDMO / DDMCC	NADMA	RRD	OCD	SCDF	DDPM	GDNDPC
2.	**Institutional arrangement**										
	National DRM committee	NDC/NCDM	NCDM	DMSC	NDPCC	NDMRC	NNDMC	NDRRM Council	Government Network	NDPMC	CSCNDPC
	Subnational DRM system	DCDM	PCDM/DCDM/CCDM	BPBD	DDPCC	DDMRC	DDDMC	LDRRM Office	District Network	DDPMC	DCNDPC
	National CCA policy	Sector-wise CC policies	CCCSP	RAN-API	CCAP	NPCC	MCCSAP	NCCAP (2011-2038)	NCCS	CCMP	NAPCC
	Responsible CCA agency	EIDPMO	MOE	DGCC, KLHK	DDMCC, MONRE	PASPI, NRE	ECD, MONREC	CCC	Resilience WG, MEWR and MND	ONEP, MONRE	DMHCC, MONRE
	National CC committee	SCCCC	NCSD	BAPPENAS/ KLHK	NSCCC	NCCC	NECCC	CCC	IMCCC	NCCC	NCCC
	River basin (land-use) management system	PWD	MOWRAM/ LGUs	DGWR, PU (Bare) / LGUs	DWR, MONRE/ MPWT	DID/ States	DWIR, MOTC/ LGUs	RBCO & LMB, DENR/ HLURB	PUB/ BCA/ HDB	DWR, MONRE/ LGUs	DWRM & DLA, MONRE
	Water resource management system	PWD	MOWRAM	PU	DWR, MONRE	DID/ States	DWIR/ IWUMD, MOALI	NWRB, DENR/ NIA	PUB	DWR/ RID	DWRM
	River management system	PWD	MOWRAM/ MAFF	DGWR, PU/ Bare/ LGUs	DWR/ Depart. Waterways, MPWT	DID/ States	DWIR, MOTC/ LGUs	LGUs/ DPWH	PUB	DWR/LGUs	DWRM/ DWR, MARD/ IWA, MOT
3.	**Financial arrangement**										
	Funding for DRM and DRR	Domestic Fund	Domestic fund	Domestic Fund	Domestic fund	Domestic Fund	Domestic fund	NDRRM Fund	Domestic Fund	Domestic Fund	Domestic Fund
	Funding for community-based DRM	CBDRM Program	Domestic fund	APBN	Emergency Response Fund	KWABBN Fund	CBDRR Fund	LDRRM Fund	Disaster Response Fund	IDRM Fund	CBDRM Fund
	Funding for CCA		Tracking by CPEIR	ICCTF				People's Survival Fund		Tracking by CPEIR	Tracking by CPEIR
4.	**Risk assessment**										
	Major water-related disasters	F, L, S	F, L,D	F, L, S, D	F, L, D	F, L, D	F, L, S, D	F, L, S, D	F, S	F, L, S, D	F, L, S, D
	Disaster data management	NDMC	NCDM	BNPB	NDMO / DDMCC	NADMA	RRD	OCD	No info.	DDPM	DMC
	Meteorological data management	BDMD	MOWRAM	BMKG	DMH	MMD	DMH	PAGASA	MSS	TMD	NHMS
	Downscaling from global climate models (GCMs)			BMKG		MMD		PAGASA	MSS		IMHEN
	Flood hazard map and risk map	PWD	MRC	BNPB/ BMKG	ADCP/ MRC	DID	DMH	MGB/ PAGASA		DWR / RID	NHMS/ SIWRP
	with CC impact					DID					SIWRP
	Landslide hazard map and risk map	PWD		PVMBG	MPWT	JKR / JMG		MGB	-	DMR	MOT
	with CC impact										
	Storm surge hazard map and risk map	PWD	-		-	-	DMH	MGB	No info.		
	with CC impact		-		-	-					
5.	**Planning and Implementation**										
	Policy and strategy of DRR with CCA	NDMC/ PWD	NCDM	BNPB/ PU	DDMCC/ DWR	NADMA/ DID	RRD/ DWIR/ IWUMD	OCD/ DPWH/ DENR/ LGUs	BCA	DDPM/ DWR	GDNDPC / DWRM
	Guideline and standard of DRR with CCA	PWD				DID		DPWH	BCA		
	Flood risk management (FRM) with CCA: Good practices			Semarang rivers with Sea Level Rise							Mekong Delta FRP with sea level rise
	Potential good practices	Elevated house	Elevated house	River improve. Etc.	River dikes	River improve. etc.	River improve. etc.	River improve. etc.	River improve. etc.	River improve. etc.	River improve. etc.
	Landslide risk management (LRM) with CCA: Good practices								-		
	Potential good practices			Land-use management		Land-use management		Land-use management	-	Land-use management	
	Storm and storm surge risk management (SRM) with CCA: Good practices	Coastal dikes with sea level rise	-	Coastal reclamation with sea level rise	-	-			Coastal reclamation with sea level rise		
	Potential good practices	Mangrove reforestation	-	Mangrove reforestation	-	Mangrove reforestation	Mangrove reforestation	Mangrove reforestation	Mangrove reforestation	Mangrove reforestation	Mangrove reforestation
	Drought risk (water resources) management								Water saving measures		
6.	**Capacity building**	CBDRM program	CBDRM program	2-week training by BAPPENAS	CBDRM program	CBDRM program	CBDRM program	CBDRRM program	CBDRM program	CBDRM program	CBDRM program

F: Flood, L: Landslide, S: Storm surge including flood caused by high tide and coastal erosion, D: Drought

DRM: Disaster risk management, DRR: Disaster risk reduction, CCA: Climate change adaptation, FRM: Flood risk management, LRM: Landslide risk management, SRM: Storm and storm surge risk management (including high tide and coastal protection)

- Not related

Not prepared or conducted yet (or not relevant) | Possessing direction or moving forward | Existing or being conducted

List of Acronyms of Table 2.11.1

Brunei	
BDMD	Brunei Darussalam Meteorological Department
DMO 2006	Disaster. Management Order, 2006
EID	Energy and Industry Department
NCDM	National Committee on Disaster Management
NDC	National Disaster Council
NDMC	National Disaster Management Centre
PMO	Prime Minister's Office
PWD	Public Works Department
RPJMN	National Medium-Term Development Plan
SCCCC	Stakeholders Consultative Committee on Climate Change
SNAPDRR	Strategic National Action Plan for Disaster Risk Reduction
Cambodia	
CCCSP	Climate Change Strategic Plan
NAP-DRR	National Action Plan for Disaster Risk Reduction
CCDM	Commune Committee for Disaster Management
CPEIR	Climate Public Expenditure and Institutional Review
DCDM	District Committee for Disaster Management
LGUs	Local Government Units
MAFF	Ministry of Agriculture, Forestry and Fisheries
MOE	Ministry of Environment
MOWRAM	Ministry of Water Resources and Meteorology
MRC	Mekong River Commission
NCDM	National Committee for Disaster Management
NCSD	National Council for Sustainable Development
NSDP	National Strategic Development Plan
PCDM	Provincial Committee for Disaster Management
Indonesia	
APBN	Anggaran Pendapatan dan Belanja Negara (State Budget)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)
BMKG	Badan Meteorologi, Klimatologi, Dan Geofisika(Indonesian Agency for Meteorology, Climatology and Geophysics)
BNPB	Badan Nasional Penanggulangan Bencana (National Disaster Management Agency)
BPBD	Badan Penanggulangan Bencana Daerah (Regional Disaster Management Agencies)
DGCC	Directorate General of Climate Change
DGWR	Directorate General of Water Resources
DMSC	Disaster Mitigation Steering Committee
ICCTF	Indonesia Climate Change Trust Fund
LGUs	Local Government Units
KLHK	Kementerian Lingkungan Hidup dan Kehutanan (Ministry of Environment and Forestry)
PU	Kementerian Pekerjaan Umum dan Permahan Rakyat (Ministry of Public Works)
PVMBG	Pusat Vulkanologi dan Mitigasi Bencana Geologi (Center for Volcanology and Geological Hazard Mitigation)
RAN-API	Rencana Adaptasi Perubahan Iklim (National Action Plan on Climate Change Adaptation)
RENAS PB	Rencana Nasional Penanggulangan Bencana (National Disaster Management Plan)
RPJPN	Rencana Pembangunan Jangka Panjang Nasional (National Long-Term Development Plan)

Lao PDR	
ADPC	Asian Disaster Preparedness Center
CCAP	Climate Change Action Plan
DDMCC	Department of Disaster Management and Climate Change
DDPCC	District Disaster Protection and Control Committee
DMH	Department of Meteorology and Hydrology
DWR	Department of Water Resources
MONRE	Ministry of Natural Resources and Environment
MPWT	Ministry of Public Works and Transport
MRC	Mekong River Commission
NDMO	National Disaster Management Office
NDPCC	National Disaster Prevention and Control Committee
NPDM	National Plan for Disaster Management
NSCCC	National Steering Committee on Climate Change
NSEDP	National Socio-Economic Development Plan
NSPDRM	National Strategic Plan on Disaster Risk Reduction
Malaysia	
DDMRC	District Disaster Management and Relief Committee
JKR	Jabatan Kerja Raya (Department of Public Works)
JMG	Jabatan Mineral dan Geosains (Department of Minerals and Geoscience)
JPS (DID)	Jabatan Pengairan dan Saliran Malaysia (Department of Irrigation and Drainage)
KWABBN	Kumpulan Wang Amanah Bantuan Bencana Negara (National Disaster Relief Fund)
MMD	Malaysian Meteorological Department
(11th) MP	Eleventh Malaysia Plan, 2016-2020
NADMA	National Disaster Management Agency
NSCCC	National Steering Committee on Climate Change
NDMRC	National Disaster Management and Relief Committee
NPCC	National Policy on Climate Change
NPDRR	National Platform for Disaster Risk Reduction
NRE	Ministry of Natural Resources and Environment
NSC	National Security Council
PASPI	Environmental Management and Climate Change Division

List of Acronyms of Table 2.11.1 *(continued)*

Myanmar	
CBDRR	Community Based Disaster Risk Reduction
DDMC	District Disaster Management and Relief Committee
DMH	Department of Meteorology and Hydrology
DWIR	Directorate of Water Resources and Improvement of River System
ECD	Environment Conservation Department
IWUMD	Irrigation and Water Utilization Management Department
LGUs	Local Government Units
MAPDRR	Myanmar Action Plan on Disaster Risk Reduction
MCCSAP	Myanmar Climate Change Strategy and Action Plan
MOALI	Ministry of Agriculture, Livestock and Irrigation
MOTC	Ministry of Transport and Communications
MONREC	Ministry of Natural Resources and Environmental Conservation
NCDP	National Comprehensive Development Plan
NDM	Natural Disaster Management
NDMC	National Disaster Management Committee
NECCC	National Environmental Conservation Committee
RRD	Relief and Resettlement Department
Philippines	
CCC	Climate Change Commission
DENR	Department of Environment and Natural Resources
DPWH	Department of Public Works and Highways
DRRM	National Disaster Risk Reduction and Management
HLURB	Housing and Land Use Regulatory Board
LGUs	Local Government Units
LMB	Land Management Bureau
MGB	Mines and Geosciences Bureau
NCCAP	National Climate Change Action Plan
NIA	National Irrigation Administration
NDRRMC(O)	National Disaster Risk Reduction and Management Council (Office)
NDRRM	National Disaster Risk Reduction and Management
NWRB	National Water Resources Board
OCD	Office of Civil Defense
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
RA (10121)	Republic Act No. 10121
RBCO	River Basin Control Office
PDP	Philippine Development Plan

Singapore	
BCA	Building and Construction Authority
IMCCC	Inter-Ministerial Committee on Climate Change
MEWR	Ministry of the Environment and Water Resources
MND	Ministry of National Development
MSS	Meteorological Service of Singapore
NCCS	National Climate Change Strategy
PUB	Public Utilities Board
SCDF	Singapore Civil Defense Force
SCDF EPP	Singapore Civil Defense Force Extended Police Posts
(Resilience) WG	(Resilience) Working Group
Thailand	
CCCO	Climate Change Coordination Office
CCMP	Climate Change Master Plan
DDPM	Department of Disaster Mitigation and Prevention
DMR	Department of Mineral Resources
CPEIR	Climate Public Expenditure and Institutional Review
DPM (Act)	Disaster Prevention and Mitigation (Act)
DWR	Department of Water Resources
LGUs	Local Government Units
MONRE	Ministry of Natural Resources and Environment
NCCC	National Committee on Climate Change
IDRM	Integrated disaster risk management
NDPMC	National Disaster Prevention and Mitigation Committee
NDRMP	National Disaster Risk Management Plan
NESDP	National Economic and Social Development Plan
ONEP	Office of Natural Resources and Environmental Policy Planning
RID	Royal Irrigation Department
TMD	Thai Meteorological Department
Viet Nam	
CBDRM	Community based disaster risk management
CCNDPC	Commune Committee for Natural Disaster Prevention and Control
CPEIR	Climate Public Expenditure and Institutional Review
CSCNDPC	Central Steering Committee for Natural Disaster Prevention and Control
DCNDPC	District Committee for Natural Disaster Prevention and Control
DLA	Department of Legal Affair
DMC	Disaster Management Centre
DMHCC	Department of Meteorology, Hydrology and Climate Change
DWR(M)	Department of Water Resources (Management)
GDNDPC	General Department of National Disaster Prevention and Control
IMHEN	Institute of Meteorology, Hydrology and Climate Change
IWA	Inland Waterways Administration
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
MOT	Ministry of Transport
NAPCC	National Action Plan to Respond to Climate Change
NCCC	National Committee on Climate Change
NHMS	National Hydro-Meteorological Service
NSNDPRM	National Strategy for Natural Disaster Prevention, Response and Mitigation
SEDP	Socio-economic Development Plan
SIWRP	Southern Institute for Water Resources Planning

As shown here, in general, institutional arrangement for DRR and CCA in terms of policy formulation and organisational setup from national to subnational levels is well developed in each Member State. However, coordination among national disaster management offices (NDMOs), or ACDM members, and other agencies in charge of DRR and CCA is not so strong in many countries. Particularly for subjects that require intensive coordination among relevant agencies and local governments, such as river basin management, water resources management and river management from upstream to downstream, an essential approach to reduce disaster risk in the area, it is still at a development stage in most countries.

The level of risk assessment for water-related disasters is advanced in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam, but climate risk assessment and its incorporation is still limited, such as at selected areas in Malaysia and Viet Nam. Similarly, the level of planning and implementation of DRR and CCA integrated projects vary from country to country. Development of guidelines incorporating disaster and climate risk is observed in Indonesia, Malaysia and the Philippines, but there is room to improve them by enhancing the science-based analysis.

It is inferred from that strengthening coordination among NDMOs and DRR and CCA line agencies for mainstreaming DRR and CCA policies and capacity building for DRR and CCA integrated risk assessment, planning and implementation are the two main areas ASEAN Member States need to improve. In other words, these two areas could be the focus for developing a regional collaborative activity to improve the current situation. Excerpts of the assessment in the six categories are shown below as well as in Annex 1:

1) Laws, regulations and policies

National development plan

- Each Member State has outlined the importance of DRR and CCA directly or indirectly in their respective national development plan. Among them, the Five-Year National Socio-Economic Development Plan VIII (2016-2020) in Lao PDR and the Philippine Development Plan (2017-2022) in the Philippines clearly indicate DRR and CCA as a main cross-cutting concern.

DRM policy and the responsible agency

- Each Member State has a national DRM policy and a designated DRM organisation based on the law (Cambodia, Indonesia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam), order (Brunei), decree (Lao PDR) and directive (Malaysia).

CCA policy and the responsible agency

- Each Member State has either climate change policy, strategy, programme or plan and a designated agency mostly under the ministry of environment. CCA is mainstreamed in each ministry's action plan in Cambodia and Indonesia.

2) Institutional arrangement

National DRM committee

- Each Member State has a national DRM committee consisting of multiple line ministries and agencies responsible for DRR and CCA.
- Often National Disaster Management Offices (NDMOs), i.e. ACDM members, focus on improving the awareness, preparedness and response to disasters while other line ministries/agencies, which are in charge of flood, storm, landslide and drought risk reduction are responsible for prevention and mitigation measures. Coordination between

them is essential for effective DRR, but it is still a challenge in many Member States. Some good practices are: the National Disaster Management Agency (NADMA) of Malaysia coordinates well with the Department of Irrigation and Drainage (DID) and other line agencies and the General Department of Disaster Prevention and Control (GDDPC) under the Ministry of Agriculture and Rural Development (MARD), Viet Nam, coordinates well with DRR-related agencies within the ministry.

National CC committee

- Each Member State also has a national CC committee consisting of multiple line ministries and agencies. The member composition is often similar to the one for the national DRM committee, but their direct coordination is rare. One good practice is in the Philippines where the DRR and CCA focal points signed a cooperation agreement to coordinate their works.

Vertical DRM system

- Each Member State has a vertical DRM system from national, state/provincial, district/municipal to village/community level. Some countries have direct command line of the NDMO to village/community level (e.g. the Office of Civil Defense in the Philippines), while most countries' system consists of subnational committees for disaster management often headed by the leader of the subnational government with participation of relevant agencies and departments.

3) Financial arrangement

Funding for DRM and DRR

- NDMOs' budgets are usually used for strengthening awareness, preparedness and response capacity of the institution at national and local levels. Investment for prevention and mitigation measures are often managed by other relevant line ministries/agencies based on their priorities.
- Funding pool for disaster management is mandated for local governments in the Philippines as the Local DRR and Management Fund (LDRRMF). Thirty percent of the LDRRMF is automatically allocated as Quick Response Fund (QRF) which serves as a stand-by fund for relief and recovery; while the rest is used for pre-disaster measures. In this way, the QRF incentivises local governments to invest in prevention and mitigation.

Funding for CCA

- Some Member States have CCA funds to promote implementation of local actions. For example, the Indonesia Climate Change Trust Fund (ICCTF), the only national trust fund for climate change in Indonesia, promotes land-based mitigation projects (forestation and conservation) and adaptation and resilience projects by providing small-grants; and the People's Survival Fund in the Philippines promotes projects for water resources management, land management, natural ecosystems conservation, forecasting and early warning systems, institutional development for droughts and floods, among others, based on the risk and vulnerability assessment.
- In Cambodia, Thailand and Viet Nam, a systematic qualitative and quantitative analysis of country's climate change-related public expenditures called Climate Public Expenditure and Institutional Review (CPEIR) has been implemented since 2011. By that, total climate change related expenditures are estimated at 6.3 percent and 2.7 percent of the total government expenditures in Cambodia and Thailand, respectively.

- The Vietnam Administration for Forestry has created a Payment for Forest Environment Services (PFES) system which collects service fees from hydropower generators, water suppliers and others. The annual revenue, about USD50 million - 60 million, is used for forest protection by the communities, forest owners, national parks and nature reserves.

4) Risk assessment

Disaster data management

- All Member States record disaster data and some of them disclose it (e.g. Cambodia, Indonesia, the Philippines, Thailand and Viet Nam).

Meteorological data management and downscaling from Global Climate Models (GCMs)

- All Member States have a meteorological data management system and some of them are downscaling from GCMs to provide climate risk information for risk mapping and DRR and CCA planning (e.g. Indonesia, Malaysia, the Philippines, Singapore and Viet Nam). Other countries collect downscaled values from national research institutes or domestic or foreign universities such as Tokyo University, CSIRO (Commonwealth Scientific and Industrial Research Organisation, Australia), NIES (National Institute for Environmental Studies, Japan), and SEA START RC (Southeast Asia START Regional Center, Thailand).

Hazard and risk map

- Most Member States have prepared hazard and risk maps for flood, storm and landslide but mostly the resolutions including the topographic data are insufficient for quantitative risk assessment and associated evacuation planning and designing of effective prevention and mitigation measures.
- Flood risk maps incorporating CC impact are prepared only in some areas in Malaysia and Mekong Delta in Viet Nam.

Quantitative evaluation of the effects of DRR and CCA

- Quantitative evaluation of the effects of DRR and CCA measures on human and economic impacts has not been implemented in any Member States yet.

5) Planning and implementation

Good practices

- There are some good and potential good practices of flood risk management incorporating CC risk in the design. However, as implementation of basic flood risk reduction measures based on a current designed return period is insufficient in many places, continuous implementation of such measures is needed.
- Landslide risk areas are often well-versed for non-structural measures including early warning, evacuation and restricted land-use (e.g. no built zone) to reduce potential risk. Implementation of such measures, as well as structural measures including check dams, is needed in the region.
- Forest conservation including reforestation is actively conducted in most Member States.
- There are some water-saving and drought risk reduction measures (see Box 1) implemented in various countries such as storage of flood water for the use in drought period, conservation farming, sprinkler irrigation, formulation of water user association and farmer association, among others.
- Integration of DRR and CCA concepts in a local development plan and a land-use plan guided by the national government is observed in some Member States (e.g. Indonesia, the Philippines).

Guiding tools for DRR and CCA integration

- The Department of Public Works and Highways (DPWH), the Philippines, has developed a guideline and standard for incorporating CC impacts into flood control planning. The Ministry of Public Works and Housing (PU), Indonesia, has developed a similar one and the Department of Irrigation and Drainage (DID), Malaysia, is also developing one.

6) Capacity building

- DRM training is actively conducted in each Member State particularly for local communities and other stakeholders including schools, hospitals and private companies, among others.
- The National Development Planning Agency (BAPPENAS) in Indonesia is providing a two-week training course for integrating DRR and CCA in local development plans for national and local government officials.
- Provision of location-specific weather and rainfall forecast and training of farmers to interpret the usage of the data proved to be effective in increasing the crop yields in some Member States (e.g. Indonesia, Myanmar and the Philippines).

Box 1: Condition of drought in ASEAN

Overall, ASEAN countries show considerable vulnerability to drought for the reason that the economies of ASEAN countries are significantly contributed by the agriculture and allied sectors and large proportion of populations are still employed by these sectors even though their share of contribution to the overall GDP is on the decline. The accurate comparison of importance of drought compared to other natural hazards such as floods, storms, landslides has not been possible due to limited reportage of drought impacts related data in the globally available datasets such as EM-DAT. While no drought-impacts related data has been reported in this data set for countries such as Lao PDR and Myanmar, limited number of drought-impact data were reported for other countries. The available data during 2000-2016 indicates Thailand reporting largest number of people affected by any given drought event followed by Cambodia and Indonesia during 2000-2016. However, the reported economic losses do not corroborate with the number of people and the economic losses were highest in Vietnam followed by Thailand and Cambodia.

In general, ASEAN countries are making progress in addressing drought risk reduction. One significant aspect of this progress is in terms of putting in place appropriate institutional mechanisms which form the basis for promoting various risk mitigation, preparedness and relief interventions. The progress in putting in place the institutional mechanisms from the national level to sub-national level is commendable and is derived from the ASEAN commitment to improve risk governance and the inspiration it draws from the global advancements in disaster risk reduction including Hyogo Framework of Action (HFA) and Sendai Framework. Even though the intuitional arrangements in ASEAN countries are multi-hazard focused, the specific focus given to drought risk reduction at the national level often falls short of the focus given to addressing sudden onset disasters such as floods, typhoons and landslides.

In terms of the best practices for drought risk reduction, it is evident that the ASEAN countries have been making steady progress by introducing various drought risk reduction practices that can result either in reduction of the drought intensity (i.e. reduce the degree of reduction in water availability) or drought impacts (i.e. for example reduced damage to crops through changes in crop varieties, cropping or efficient agronomic practices. Practices such as farmer field schools, climate field schools and water user associations are highly prevalent in the region while the progress towards risk assessments and their use in local and policy level decision making, improved weather forecasts that

cater to the location-specific conditions and needs and real-time drought monitoring and assessment are yet to fully take shape in the region.

In terms of hazard and vulnerability assessments, some progress has been made in terms of national level and prefectural level drought hazard maps in few countries. It is evident that hazard assessments can be improved both in terms of their scale, i.e. reaching down to the prefecture and village levels and in terms of their use in actual decision making in areas of policy targeting in general and water resource management and agriculture production planning in specific.

Climate change is a significant threat for the ASEAN region and can negatively influence the region's ability to address drought risks if the emerging concerns are not taken into consideration in planning and execution of drought risk reduction interventions. Countries are still at nascent stages of identifying and integrating the climate change concerns into drought risk reduction both at the policy level and at the programmatic and project level in terms of designing the interventions and their implementation on the ground. However, initiatives such as climate field schools, which have been tremendously helping farmers in planning their agriculture practices, and downscaled weather forecasting methods being piloted hold great potential in addressing climate change vulnerabilities of the ASEAN countries. The community based resource management in terms of farmer associations, water user associations and community based forestry are showing greater promise in addressing the underlying factors in terms of augmenting the capacity of local governments in addressing emerging risks.

Insufficient development of water resources assessment including water budgeting on demand and supply side and integrating this information into national and sectoral planning and policies needs urgent attention. Several countries either do not have comprehensive water resources assessments or are relying upon outdated assessments which needs to be updated. Groundwater assessment in specific requires an attention given the fact that the region is yet to optimally utilize its groundwater especially for its conjunctive use for drought risk reduction.

In terms of regional initiatives for addressing the drought risks in the ASEAN region, very few regional initiatives could be observed that are either directly promoted by ASEAN Secretariat with the Member Countries or with the initiative of the multi- and bi-lateral support such as ADB and other developmental partners. The regional activities are more related to the drought monitoring, hazard and risk assessments and multi-lateral donor driven projects.

In terms of drought monitoring, The Regional Drought Mechanism by UNESCAP enhances the capacity of governments to use space-based data for effective drought monitoring and early warning.[33] It applies science and technology to support the Asia-Pacific region in better addressing drought. Participating countries benefit from: (a) enhanced access to space-based data; (b) capacity building in preparedness and response; (c) strengthened institutional coordination and policies at the country level; and (d) Regional and South-South cooperation and support networks. Currently, the Regional Drought Mechanism has six pilot countries: Afghanistan, Cambodia, Mongolia, Myanmar, Nepal, and Sri Lanka. The initial work in Mongolia and Sri Lanka, which is being supported by two regional service nodes, demonstrates the efficiency and effectiveness of Regional Drought Mechanism. The regional service nodes were established under the Regional Drought Mechanism with the support of China and India to provide the pilot countries with satellite imagery, services, expert training and capacity development.

Under the GMS Cooperation Framework Action Plan for Flood and Drought Control and Management, ADB supported a multi-country initiative to address drought and flood management.

[33] https://www.unescap.org/news/un-initiative-strengthens-drought-monitoring-and-early-warning-asia-pacific

Implemented as a regional technical assistance framework, the project was implemented in Cambodia, Lao PDR, Thailand and Vietnam. The project further prepared three separate investment proposals for Cambodia, Vietnam and Lao PDR in which it improved the abilities of communities and governments to prepare and respond to droughts and floods. Specifically, it strengthened the data management for floods and droughts, strengthened cross-border solutions, upgraded water management infrastructure, enhanced the CBDRM capacities and improved the project implementation capacities for monitoring and evaluation. It also conducted feasibility studies for national investment programs in the three countries mentioned above. The National Mekong Committees have played a major role in implementation of the project.

In terms of drought hazard and risk mapping with applications for drought monitoring, The University of Tokyo has developed a satellite-based drought monitoring and early warning system (DMEWS) for Asian Pacific counties using freely available data, and to develop capacity of policy makers in those countries to apply the developed system in policy making (University of Tokyo, 2016).[34] The tool uses the Keetch-Byram Drought Index (KBDI) which is an index used to determining forest fire potential of droughts which is calculated based on the daily water balance, where a drought factor is balanced with precipitation and soil moisture.[35]

ASEAN region needs to show progress in areas of recognizing the drought as a major threat to the region, putting in place robust drought monitoring and evaluation frameworks at the national and sub-national level and integrating the drought risk assessments at the programmatic and project levels so that the development interventions do not exacerbate the drought risks. Despite its potential, integrated natural resource management methods such as integrated watershed management, integrated water resource management are still at a very nascent stage that need immediate attention for the long-term drought risk reduction in the region.

DRR and CCA institutions in each ASEAN Member State

As a reference, an overview of DRR and CCA institutions in each ASEAN Member State is summarised below as well as in Annex 8:

Brunei Darussalam

- The National Disaster Management Centre (NDMC) is responsible for disaster response and preparedness including community-based DRM with awareness raising and education programmes. Structural measures for DRR (prevention, mitigation and recovery) are implemented by the Public Works Department (PWD), Ministry of Development (MoD). The Brunei Darussalam Meteorological Department (BDMD) provides meteorological data to the PWD for the design of infrastructures.
- Forest cover is about 75% of the total land which is managed by the Forestry Department, Ministry of Primary Resources and Tourism. The coverage is much larger than the average of Borneo Island which is less than 50%. The large forest cover seems to be functioning as a buffer for reducing disaster and climate risk as the country has not faced any severe potent natural hazard. Water demand from the agricultural sector is modest as the total cultivated area is less than 2% of the total area.
- The Energy and Industry Department under the Prime Minister's Office coordinates climate change issues.
- Urbanisation is progressing but the population pressure is low as the total population is still a little over 400,000 in an area of 5,765km^2.

[34] http://wtlab.iis.u-tokyo.ac.jp/DMEWS/Myanmar/
[35] http://twc.tamu.edu/kbdi

Cambodia

- The National Committee for Disaster Management (NCDM) is headed by the Prime Minister as president with comprising of 37 memberships from all line ministries and the concerned agencies which has a vertical network extending to province, district, commune and village levels. It is recognised as the headquarters of the Royal Government to lead, administer and coordinate all disaster management activities induced by either natural or human-made disasters in Cambodia.
- The Department of Hydrology and River Works (DHRW), Ministry of Water Resources and Meteorology (MOWRAM), manages main rivers and the Department of Irrigation (DI), MOWRAM and the Ministry of Agriculture, Forestry and Fisheries (MAFF) manage irrigation facilities. Water resources management is under the Department of Water Resources Management Conservation (DWRMC), MOWRAM. Since the Department of Meteorology (DM) is also under the MOWRAM, most water-related data management, planning and implementation comes under the MOWRAM while the MAFF manages the agriculture, forestry and fisheries sectors. Coordination between the two ministries is essential for reducing flood and drought risk.
- Cambodia faces floods and droughts regularly. According to the NCDM, the 2013 floods affected 1.8 million people in 20 provinces of which damages and losses were estimated to be a total of over USD350 million. The 2016 drought was the worst after 2004 drought that impacted millions of people which was exacerbated by the low water level of the Mekong River. The fisheries sector contributing to 12% of the national GDP is also highly vulnerable to drought. In general, more structural measures are required to co-manage flood and drought risks such as by constructing more road dikes, evacuation facilities, irrigation canals and water retention facilities.
- In 2006, the Royal Government of Cambodia established the National Climate Change Committee (NCCC), a cross-sectoral and multi-disciplinary body with the mandate to prepare, coordinate and monitor the implementation of policies, strategies, legal instruments, plans and programmes related to climate change. With an amendment in 2014, the NCCC has functioned as an inter-ministerial mechanism for coordination of climate change response in the country. Its functions have recently been taken over by the National Council for Sustainable Development (NCSD) established in May 2015. The Council comprises high-level representatives (Secretaries and Under-Secretaries of State) of concerned government ministries and agencies, with the Prime Minister as its Honorary Chair and the Minister of Environment as its Chair. Council membership has increased compared to the NCCC, covering a greater number of ministries and agencies, including provincial governors. General Secretariat of the NCSD is the Department of Climate Change, Ministry of Environment.

Indonesia

- The National Disaster Management Authority (BNPB) was created in 2008 by the National Disaster Management Law 2007. In line with the National Disaster Management Plan 2015-2019, all 34 provinces and more than 90% of districts and cities have established local disaster management agencies (BPBDs). The BNPB has a disaster database and a disaster risk assessment tool, while the Directorate General of Climate Change (DGCC), Ministry of Environment and Forestry (KLHK), also has a vulnerability assessment tool, and integration of them are being attempted. Integrating DRR and CCA risks in local development plans are coordinated by the National Development Planning Agency (BAPPENAS), the Ministry of Agrarian and Spatial Planning and the Ministry of Home Affairs.
- The BAPPENAS conducts a two-week training programme for DRR and CCA integration in local development plan for national and local government officials. The BAPPENAS also promotes development of local CCA projects with incorporation of DRR concepts by

supporting the operation of the Indonesia Climate Change Trust Fund (ICCTF) which provides small grants to local organisations.

- The Directorate General of Water Resources (DGWR), Ministry of Public Work and Housing (PU), is responsible for river management and flood risk reduction. There are 34 Basin WRM Centres (*Balai*) responsible for development of framework (*Pola*) and master plan (*Rencana*) of river basin management. *Balai* also coordinates stakeholders for spatial planning under the associated Basin WRM Councils (TKPSDA) comprising related government and nongovernment members. Integrating the river basin management plan further with forestry and mangrove management plans at the upstream and downstream managed by the KLHK is a remaining challenge.
- The PU has integrated planning divisions of all departments to formulate a Regional Infrastructure Development Agency (BPIW) in 2015 which develops technical guidelines for rivers, roads, buildings and housings incorporating disaster and climate risks for relevant departments.
- The Ministry of Energy and Mineral Resources (ESDM) is largely responsible for geological hazards, particularly volcanic eruption and landslide.
- The Agency for Meteorology, Climatology and Geophysics (BMKG) provides necessary meteorological data and its analysis with downscaled global climate models (GCMs) to relevant agencies.

Lao PDR

- The National Disaster Management Office (NDMO), Department of Social Welfare, Ministry of Labour and Social Welfare (MLSW), is the ACDM focal point, having local offices in charge of disaster management at provincial and district levels. However, the Department of Disaster Management and Climate Change (DDMCC), Ministry of Natural Resources and Environment (MONRE), is the secretariat of the National Disaster Prevention and Control Committee (NDPCC) since 2013. It is still in the transition phase between the two ministries to demarcate their roles and responsibilities. The NDPCC is chaired by the Deputy Prime Minister/Minster of Defence and has Provincial DPCC and District DPCC at subnational level.
- Three departments under the Ministry of Public Works and Transport (MPWT) are responsible for: river course management by the Department of Waterways, slope and landslide management along roads by the Department of Roads and Bridges and urban planning and building design by the Department of Housing and Urban Planning.
- Departments under the MONRE are mainly responsible for planning and data management: meteorological and hydrological data management by the Department of Meteorology and Hydrology (DMH), water resources management by the Department of Water Resources (DWR), and disaster data management and climate change policy formulation by the DDMCC. Data management capacity including hazard and risk map preparation which is being supported by development partners requires improvement.
- The Department of Forestry, Ministry of Agriculture and Forestry (MOAF), is responsible for forest management and maintenance of irrigation facilities. More water retention ponds and irrigation networks are required to reduce drought risk, but available resources are limited – a common constraint for all agencies.

Malaysia

- The National Disaster Management Agency (NADMA) established in 2015 under the Prime Minister's Department works closely with other line ministries/agencies, especially the Department of Irrigation and Drainage (DID), Ministry of Natural Resources and Environment (NRE), the Malaysian Metrological Department (MMD), Ministry of Science,

Technology and Innovation (MOSTI) and the Public Works Department (JKR), Ministry of Works (KKR), which assess disaster and climate risk and implement DRR measures (prevention, mitigation and recovery). There is a Central Disaster Management and Relief Committee (CDMRC) at national level and State DMRC and District DMRC at subnational level.

- The DID is responsible for river management and flood risk reduction and prepares flood hazard and risk maps by incorporating meteorological data provided by the Malaysian Meteorological Department (MMD), Ministry of Science, Technology and Innovation (MOSTI). The JKR is responsible for management of national roads and slopes along them and operates a Disaster Operation Room to respond to emergencies in cooperation with the NADMA. Landslide hazard and risk maps are prepared by the Department of Minerals and Geoscience (JMG), NRE and shared with the Slope Protection Department of KKR.
- State Government has the authority of land-use and river basin management and the Federal Department of Town and Country Planning (JPBD), Ministry of Urban Wellbeing, Housing and Local Government (KPKT), gives the direction.
- The Environment Management and Climate Change Division (PASPI), NRE, is responsible for promoting CCA but its outreaching capacity to local authorities is limited due to many other tasks and limited human resources.

Myanmar

- The Ministry of Social Welfare, Relief and Resettlement (MSWRR) is responsible for DRM and the Relief and Resettlement Department (RRD), the ACDM focal point, was established to provide relief for victims of natural hazards. The National Disaster Preparedness Central Committee (NDPCC) under the Prime Minister is the inter-agency DRM body which has a vertical network from national to subnational levels including Disaster Preparedness Committees at region, state, district, township and village. Main task of the RRD is preparedness and response, but it is coordinating with other line ministries, namely the Ministry of Transport and Communications (MOTC), the Ministry of Agriculture, Livestock and Irrigation (MOALI) and the Ministry of Natural Resources and Environmental Conservation (MONREC), to implement more proactive DRR measures including prevention and mitigation.
- Coordination between the MOTC and the MOALI, two ministries managing river and water resources, is needed for efficient flood risk reduction and water resources management. The Department of Meteorology and Hydrology (DMH), MOTC, manages meteorological and hydrological data and the Irrigation and Water Utilisation Management Department (IWUMD), MOALI, also manages hydrological data. The Directorate of Water Resources and Improvement of River Systems (DWIR), MOTC, maintains river courses of main rivers for inland waterway transport while the IWUMD, MOALI, maintains other river courses mainly for irrigation purpose.
- Slope protection as well as quick recovery from slope failures along main roads is managed by the Ministry of Construction but proactive preventative measures are limited.
- Drought is a serious issue in the central dry zone where multiple interventions have been implemented including establishment of a regional water management committee, introducing new crop varieties, greening by afforestation, among others. Among them, one of the successful ones is a location-specific weather advisory programme for farmers with the DMH's intervention.
- The Environment Conservation Department (ECD), MONREC, the focal point for climate change, is actively engaging other agencies/ministries by playing a coordinating role of the Technical Working Group of Myanmar Climate Change Alliance (MCCA).

The Philippines

- The Office of Civil Defense (OCD), the administrator of the National Disaster Risk Reduction and Management Council (NDRRMC) with 44 member agencies, manages a vertical network of Local DRRM Offices at regions, provinces, cities, municipalities and barangays. The DRRM Act (2010) mandates local authorities to set aside 5% of the budget for DRRM activities and to set up a local DRRM office with at least four members.
- Local authorities develop a Local DRRM Plan and a Comprehensive Land-Use Plan (CLUP) by incorporating hazard and risk map provided by the Mines and Geoscience Bureau (MGB), Department of Natural Resources and Environment (DENR), and the OCD, the National Economic and Development Authority (NEDA) and the Housing and Land Use Regulatory Board (HLURB) review it.
- The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) provides meteorological data and its analysis with downscaled global climate models (GCMs) to relevant agencies.
- The Flood Control Management Cluster (FCMC), Department of Public Works and Highways (DPWH), is responsible for river management and flood risk management. The River Basin Control Office (RBCO), DENR, is responsible for development of river basin master plan for the 18 major river basins but the planning and enforcement capacity is limited due to the limited human resources allocation. For an effective river basin management as well as water resources management, coordination of relevant agencies is required including the National Water Resources Board (NWRB), the Land Management Bureau (LMB) and the Forest Management Bureau (FMB) under the DENR and the National Irrigation Authority (NIA) and the Bureau of Soil and Water Management (BSWM) under the Department of Agriculture, among others.
- The Climate Change Commission (CCC) supports local authorities to develop Local Climate Change Action Plan and manages the People's Survival Fund to provide necessary financial support for the implementation.

Singapore

- The Singapore Civil Defence Force (SCDF) provides emergency services including firefighting, rescue and ambulance services and preparedness programmes for DRR activities. Singapore does not face severe natural hazards in general.
- Singapore has progressively transformed almost two-third of the land surface into water catchment through constructing a network of rivers, canals and drains channelled to 17 reservoirs to address the water security issue which also has a flood and storm DRR function. The Public Utilities Board (PUB, Singapore's National Water Agency) under the Ministry of the Environment and Water Resources (MEWR) is responsible for water resources and river management. The Building Construction Authority (BCA) under the Ministry of National Development (MND) works closely with PUB. The Meteorological Service Singapore (MSS) provides meteorological advice to the PUB. The Housing & Development Board (HDB) and the Urban Redevelopment Authority (URA) both under the MND, together with BCA, are involved in the land-use management.

Thailand

- The Department of Disaster Prevention and Mitigation (DDPM), Ministry of Interior, is responsible for DRM in line with the National Disaster Risk Management Plan 2015 and the Disaster Prevention and Mitigation Act 2007. Both Master Plan and Act stress the importance of proactive approach for prevention and mitigation, however still main activities are on preparedness and response. The National Disaster Prevention and Mitigation Committee (NDPMC) formulates national DRM policy and the vertical operational network extends from

the National Disaster Command Headquarters (NDCH), the Central Disaster Management Centre (CDMC) to Provincial, District and Municipal Disaster Management Centres.

- The Department of Water Resources (DWR), Ministry of Natural Resources and Environment (MONRE), is the agency for coordinating river basin management and water resources management including drought, flood and landslide risk management. The Water Law is being developed to mandate the role of the DWR. The Royal Irrigation Department (RID), Ministry of Agriculture and Cooperatives (MOAC), also manages rivers and water resources for irrigation purpose. The National Water Resources Committee chaired by the Prime Minister has set up Basin Committees in 25 major river basins for the river basin management.
- The Thai Meteorological Department (TMD) provides meteorological data and forecast to relevant agencies. Flood hazard maps and landslide hazard maps prepared by the DWR and the Department of Mineral Resources (DMR), MONRE, respectively, are shared with the DDPM.
- The Royal Forest Department (RFD), MONRE, proactively promotes community-based forest management by engaging more than 11,000 communities. The Department of Marine Coastal Resources (DMCR), MONRE, rehabilitates mangrove forest along the Gulf of Thailand.
- The Office of Natural Resources and Environmental Policy and Planning (ONEP), MONRE, is the national focal point for climate change matters. The National Committee on Climate Change (NCCC) chaired by the Prime Minister formulates climate change policies with the line ministries and agencies. The composition of the members of the NCCC and the NDPMC are similar but direct policy coordination between them is rare.

Viet Nam

- The Department of Natural Disaster Prevention and Control (DNDPC) under the Directorate of Water Resources (DWR), Ministry of Agriculture and Rural Development (MARD), has been upgraded to the General Department of Natural Disaster Prevention and Control (GDNDPC) in August 2017 by merging other agencies that have the same function. The newly established department monitors all natural disasters throughout the country, advises the Central Steering Committee on Natural Disaster Prevention and Control (CSCNDPC) headed by the Minister of the MARD for disaster management and provides timely guidance to local authorities regarding disaster prevention and post-disaster reconstruction. Viet Nam is the only country in ASEAN which has a DRM organisation under the river and water resources management authority.
- The Department of Water Resources Management (DWRM), Ministry of Natural Resources and Environment (MONRE), is responsible for water resources and river basin management. However, the law on river basin management including water resources management has not been enacted yet and the demarcation between the DWR, MARD is not so clear.
- The National Hydro-Meteorological Service (NHMS), MONRE, forecasts floods based on real-time meteo-hydrological observation data. The DNDPC uses it for flood warnings and the DMC prepares flood hazard maps based on that. The flood and drought risk management plan in the Mekong Delta incorporating climate risk is one of the most advanced in the country.
- There are no nation-wide landslide hazard maps except in some pilot areas along national roads prepared by the Ministry of Transport.
- Viet Nam Forest Administration, MARD, promotes community-based forest management and rehabilitation of mangrove forest. The Payment for Forest Environmental Services which levies hydropower generators and water suppliers for the service fees is a successful model for raising funds for forest protection and rehabilitation activities.

- The Department of Meteorology, Hydrology and Climate Change (DMHCC), MONRE, serves as the secretariat of the National Committee on Climate Change (NCCC) headed by the Prime Minister which coordinates the line ministries to implement the National Strategy on Climate Change (NSCC) and the National Target Programme to Respond to Climate Change (NTP-RCC).

3. Good Practices of DRR and CCA Integration in ASEAN

As the previous chapter assessed the integration status of DRR and CCA in each country, this chapter summarises good practices of them in the six categories. This chapter corresponds to the expected output No. 1 of the CN20 Project.

DRR and CCA have several overlapping areas, which makes them easy to be integrated in management approaches. Both DRR and CCA planning include vulnerability and risk assessments aiming to reduce vulnerabilities and improve capacities so that the impacts of disasters are reduced. Both need policies and guidelines to affect needed change at national and local levels. Interventions could also have both DRR and CCA benefits. For example, protected forests and wetlands reduce rainwater and sediment runoff as well as consequent flood risk. Forests reduce landslide risk, and coastal forests such as mangroves reduce storm surge risk. These forests and wetlands function not only as a buffer for reducing disaster damage, but also for retaining water resources that helps improve the resilience and adaptive capacity of communities and ecosystems. From this viewpoint, natural resources management, including management of forests, wetlands and water resources, have several essential DRR and CCA functions, which need to be properly evaluated. Related understandings and principles of DRR and CCA should also be incorporated into various risk assessments and national and local development plans, including land-use plans. Recognising and maximising such multiple functions essentially integrates DRR and CCA into interventions at all levels.

Recognising the above discussed needs, synergies and compatibility, incorporating CCA considerations in every aspect of a DRR decision-making process is essential for reducing overall disaster risks and maximising the investment of limited resources. The DRR decision-making framework, as shown in Figure 3.1, can be viewed in four components: a) setting up of appropriate institutions; b) assessing disaster risks; c) strategic planning and implementation; and d) monitoring and evaluation of the interventions at regular intervals. Key processes include climate impact analysis in disaster risk assessments and development plans, programs and projects; developing guidelines that will help various stakeholders to achieve the necessary integration; and putting in place appropriate institutional management and funding systems so that the additional costs and capacity needs associated with such integration are addressed. Such integration would have to take place from the national to the ground level with ultimate success felt in overall risk reduction.

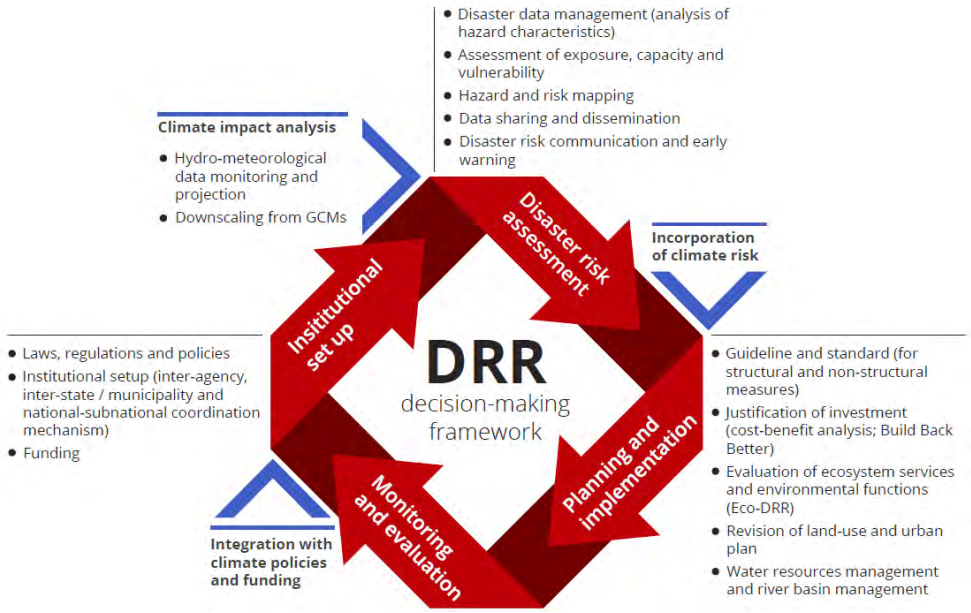


Figure 3.1: DRR decision-making framework with CCA coupling points
Source: JICA Project Team

The Project Team has identified a number of good practices on DRR and CCA integration in the Member States through interviews with government officials and field visits. This selection of good practices reflects the nature of the quick study, which was around two weeks in most countries, while lesser, between two and eight days, in some countries. Selected practices have DRR and CCA synergies and importantly they are transferable, applicable and a good reference for all the Member States. A range of practices were selected for risk reduction of storms, floods, droughts and landslides, which include practices that integrated downscaled climate projections into risk assessments, and practices coordinating DRR and CCA policies, management strategies and funding systems. While not all practices have fully integrated DRR and CCA, they still have a potential to be promoted in the end due to the high proportion of DRR and CCA benefits they bring compared to business-as-usual practices.

Selected good practices, which could be used as resources for regional collaboration, are sorted in the same six categories as listed in Table 3.1. These are also summarised in a separate report titled “One against disasters: A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN” which is accessible at the project website at: https://www.drrandcca.com/.

Table 3.1: List of selected good practices

Category	Good practices
1. Laws, regulations and policies	• National development plans incorporate DRR and CCA concepts • DRR laws, regulations and policies are enacted with consideration of CCA • CCA laws, regulations and policies are enacted with consideration of DRR • DRR and CCA concepts are incorporated in relevant sectoral laws, regulations and policies
2. Institutional arrangement	• A national DRM committee has been setup for inter-ministerial coordination and it also coordinates with the CCA committee; A national-subnational DRM system has been setup for integrated DRM • A national CCA committee has been setup for inter-ministerial coordination and it also coordinates with the DRM committee

Category	Good practices
	• A multi-stakeholder transboundary DRM system has been setup for floods, storms and droughts
3. Financial arrangement	• Funds are allocated for DRR activities with a monitoring and tracking system • Funds are allocated for CCA activities with a monitoring and tracking system • Insurance, microfinance, and payment for ecosystem services are implemented
4. Risk assessment	• Disaster data is recorded and used for science-based analysis • Climate risk is analysed based on hydro-meteorological monitoring and efforts are made to integrate downscaling from Global Climate Models (GCMs) • Hazard maps and risk maps for flood, storm surge, landslide and drought are prepared by assessing the damages of the past disasters, the capacity and vulnerability of local authorities and communities, and the climate risk and they are provided with high resolution for local planning • Disaster and climate risk data including hazard and risk maps are accessible to wide variety of stakeholders • Prediction, forecasting and early warning systems are setup and disaster risks are communicated through traditional media, social media and mobile phone networks
5. Planning and implementation	• Guidelines and standards incorporating disaster and climate risk are developed and used • Land-use and urban plans are prepared by incorporating disaster and climate risk and with an assessment of ecosystem services • Public and private investments are channelled to strengthen resiliency of critical facilities, including schools, hospitals, evacuation facilities, roads and transport, river and coastal dykes, reservoirs and irrigation networks, forests and retardation areas, etc., and they are implemented in a stage-wise manner • Drought risk reduction measures including water saving and agricultural measures are implemented
6. Capacity building	• DRR and CCA trainings for national and local government officials and other stakeholders are provided • Special training programs are implemented for specific purposes

3.1 Laws, Regulations and Policies

(1) The Philippine Development Plan 2017-2022

The National Economic and Development Authority (NEDA) of the Philippines formulated the Philippine Development Plan (PDP) 2017-2022. The PDP 2017-2022 is the first medium-term development plan that is anchored on a long-term vision. It is the first of the four six-year plans that aim to realise AmBisyon Natin 2040, the 25-year vision for the country. The PDP 2017-2022 has identified DRR and CCA as main crosscutting concerns. This can be mainly found in Chapter 11 on Reducing Vulnerability of Individuals and Families. The plan envisages rolling out climate and disaster vulnerability and risk assessment nationwide.

DRR and CCA have been integrated into a wide range of different sectors and sub-sectors using various strategies in order to address climate change vulnerabilities and contribute to the reduction of disaster risks. Part 6 (Foundations for Inclusive and Sustainable Development) of the PDP includes chapters related to DRR and CCA covering strategy framework on foundation for

inclusive growth, a high-trust society and a globally competitive knowledge economy created with subsector strategies such as incorporation of disaster resilience measures, ensuring security of infrastructure facilities, framework on ecological integrity, clean and healthy environment, mitigation and preparedness at the local level, strengthening implementation of response, recovery and rehabilitation efforts and strengthening monitoring and evaluation of effectiveness of DRR and CCA actions.

The PDP expressed that it is necessary to continue to mainstream DRR and CCA in national and local development plans and policies. In this connection, the PDP stressed the necessities to mainstream updated climate projection and risk and vulnerability assessment in the development processes to carefully identify interventions that will be implemented and avoid implementation of maladaptive practices and activities.

To mainstream DRR and CCA, The Philippine Climate Change Commission (CCC) is entrusted to draft an enabling policy and provide assistance to local communities in conducting vulnerability and risk assessments. The CCC will explore partnerships with the National Disaster Risk Reduction and Management Council (NDRRMC) to maximize the People Survival Fund (PSF) and NDRRM funds for risk transfer schemes such as insurance.

The benefit of this good practice is that it provides a clear-cut linkage between upstream national development plan and downstream strategies/polices and contributes to implementing DRR and CCA in an integrated manner. The implementation of downstream strategies/policies requires national resource mobilisation based on upstream national development plans for which the governmental top-down commitment is provided through this development plan. The results of the vulnerability assessments conducted at the local level will form the backbone for local strategies and measures to reduce vulnerabilities. To develop facilities for adaptation including risk transfer mechanisms, the PSF will provide technical and financial assistance to enable local communities implement adaptation measures.

(2) Sectoral Climate Change Action Plans in Cambodia

The Royal Government of Cambodia has developed climate change action plans across various sectors and ministries. The Cambodia Climate Change Alliance (CCCA), a multi donor initiative funded by EU, SIDA, DANIDA and UNDP, contributed to the formulation of the climate change action plan of each line ministry in Cambodia. Under this umbrella mechanism, the sector wide climate change adaptation plans for major line ministries have been prepared. The plans were prepared for the ministries of agriculture, forestry and fisheries, disaster management, education, gender, public health, water resources and meteorology, rural development, transportation, land management and urban planning, tourism, information, handicrafts, and energy sectors. There is also an overarching climate change action plan to be implemented under the Ministry of Environment.

Mainstreaming DRM and CCA into the development plans of line ministries will lead to the potential development of specific actions at the ministry level. In addition, there is a greater accountability and ownership of such plans than those developed outside the individual ministries leading to greater impact.

(3) Local CCA Action Plans, Viet Nam

In Viet Nam, the Climate Change Bureau (CCB) and the Climate Change Coordination Office (CCCO) were set up in major cities: CCCOs are established in 3 cities, Can Tho, Da Nang and Quy Nhon, and CCB in Ho Chi Minh City. The main responsibilities of CCCOs are improving

climate change resilience and adaptation through local government planning, decision-making, and policy implementation. CCCO Danang City, the coordination body of the city on climate change issues, prepared the 'Resilient Strategy for Danang City' under the 100 Resilient Cities initiatives. CCCO in Quy Nhon has a target to achieve 100% flood free by 2025. CCB Ho Chi Minh City formulated the 'Climate Change Response Action Plan (CCRAP) 2016-2020' targeting multiple sectors. CCB advises and assists the Steering Committee in the Implementation of CCRAP and proposes policy measures and coordination mechanisms for the effective implementation of the city's response to climate change.

These plans promote CCA and climate change mitigation in multiple sectors such as agriculture, water, energy, transport. They aim to train households on climate change and disaster preparedness and have introduced multi- purpose flood prevention houses and improved the coordination mechanism at the local level. The local CCA plan, which is customized based on the integrated local situation of disaster risks and climate change scenarios, contributed to the potential integration of DRR and CCA in Viet Nam.

(4) Sectoral Law and Regulations in Viet Nam, the Philippines and Indonesia

In Viet Nam, environmental charges such as the payment for forest environmental services defined under Decree 99 are incorporated into the financial framework related to climate change response. Similarly, under Decision 799, the National REDD+ Action Program is designed in compliance with the policies and laws of Viet Nam, and consistent to the provisions of UNFCCC and relevant treaties.

In the Philippines, under the Resolution No. 915 of the Housing and Land Use Regulatory Board (HLURB), the Supplemental Guideline was developed in compliance with two landmark national laws, the Climate Change Act of 2009 and the Disaster Risk Reduction and Management Act of 2010. This is also HLURB's response to address and support for our local government units to mainstream Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) into the Comprehensive Land Use Plans and Zoning Ordinances. Indonesia's legislative framework for "Integrated Water Resources Management (IWRM)" is based on Water Law No.7/2004 and subsequent regulations. The most important milestone in implementing the IWRM principles and processes occurred by the politics of administrative reform is the enactment of Water Law No. 7/2004. Efforts such as the regulations, guidelines as well as short- and long-term plans issued by local and central governments have been attempted to implement the IWRM as prescribed by the Water Law.

The incorporation of individual sectoral laws and regulations on river management, river basin management, forestry management and land use management into the laws and regulations related to DRR and CCA of these countries significantly contributes to the integration of DRR and CCA in relevant sectors. Strengthening these sectoral laws and regulations, including those addressing forestry services, land- use and water resource management contributes to the improvement of risk assessment by incorporating disaster and climate risks.

3.2 Institutional Arrangement

(1) National disaster risk management system, the Philippines

In the Philippines the National Disaster Risk Reduction and Management Council (NDRRMC), a national platform for DRM, acts as the main coordinator for disaster management activities. The Office of Civil Defence (OCD) is the operating arm and secretariat of the NDRRMC with the

following institutional setup, which contributes to strengthening of the potential institutional integration of DRR and CCA. Disaster Risk Reduction and Management (DRRM) plans and DRRM offices at all administrative levels of National– Regional–Provincial–Municipal–Barangay are strongly supported by the OCD's nationwide vertical network. The OCD reviews and evaluates the Local DRRM plans to facilitate the integration of DRR and CCA measures into the local Comprehensive Development Plan (CDP) and the Comprehensive Land Use Plan (CLUP). Local DRRM offices are under the Office of the Governor and the City or Municipal Mayor, and assisted by staff members responsible for administration and training, research and planning, and operations and warning.

The close national to local level vertical DRM network which is composed of the national DRM platform, and all local level administrative offices for DRM act as the main institutional arrangement for the coordination of disaster management activities, and the network significantly contributes to the strengthening of the potential institutional integration of DRR and CCA. It improves the coordination while bringing diverse stakeholders into the gamut of DRM.

(2) Integration of DRR and CCA by the Ministry of Public Works and Housing (PU), Indonesia

The Ministry of Public Works and Housing (PU) of Indonesia established the Regional Infrastructure Development Agency (BPIW) in 2015 by integrating all planning divisions of directorate generals. The BPIW functions like the BAPPENAS of the PU for the creation of technical policies, plans, strategies, standard operating procedures and guidelines for regional development. The PU's climate change mitigation and adaptation team (Tim MAPI) was formulated in 2010, and the function of DRR was added in May 2016 (Tim MAPI & PRB). The team consists of representatives of all DGs and agencies. BPIW is now responsible for integrating climate change mitigation and adaptation and DRR in PU's 20-year long term plan, 5-year midterm plan and annual plans. The 2012 Regulation (RAN-MAPI 2012-2020) covers only climate change mitigation and adaptation, while the 2016 Decision includes DRR. There is a technical guideline for risk analysis of natural disasters covering flood, landslide, earthquake, tsunami and volcano, the climate change risk is incorporated in the technical guideline.

Strengthening intra- ministerial linkage for mainstreaming DRR and CCA as well as assigning an umbrella organisation in each line ministry contributes to the close coordination of DRR and CCA integration in each sector.

(3) Institutional coordination between DRM and CCA focal points, the Philippines

In the Philippines, a Memorandum of Understanding (MOU) between the NDRRMC and the Philippine Climate Change Commission (CCC) was signed with the objective of institutionally integrating DRR and CCA, and the OCD and the CCC to have common staff. The MOU aims at promoting the collaboration and integration of DRR and CCA at all administrative levels, especially in formulating local plans and actions.

It provides a strong coordination between DRR focal points and CCA focal points, thereby efficiently implementing national policies on technical and financial measures to support the integration of DRR and CCA at local levels.

(4) River Basin Management Offices (Balai), Indonesia

DGWR (Directorat Jenderal Sumber Air/ Directorate General of Water Resources) of PU (Kementerian Pekerjaan Unum dan Permahan Rakyat/ Ministry of Public Works and Housing)

has the responsibility of River Basin Management (RBM) at the national level. It has 34 river basin management offices covering the whole country, which include 14 river basin management offices for the major rivers (Balai Busar Wilayah Sungai) such as the Solo River and the Brantas River. DGWR and the river basin management offices conduct flood risk management (FRM), landslide risk management (LRM), and water resources management (WRM), mainly focusing on infrastructure development and management.

The river basin offices will help in promoting DRR and CCA integration at the river basin level and help improve the environmental integrity of river basins.

3.3 Financial Arrangement

(1) Local DRRM Funds, the Philippines

In the Philippines, there is a built-in funding system that mandates local government units to compulsorily set aside part (5 percent) of the estimated revenue as the Local Disaster Risk Reduction and Management Fund (LDRRMF) to support DRM activities at local level. The Quick Response Fund (QRF) is another built-in budgetary allocation that represents pre-disaster or stand-by funds (30 percent of LDRRMF) for local government units.

One of the critical elements for the integration of DRR and CCA is the overall framework for financial resources with a wide range of options to mobilize related finance from various domestic and international funding sources. The local DRRM funds provide an important opportunity for local governments to further the agenda of DRR and CCA integration wherever such capacity exists. These built-in local DRM funds could be good practices for integrating DRR and CCA, since these DRM funds can be synergized with other demand-driven CCA funds.

(2) Indonesia Climate Change Trust Fund (ICCTF)

The Indonesia Climate Change Trust Fund (ICCTF) is the national trust fund for climate change in Indonesia which was established to increase the effectiveness and efficiency of Indonesia's coordination in combating climate change in accordance with the National/ Local Action Plan on Mitigation (RAN/RAD-GRK) and the National Action Plan on Adaptation (RAN-API). The fund provides small-grant funds for NGOs/ CSOs, up to a maximum of IDR 1b for adaptation and resilience projects and IDR 3.5b for land-based mitigation projects (forestation and conservation). The projected total amount of ICCTF from the financial year 2015 up to 2018 is estimated at 203 Rp. Billion. The RAN-API Secretariat (BAPPENAS) is also involved in the project selection.

Some ASEAN member states have CCA funds to promote implementation of local climate change adaptation plans including the Indonesia Climate Change Trust Fund (ICCTF). The benefit of this good practice is that the ICCTF is the only national trust fund for climate change in Indonesia, for land-based mitigation projects (forestation and conservation), and adaptation and resilience projects with small-grants, which contributes to the DRR and CCA integration in future

(3) People's Survival Fund, the Philippines

The People's Survival Fund (PSF) in the Philippines was created to provide a long-term finance scheme for effectively addressing climate change. In the national budget for the financial year 2016 of the Philippines, PHP 1.0 billion (approx. USD 19.9 million) was allocated for the PSF. Based on the Climate Change Act (2009), the fund has already successfully funded two projects in Dec 2016 with 60 more projects in the pipeline. The fund is expected to strengthen the risk and

vulnerability assessments in the country and enhance the CLUP/CDP and Local Climate Change Action Plans (LCAP). There is also high emphasis for water resources management, land management, infrastructure development, natural ecosystems; forecasting and early warning systems; institutional development (for droughts and floods); information networks; a guarantee for risk insurance needs for farmers.

(4) Climate Change Expenditure Tagging (CCET), the Philippines

The Climate Change Expenditure Tagging (CCET) is a budget tool for monitoring and tracking of climate-related expenditures in the national budget system, thereby acting as a label on the expenditure items, which are essential to identify and track them, generating data on domestic climate-relevant investment and operating expenditures. The Department of Budget Management (DBM) and the Philippine Climate Change Commission (CCC) have jointly developed CCET and started the piloting at the Local Government Units (LGUs), enabling consistent and comprehensive assessment of climate spending at both national and sub national levels. Forty-two LGUs have been trained to tag their 2015 Annual Investment Plans, preparing for scaling up CCET to cover all LGUs in the financial year 2016.

The introduction of an expenditure tagging and tracking system contributes to the efficient allocation and mobilisation of financial resources for integrating DRR and CCA.

(5) Microfinance in Flores Island, Indonesia

Microfinance refers to a range of financial services that are made available to the poor and vulnerable who otherwise do not have access to formal banking facilities and loans. Microfinance makes available small amount of money to the poor to invest in gainful livelihood generation options. The microfinance program is being implemented by Sube Huter in the Nangablo village of Sikka Regency, Flores Island in Indonesia. However, microfinance has been increasingly promoted throughout the ASEAN region reaching out to the poor supporting their livelihoods through financial access services and skill development.

Microfinance is helping rural communities to diversify their livelihoods and hence are less prone to weather vagaries. There are several rural development and resilience benefits, including improved access to markets, better skills, women empowerment, access to social services, such as health and education for children and additional income. Reduced fluctuation in income was also reported due to alternative income sources.

(6) Insurance in the Philippines, Indonesia and Thailand

Farmers are insured against the risk of crop loss caused by disaster such as floods and droughts. In Indonesia, crop insurance was first started as pilot program with the assistance of JICA by Directorate of Infrastructure and Agriculture Finance in 2015.

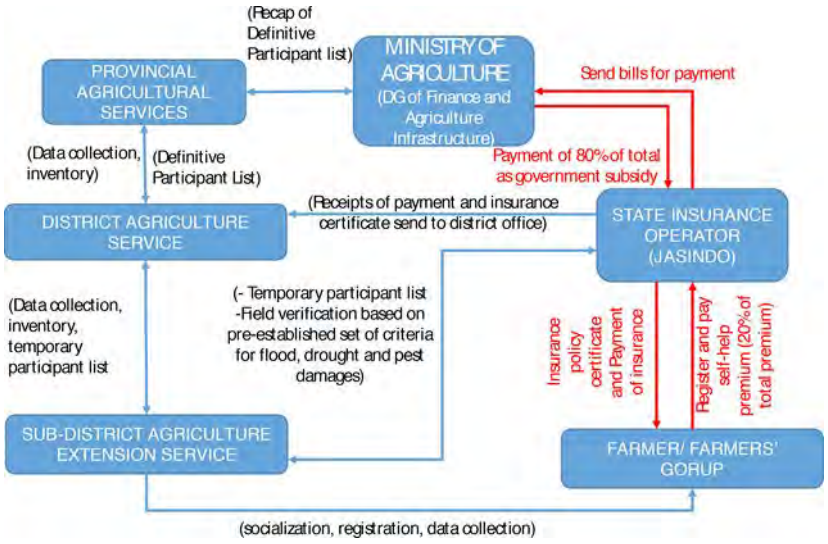


Figure 3.3: Implementation mechanism of rice crop insurance
Source: MOA, Indonesia

Directorate General of Agricultural Infrastructures and Facilities under the Ministry of Agriculture (MOA) has stipulated the Guidelines for Rice Farming Insurance Premium Aid. Unlike state's direct involvement in Indonesia, Thailand's Bank for Agriculture and Agricultural Cooperatives (BAAC), in collaboration with Sompo Japan Insurance, has introduced Weather Index Insurance (WII) against Drought Risk in Northeast Thailand since 2010.

Weather index insurance refers to the insurance payments made based on a trigger designed around weather elements such as temperature, precipitation and relative humidity rather than based on the direct assessment of the crop loss. Philippine Crop Insurance Corporation (PCIC) in collaboration with the World Bank, DA-PhilRice and PAGASA are implementing a pilot weather index insurance with 75 farmers are enrolled for this purpose. The first phase of the program finished in 2016 and the second phase is to start in 2018. Insurance premium is 891 peso per ha (100% subsidized by the government for subsistence farmers) and farmers will receive seeds and fertilizers as incentives to join the program. The cost of implementing the insurance per farmer is 5,000 peso for PCIC.

WII helps to avoid moral hazard and adverse selection, increased efficiency in operating the insurance program and reduced overall costs compared to the traditional insurance products. Farmers are able to obtain insurance payouts quickly leading to reduced financial stress and quick second season cropping. Helps strengthen the weather stations, provides opportunity to develop individual insurance products. Weather index insurance has shown better performance compared to the indemnity insurance in terms of long-term costs in implementation (initial costs are high for weather index for installation of weather stations).

(7) Payment for Forest Environmental Services, Viet Nam

In Viet Nam, environmental charges such as the payment for forest environmental services are incorporated into the financial framework related to climate change response. Forest Administration Office of MARD, Viet Nam is the responsible agencies of forest management including conservation of forest and reforestation for upland forest and mangrove forest in the coastal areas. There is a fund for forest management from hydropower, water supply and eco-

tourism sectors, which is used for supporting communities for reforestation. Therefore, forest management is well conducted and being progressed.

Under the Decree 99, organizations and individuals benefiting from forest environmental services must pay for forest environmental services to owners of forest. Payment for forest environmental services is in money through direct or indirect payment methods. The payment for forest environmental services through a Forest Protection and Development Fund is the money that users of forest environmental services entrust the Fund to pay to owners of forests that supply forest environmental services. The Decree stipulates the payment from the following parties for forest environmental services through a Forest Protection and Development Fund: Hydropower production facilities (20 VND/Kwh), Clean water production and supply facilities (40 VND/m3), Industrial production (On-going), Tourism service providers (1-2 % of revenue), and Others (carbon sequestration, aquaculture (On-going).

Participation of local communities and stakeholders in forest protection through this practice includes 500,000 households, 650 forest organisational owners, 84 forest companies, 15 national parks and 40 nature reserves.

One of the critical elements for the integration of DRR and CCA is the mobilisation mechanism for a wide range of financial options required for DRM and climate change finance generated from forest services. Introducing payment for ecosystems based on economic evaluation of forest environmental services for conservation and rehabilitation of ecosystems provides an important opportunity for the national and local governments to promote fund raising from forest services with multiple benefits for local communities.

3.4 Risk assessment

(1) Disaster database

Disaster database is very important for grasping, analyzing and sharing disaster conditions, which is also one of the important information for decision making for Preparedness, Response, Recovery and Rehabilitation and Prevention and Mitigation.

Among the ASEAN ten member states, Cambodia, Indonesia, Philippines, Thailand and Viet Nam have disaster database systems, and they are among the good practices of disaster database. Other member states have direction of developing disaster database or are progressing for development of the disaster database.

Web-based and Open-source Disaster Loss Database, Indonesia:

This disaster loss database is developed by BAPPENAS, BNPB, DEPDAGRI in cooperation with UNDP and DFID of UK based on the DesInventar, which is a free, open-source methodology and software. The tool has a range of options for analysis allowing national and sub-national authorities and DRR practitioners to understand disaster trends, patterns and their impacts in a systematic manner. With increased understanding of the disaster trends and their impacts, better prevention, mitigation and preparedness measures can be planned to reduce the impact of disasters on communities.

This practice can be highly scalable to all ASEAN countries. Several ASEAN countries including Cambodia, Lao PDR, Myanmar and Viet Nam have already put in place similar databases.

(2) Meteorological data management and downscaling from global climate model

Meteorological Data Management:

All ASEAN ten member states have agencies for meteorological observation and management of meteorological data. They also conduct weather forecast and warning of typhoons/ cyclones, storm rainfall etc. They are referring satellite images such as Himawari of Japan etc. for weather monitoring and forecast. Difference may be density and technology including equipment and capacities of hydro-meteorological observation systems.

Downscaling from Global Climate Models:

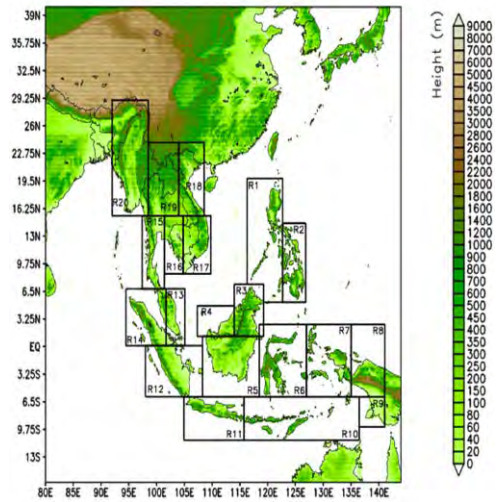
Governmental agencies of the several member states such as Indonesia, Malaysia, Philippines, Singapore and Viet Nam have conducted downscaling from Global Climate Models (GCM) for all over the territories of their countries. Resolution of the downscaling is 12km mesh to 50km mesh in general. These activities are among the good practices in terms of downscaling from GCM.

However, for users who apply the downscaled values such as rainfall change and sea water level rise by climate change to planning structural and non-structural measures for flood and storm surge risk management, landslide risk management and water resources management, the users need standard values of rainfall change and sea water level rise by regions or areas based on the statistical analysis of observed data as well as projected values based on the downscaling from GCM etc. Based on the standard values, DRR planning incorporating CCA will be easier and will facilitate for prevailing CCA integration in each member states.

Table 3.4.1: Examples of good practices of downscaling from GCMs

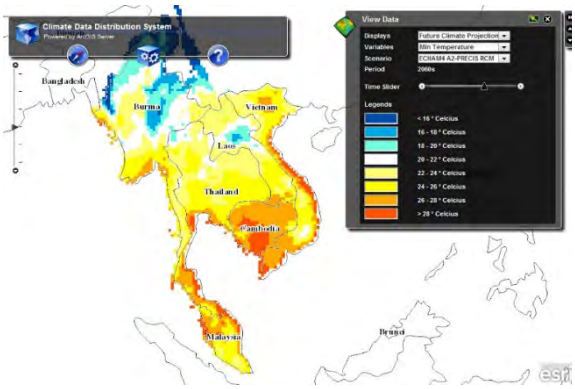
No.	Project/ Activities	Place/ Country	Reason	G or PG
D1	Regional Collaboration for GCM Downscaling	Regional activity including Malaysia, Indonesia, LaoPDR, Japan and so on.	● 13 countries and 17 institutions are involved in the project. ● The objective is, on a task-sharing basis, carry out a joint regional climate downscaling activity over a common SEA domain with RegCM4 (and other RCMs) using a number of CMIP5 GCMs and RCP scenarios. ● Some ASEAN countries joined this activity and it can be scalable to the other ASEAN countries.	G
D2	Climate data distribution system	Southeast Asia START Regional Center, Thailand	● The Climate Data Distribution System gives future climate data in the Southeast Asia region from several climate scenarios, which are developed from future climate projections. ● The Southeast START Regional Center has been conducting the study on climate change impact, vulnerability and adaptation in Southeast Asia region since 1997 for an understanding on climate change at the regional scale, to develop research capacity and research network in the region.	G

Note: G – Good practice, PG – Potential good practice



20 sub-regions used for further regional model
Source: SEACLID

D1: Regional Collaboration for GCM Downscaling



Climate data distribution system
Source: SEA START RC

D2: Climate data distribution system, Southeast Asia START Regional Center, Thailand

Figure 3.4.1: Good Practices of downscaling from GCMs

(3) Risk assessment of flood, storm and landslide

Flood Hazard Maps and Risk Maps:

Brunei, Indonesia, Malaysia, Philippines, Thailand, Viet Nam etc. have produced flood hazard maps of probable floods etc. by their governmental agencies (see sub-sections 2.1.4 (3), 2.3.4 (3), 2.5.4 (3), 2.7.4 (3), 2.8.4 (3) and 2.10 4 (3)). Although, these flood hazard maps don't include climate change impacts in general, these kinds of flood hazard maps are basically important for identifying the problematic areas of floods and for planning and decision making for Flood Risk Management (FRM) including DRR as well as Preparedness. These are among the potential good practices of hazard maps and risk maps.

Viet Nam makes flood hazard map of probable floods in Mekong Delta with climate change impacts including sea water level rise. Malaysia also makes flood hazard maps of probable floods with climate change impacts. These kinds of flood hazard maps with climate change impacts is necessary for estimating problematic areas of floods under climate change and for planning and decision making of CCA. These are among the good practices of hazard maps and risk maps.

Landslide Hazard Maps and Risk Maps:

Landslide hazard maps (susceptibility maps) are prepared by the governmental agencies of the several countries such as Indonesia, Malaysia, Philippines and Thailand (see sub-section 2.3.3 (4), 2.5.3 (4), 2.7.3 (4) and 2.8.3 (4)). These don't include CC, but are among potential good practices of landslide hazard maps.

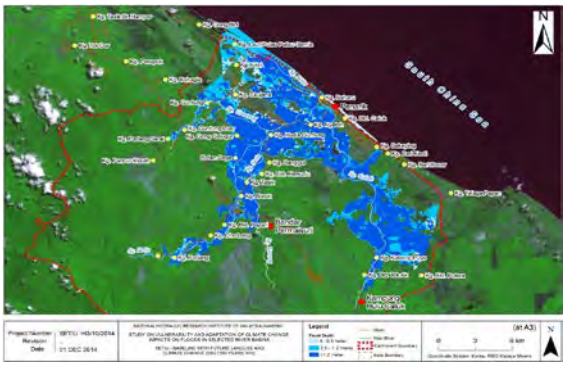
Landslide hazard maps are also basically important for identifying problematic areas (risk areas) of landslide and planning and decision making for Landslide Risk Management (LRM) including DRR. Based on the provincial level or municipality level landslide hazard maps, community level landslide hazard maps are also being prepared in Thailand and other countries. However, unavailability of detailed topographic maps with scale 1/1000 to 1/5000 is one of the general problems for making more detailed hazard maps in the landslide risk areas. Hence, utilization of satellite images with higher resolution such as 2m x 2m meth or higher is better to be considered.

As the phenomena of landslide is complex, climate change impacts such as increasing rainfall amount may not linearly affect occurrence of landslide. Hence, it may be a little difficult to produce landslide hazard maps with climate change impacts.

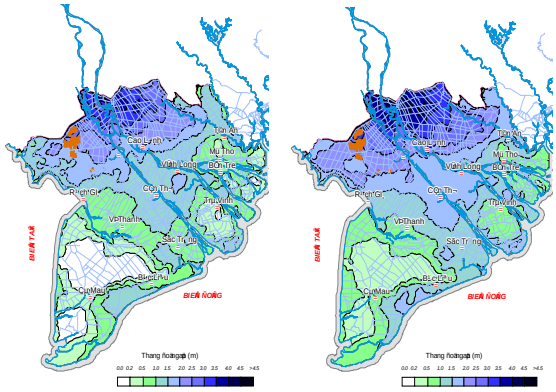
Following table shows some examples of good practices of hazard and risk maps including climate change as well as potential goon practices without climate change.

Table 3.4.2: Examples of good practices of hazard & risk maps

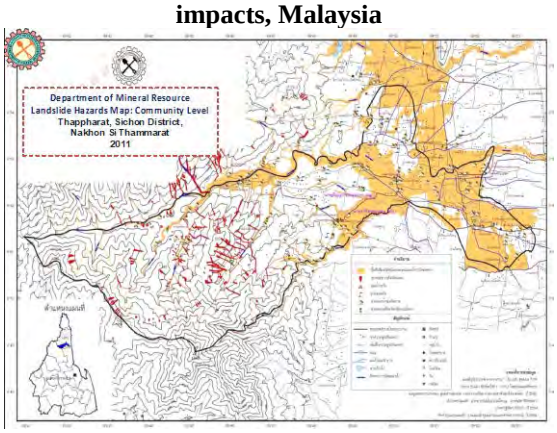
Project/Activities	Place/Country	Reason	G/PG
Flood hazard mapping with climate change impacts	Malaysia	● Flood hazard maps with climate change impact were created based on four scenarios which are baseline, baseline with future land use, baseline with climate change (current land use) for 2030 and 2050, and baseline with future land use and climate change for 2030 and 2050. ● This practice can be scalable to other ASEAN countries.	G
Inundation map with and without sea level rise caused by climate change	Viet Nam	● Climate change impact predictions in Viet Nam were carried out, which developed three scenarios for the country: Low emission (B1), Average emission (B2) and High emission (A2). ● Inundation maps with and without sea level rise were prepared. ● This practice can be scalable to other ASEAN countries.	G
Landslide hazard mapping	Thailand	● Thailand has been a pioneer among the ASEAN countries in developing detailed landslide hazard maps at the national, provincial and village levels. ● Hazard maps at community levels are provided to vulnerable villages with explanation and landslide waring volunteer network has been built in each village. ● These landslide hazard maps didn't take into account CC impact.	PG
Web GIS based portal site of hazard maps	The Philippines	● It allows interactive viewing of various kinds of hazard maps and other relevant information such as rainfall, river water levels, tide levels and so on at the same time. ● This system will inspire people's awareness of natural hazards, which is key in cultivating a culture of preparedness and reducing the catastrophic impacts of extreme hazard events. ● This portal site has no hazard maps considering CC impacts so far, but once hazard maps considering CC impacts are created, such maps can be shown in the portal site.	PG



Hazard map of 100-year flood with climate change impacts
Source: JPS and NAHRIM
H1: Flood hazard mapping with climate change impacts, Malaysia



Inundation map without (left) and with sea level rise (right) by 30 cm in 2050
Source: SIWRP, MARD
H2: Inundation map with and without sea level rise caused by climate change, Viet Nam



Landslide hazard map at community levels
Source: DMR, Thailand
H3: Landslide hazard mapping, Thailand

Web GIS based portal site of hazard maps
Source: UP-NOAH
H4: Web GIS based portal site of hazard maps, The Philippines

Figure 3.4.2: Good or potential good practices of hazard and risk maps with climate change impacts

(4) Risk assessment of drought

Disaster databases

Real-time information platform on drought intensity: In Cambodia, with the support by the World Food Program (WFP), Humanitarian Response Forum (HRF), a real-time information platform on drought intensity based on Drought Anomaly Index (DAI) denotes countries affected by water shortages. The information is from satellite-based drought monitoring and warning system in Greater Mekong Subregion (GMS) by Institute of Industrial Science, University of Tokyo, Japan. The web-platform (https://mangomap.com/chanvibol/maps/37138/cambodia-drought-monitoring) can be accessed from NCDM website (http://www.ncdm.gov.kh/Home/Index).

InfoKemarau: It shares information on Standard Precipitation Index (SPI), dam water level and river flow to prepare monthly drought reports. InfoKemarau are based on an approach of 'Non-Structural Measures' such as map of high risk areas for drought, adaption of droughts, and awareness raising/capacity building and drought warning system. In Thailand, Drought Monitoring Center (http://drought.gistda.or.th/) reports various information relevant to drought risks such as distribution of rice grown areas, satellite based indices for vegetation (Normalized Differential Vegetation Index,

NDVI) and wetness (Normalized Differential Wetness Index, NDWI), and monthly reporting of drought affected low humidity areas.

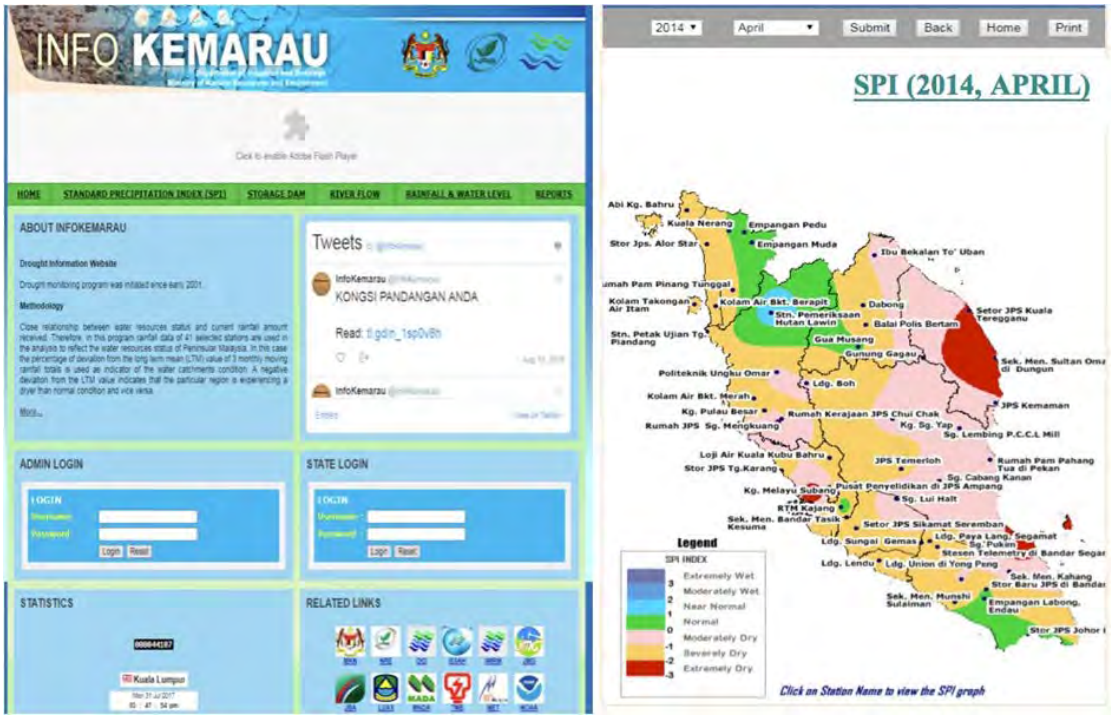


Figure 3.4.3: Example of web-based drought information platform in Malaysia
Source: DID Malaysia

Hydro-meteorological data management and climate risk analysis

NAHRIM Hydro-climate Data Analysis Accelerator: In Malaysia, NAHRIM has developed N-HYDAA (NAHRIM Hydro-climate Data Analysis Accelerator) which is a Risk assessment tool using 90 years observed and projected hydro-climate data from 2000-2100. It Covers 3,888 grids, 6kmx6km area & basin scale for 5 main parameters. There are eight modules which provide decision support on drought and flood hazards and disasters management. Out of the eight modules two are specific to droughts, and other two are on Water Stress Index and its simulation, one on climate change, rest three are on rainfall-runoff, storm center and stream flow.

Hazard and risk mapping

Web-based drought hazard map: The University of Tokyo has developed a satellite-based drought monitoring and early warning system (DMEWS) for Asian Pacific counties using freely available data, and to develop capacity of policy makers in those countries to apply the developed system in policy making (University of Tokyo, 2016).[36] The tool uses the Keetch-Byram Drought Index (KBDI) which is an index used to determining forest fire potential of droughts which is calculated based on the daily water balance, where a drought factor is balanced with precipitation and soil moisture.[37]

3.5 Implementation and Planning

Guideline/ standard for DRR and CCA integration against floods, storm and landslide:

Philippines has a guideline/ standard of incorporating climate change impacts into planning flood control projects. Malaysia is currently making guideline/ standard for incorporating CCA into planning of flood control projects in practical way. These are among the good practices of guidelines/

[36] http://wtlab.iis.u-tokyo.ac.jp/DMEWS/Myanmar/
[37] http://twc.tamu.edu/kbdi

standard including climate change impacts and CCA. However, it is necessary to confirm validity of the standard values of rainfall change and sea water level rise caused by climate change impacts set in the guideline/ standard.

Considering the wide range of various GCMs for projecting climate change impacts on rainfall etc., it is necessary that the guideline/ standard for DRR and CCA integration shall indicate practical way of CCA integration such as stage-wise implementation of CCA based on observation and analysis of climate change phenomena as well as projected values from GCM.

Guideline and standard for planning and designing of flood control facilities in the Philippines:

The Department Order of the Department of Public Works and Highways (DPWH) "Upgrades on Flood Control and Road Drainage Standards" in 2011 states to set the minimum flood return periods to be used for the design of flood control and road drainage facilities to be; a) For principal and major rivers (40km^2 drainage area and above), shall be 50-year return period of flood with sufficient freeboard to contain the 100-year return period of flood, b) For small rivers (below 40km^2 drainage area), shall be 25-year return period of flood with sufficient freeboard to contain the 50-year return period of flood.

In addition, among the Design Guidelines, Criteria and Standards of DPWH in 2015, climate change impacts on rainfall and sea water level rise for planning and designing flood control structures is to be considered at 10% increase of rainfall intensity, and 0.3m of sea water level rise by 2050.

This practice has scalability potential to be references of similar guideline/ standard.

Examples of good or potential good practices for DRR and CCA integration for flood risk management:

Following table shows some examples of good practices of DRR of flood risk management with CCA, or potential good practices, which can add CCA if necessary.

Table 3.5.1: Examples of good practices of DRR and CCA integration against floods

Project/Activities	Place/Country	Reason	G/PG
Flood Control in Ormoc City	Ormoc City in Leyte Province, The Philippines	● Flood control facilities functions well for saving people from floods. ● River management of the improved rivers are well conducted. ● To protect against increasing flood discharge by climate change, river basin conservation including reforestation, on-site retention etc. will be necessary. ● This practice has high scalability potential for similar flood control projects.	PG
Polder wall for protecting Valenzuela–Obando–Meycauayan (VOM) area from inundation by high tide and river flood	Valenzuela, Obando and Meycauayan in Metro Manila, The Philippines	● Polder walls protect low-lying coastal areas against high tide and floods from the River. ● The polder walls include additional height of 30cm against sea water level rise by climate change. ● This practice has scalability potential for similar areas affected by high tide and river floods.	G
Elevated house in flood prone area beside the River	In the flood prone areas including areas beside rivers in Brunei	● In the flood prone areas with slow flood velocity, elevated houses are effective non-structural measures for on-site settlement in combination with Preparedness measures such as warning and evacuation. ● Elevated houses will be also effective in case of rising flood water level by climate change. ● This practice has scalability potential for the areas with similar inundation with small velocity.	PG
Flood control	Viet Nam	● Flood risk management plan including structural	G

Project/Activities	Place/Country	Reason	G/PG
planning in the Mekong Delta in Viet Nam	Mekong Delta	measures such as road cum dikes and river improvements with sluice gates, and non-structural measures such as land use management to keep retarding areas for not increasing flood water level in the rivers were formulated for the Mekong Delta in Viet Nam. ● Sea water level rise by 2050 is taken into account for setting height of dikes. ● This practise has high scalability for the similar delta areas with flood problems. Also, the Plan includes the concept for not making adverse impacts to the upstream country of Cambodia by the flood control, and this has also scalability potential for similar flood problems among the neighbouring countries.	
Integrated operation of Jatilhur Dam	In the Citarum River Basin, Indonesia	● Jatilhur Dam is a multipurpose dam for irrigation, drinking and industrial water supply for Jakarta Metropolitan Area. ● Integrated operation of Jatilhur Dam with upstream hydropower dams of Cirata Dam and Saguling Dam for water resources and flood control is conducted. ● This practise has high scalability potential for the river basins with several dams.	PG
Neyama Tunnel	Tulungagung, East Java Province, Indonesia	● Flood control facilities by the floodway tunnels function well for mitigating floods in the areas. ● The Project has contributed very much for the socio-economic including agricultural developments in the areas. ● To protect against increasing flood discharge by climate change, additional tunnel or retention ponds etc., are necessary. ● This practice has scalability potential for the possibility of adding CCA.	PG
SMART Tunnel	Kuala Lumpur, Malaysia	● Floodway tunnel with retention ponds before and after the Floodway Tunnel is managed well and function well for mitigating floods in the center of Kuala Lumpur. ● Part of the tunnel is also utilized for bypass road tunnel. ● To protect against increasing flood discharge by climate change, there is possibility of increasing capacity of the retention ponds. ● This facility is not common but has scalability potential for applying urban areas with similar problems of floods and traffic congestion.	PG
Bago River flood control	Bago Region, Myanmar	● Comprehensive water resources development and flood control projects for the Bago River Basin has been implemented since 140 years ago. ● There are water retention cum water transportation canal, retarding basin cum water storage, and several water storage and flood control dams in the Bago River Basin. ● However, there is still flood problem caused by the neighbouring major river of the Sittaung River. ● There is a possibility of adding CCA. ● This practice has limited scalability potential due to applying for specific areas.	PG
Flood control project for the Pahang River downstream reach	Pekan City in Pahang Darul Makmur State, Malaysia	● Flood control and drainage project in the downstream reach of the Pahang River. ● The Project has river dikes with river walls for making polder system. ● Inside the polder, wetland is reserved for retention of rainfall runoff.	PG

Project/Activities	Place/Country	Reason	G/PG
		● There is a possibility of raising the wall against water level rise by climate change. ● This practice has scalability potential for similar flood control projects in the downstream reach of the rivers.	

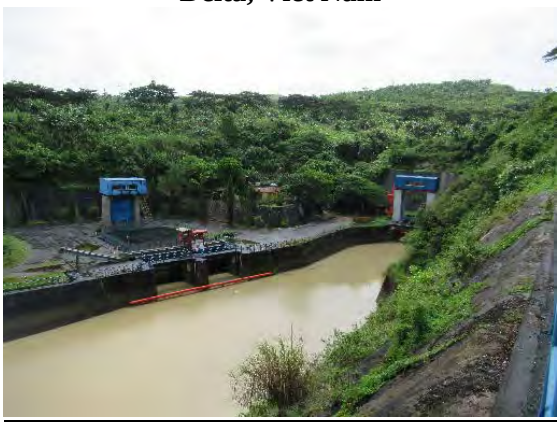
Improved Anilao River (upstream view)
Photo: JICA Project Team
F1: Flood Control in Ormoc City, Philippines

Meycauayan River (upstream view)
Photo: JICA Project Team
F2: Polder wall for protecting Valenzuela–Obando–Meycauayan (VOM), Philippines

Elevated house
Photo: JICA Project Team
F3: Elevated house in flood prone area beside the river, Burnei

Source: SIWRP
F4: Flood control planning in the Mekong Delta, Viet Nam

Downstream view from Jatilhul Dam
Photo: JICA Project Team
F5: Integrated operation of Jatilhur Dam, Indonesia



Neyama Tunnel (Inlet)
Photo: JICA Project Team
F6: Neyama Tunnel, Indonesia

SMART Tunnel Cross Section
Photo: JPS, Malaysia
F 7 : SMART Tunnel, Malaysia

Moe Yin Gyi Lake
Photo: JICA Project Team
F8: Bago River flood control, Myanmar

Pahan River downstream reach
Photo: JICA Project Team
F9: Flood control project for the Pahang River downstream reach

Figure 3.5.1: Good or potential good practices against floods

Examples of good or potential good practices for DRR and CCA integration for storm risk management

Following table shows some examples of potential good practices of DRR and CCA integration for storm risk management in the coastal areas against floods by high tide and against storm surge.

Table 3.5.2: Examples of potential good practices of DRR and CCA against high tide and storm surge

Project/Activities	Place/Country	Reason	G/PG
Cyclone Shelters in Ayeyarwady Delta	Ayeyarwady Delta in Myanmar	● Cyclone shelters are effective for the areas with storm surge risks. ● Cyclone shelter can be utilized as multipurpose in normal time such as school. ● Cyclone shelter is also effective for storm surge with sea water level rise by climate change. ● Management system including maintenance, locations and access, capacity, strength of the structures etc., and combination with forecasting and warning system are very important to be focused. ● This practice has scalability potential for similar areas	PG

Project/Activities	Place/Country	Reason	G/PG
		with storm surge problems.	
Coastal dikes in Ben Tre in Mekong Delta	Ben Tre Province in Mekong Delta in Viet Nam	● Coastal dikes against floods by high tide were constructed and protecting the agricultural areas. ● The coastal dike height is set by considering sea water level rise by climate change ● This practise has high scalability potential for the areas with similar problems of floods by high tide.	G

Cyclone shelter
Photo: JICA Project Team
S1: Cyclone Shelters in Ayeyarwady Delta, Myanmar

Coastal dike
Photo: JICA Project Team
S2: Coastal dikes in Ben Tre in Mekong Delta, Viet Nam

Figure 3.5.2: Good or Potential Good Practices against high tide and storm surge

<u>Examples of good or potential good practices for DRR and CCA integration for landslide risk management:</u>

Following table shows some examples of potential good practices of DRR and CCA integration for landslide risk management. They are all landuse management in the landslide risk areas as non-structural measure of DRR. However, combination of landuse management as non-structural measures and structural measures such as check dams, sand retarding basins and channel works will be more effective for landslide risks areas.

Table 3.5.3: Examples of potential good practices of DRR and CCA integration for landslide risk management

Project/ Activities	Place/ Country	Reason	G/PG
Landslide risk management at Sampang District in Banjarnegara Municipality	Banjarnegara Municipality, Central Java Province, Indonesia	● Relocation of the affected families and landuse management in the landslide disaster area are conducted. ● Monitoring of rainfall and slope movement is conducted for warning. ● The above measures can be also effective for climate change impacts. ● This practice has high scalability potential for similar areas with landslide problems.	PG
Landslide risk management in Guisaugon	Saint Bernard Municipality, Southern Leyte Province, The Philippines	● Same as the above.	PG

Landslide disaster area in Banjarnegara
Photo: BPBD Banjarnegara Municipality
L1: Banjarneraga landslide disaster area

Landslide disaster area in Guisaugon
Photo: San Bernard Municipality
L2: Landslide disaster at Guisaugon in Southern Leyte, Philippines

Figure 3.5.3: Good or potential good practices against landslide

Forest Management:

In addition to the above, forest management including reforestation/ forestation is widely conducted in the ASEAN member countries, which is also effective for FRM, LRM and Storm RM including Storm Surge RM against climate change impacts.

Ba Vi National Park, Viet Nam
(Source: Viet Nam Administration of Forestry)

Myanmar: Private Teak Plantation
(Sources: Forest Department, Myanmar)

Thailand: Community Forest Reforestation Activity
(Source: Royal Forest Department)

Mangrove Forest Rehabilitation in Thailand to protect coastal erosion by waves and currents

Figure 3.5.4: Forest management in various ASEAN countries

Drought

Multi-functional dams: Dam regulation has evolved as an effective coping strategy against frequent occurrences of floods and droughts in Indonesia. Dam operation is adjusted to achieve multi-functionality such as water storage to mitigate droughts and lowering water level to accommodate excess runoff for flood mitigation during wet season. For instance, Bendungan Wonorejo Dam in Central Java, a rule has been set to maintain appropriate water level. Water level in the dam is allowed to gradually increase from January till March (wet period). After March, water is released for irrigation in the dry season (April-September). After dry period, emptied space in the dam will be again available to store excess runoff in the next wet cycle. Although this is not a novel practice, it is more an outcome of increasing uncertainty over weather patterns. There is a potential to align dam regulation and weather forecasting for the co-management of water resources for both wet and dry situations in future.

Water recycling for drought risk reduction: Muda Irrigation Scheme (MIS) which was started in 1970 with an objective of increasing the access to irrigation in some of the drought prone areas of Kedah and Perlis regions. The MIS consists of Muda and Pedu Irrigation Dams. Both dams can irrigate 97,000 ha of rice fields and supports 40% of Malaysia's rice production. Faced with challenges of water resources variability, one of the important aspects of MADA administration has been to implement water recycling policy wherein the irrigation spent water (drainage) from the MADA irrigated areas are diverted to drought prone areas in Perlis to provide supplementary irrigation. The spent water is used twice before it is drained into the ocean. This strategy has helped farmers of more than 3000 ha in the Perlis region to save their crop during the drought of 2015-16.

Figure 3.5.5: Infrastructure including pumps for operating the water recycling facility

Source: JICA Project Team

Fish refuge ponds: FAO has developed community 'Fish Refuge Ponds' to help save fish during the dry season when water in the nearby fields are at its lowest. The fish refuge ponds are safe haven for aquatic animals as they can reproduce there until the rainy season, when fishes could spread out and grow in flood and inundation areas. PCDM and provincial governors realized that these fish refuges are the only place where the water is there and started developing plans to promote this approach.

Small dams for water retention: In Central Java, one thousand small dams (about 1 ha size and 3m deep) are planned for construction by government but any other agencies or individuals can also take an initiative. So far 100 ponds have been constructed. The main aim is to capture excess rainfall during the wet season and provide water nearest to point of use. At present about 80% rainfall is lost as runoff to the sea and only 20% could be captured for beneficial uses. For instance, Kebumen, one of drought prone districts in the Central Java, rainfall intensity is relatively high, but the availability of water is inadequate. To cope with the situation a small reservoir (with a catchment area of 1.34 km^2 and effective storage of 28108.8 m^3) has been constructed at Penimbun village of Karanggayam sub-

district in Kebumen district by utilizing Central Java Provincial budget to fulfil water needs of the community in dry season. This kind of small reservoirs will benefit 2338 people and help to improve their living standards by providing irrigation to 146 ha of horticulture garden, water for fishery, local tourism, and conservation of water resources.

Rainwater harvesting: Efforts for investing on rainwater harvesting are on the rise in the ASEAN region. For example, The Malaysian Ministry of Housing and Local Government considered rainwater harvesting in houses after 1998 drought, which caused water supply disruptions at Klang Valley. In 1999, the ministry produced a 'Guideline on Installing a Rainwater Collection and Utilization System'. NAHRIM through collaboration with other government agencies such as DID and universities started research and development of rainwater harvesting focusing on hydrologic and hydraulic design, system design and performance, installation and operational costs and water quality aspects, followed by its testing in a two-story residential building. Collected rainwater is then used for non-potable purposes such as toilet flushing, washing clothes and general cleaning around the house including car and motorcycle washing. NAHRIM has developed decision support software, Tangki NAHRIM, which could be used by interested users to analyze and estimate the total rainwater captured by the system. NAHRIM also provides additional guides such as system design, water quality, water uses, and cost-benefit (NAHRIM, 2014).

Artificial rainfall making: Countries in the ASEAN region are experimenting with cloud seeding to induce artificial rains during drought seasons. For example, the Ministry of Agriculture and Cooperative (Department of Royal Rainmaking and Agriculture Aviation, Royal Irrigation Department) of Thailand along with TMD are conducting artificial rainmaking and water management activity to prevent and address challenges of water scarcity and droughts (NDPMC, 2015). Similar efforts were also found in Indonesia, Myanmar and Vietnam.

Community based participatory irrigation management: In Pursat, there are water user association for managing the water (Farmer Water User Committees, FWUC). The water user associations have leader, vice leader and secondary vice leader. The first vice leader takes care of construction and second vice leader takes care of administration and water distribution and the third vice leader takes care of finances. The water user association requires the farmers to pay 20,000 riel per 3500 kg of crop per farmer. The payment is always based on the yield obtained in that particular season and the accumulated finances are used for the maintenance of canal systems.

Figure 3.5.6: Office of a water user association in Cambodia

Source: JICA Project Team

Groundwater use for drought risk reduction: Groundwater is also being promoted to supplement irrigation deficit during dry spells. In Malang, Indonesia, the Ministry of Public Works has installed groundwater pumping station at 200m depth for irrigating 40-50 ha of rice fields. Farmer water user communities (known as Hippas), comprising of 156 users, are in-charge of managing the facility. Groundwater is used occasionally during dry period for few days. Users have to pay the operation cost according to land holding (25000-50000 Rp/2500 m^2). In Malaysia, tube-wells and mobile pumps are provided to supplement irrigation to cope with temporary dry spells. There are over 280 tube-wells and 1700 mobile pumps in use for agricultural purpose in Malaysia. In Thailand, groundwater is promoted as a tool for drought mitigation by the Department of Groundwater Resources (DGR).

Short-duration crop varieties: Several ASEAN countries are introducing short-duration crop varieties to reduce drought impacts. For example, the Agriculture Department, Cambodia is introducing the short duration paddy in the downstream of the Pursat River while the upstream has already been converted to short and medium duration paddy varieties. Only 15% or less area is under the long duration paddy now. Tried to introduce irrigation scheduling but was not successful.

Conservation farming: FAO and the Ministry of Agriculture are promoting conservation farming in East and West Nusa Tenggara, one of the highly drought prone regions in Indonesia. Conservation farming aims at reducing evapotranspiration loss of soil moisture through practices such as mulching and no-tillage. It provides needed buffer from short to medium dry spells encountered during rainy season. Corn farmers are being trained on conservation farming through farmer field schools. So far, the program is able to expand the conservation farming to 6,000 farmers in two years. Conservation fields are reporting 36 times better yields than the traditional corn fields during the drought of 2015 (conservation farms gave 18 kg corn per 100 sqm while the traditional farms gave 0.5 kg per 100 m^2; interview with farmers).

Figure 3.5.7: Conservation farming in the East Nusa Tenggara island, Indonesia

Source: JICA Project Team

Organic farming: Increasing the organic fertilizer use has been one of the strategies adopted by local governments to address the short dry spells during the monsoon season. The New Lucena city in the Philippines has been implementing the Mag-Organic Na! and Eco Park programs that dovetail each other in a synergistic manner. The Eco Park promotes the citizens to segregate the waste, waste minimization and cleanliness and the organic component of the segregated waste is used to make compost for promoting organic farming. Through the Mag-Organic Na! project, the city government is preparing the organic foliar fertilizers and pesticides from disposed mango and fish waste and distribute the same to the farmers (free for the farmers participating in the program) and 250 peso/45

kg generating additional income to the city government. Farmers have reported a moderate drought impact reduction due to application of organic manure.

Crop Insurance: The governments seeking to protect farmers in the form of agricultural insurance. In Thailand, the crop insurance was first started as pilot program with the assistance of JICA by Directorate of Infrastructure and Agriculture Finance in 2015. After that the government launched the program by using state budget to insure farmers from the potential loss to the crops damaged by flood, droughts and pest attacks. For drought, it shall mean a non-fulfilment of crop water requirements during the period of plant growth resulting in the plant growth is not optimal, so as reducing the level of crop production.

Climate Field Schools (CFS): The climate field school in Dumangas, Iloilo of the Philippines is the second climate field school established in Asia after the climate field school in Indramayu of Indonesia and the first one in the Philippines. CFS is breakthrough for empowering farmers to overcome the climate change impacts in areas vulnerable to disasters (drought and flood). CFS start to develop in 19 provinces covered 100-150 units in every year spread in 100-150 districts all over Indonesia. In 2010 CFS was carried out for 200 units in 29 provinces. In 2012,130 CFS units were carried out in 30 provinces. In 2013, there were 192 units allocated in Indonesia (168 units for rice commodity and 24 units for maize commodity) in 30 provinces. In 2014, CFS was allocated for additional 120 units in 30 provinces.

Microfinance: Microfinance is helping rural communities to diversify their livelihoods and hence are less prone to weather vagaries such as drought. The microfinance program being implemented by Sube Huter in the Nangablo village of Sikka Regency, Flores Island of Indonesia showed several rural development and resilience benefits. Joining the microfinance programs has provided hundreds of rural communities with additional skills (as reported by the 90 % of the interviewed microfinance members), additional finances (as reported by 100% of the beneficiaries), additional income avenues (as reported by 10% of the beneficiaries) which has led to the increase in income (80% of the beneficiaries), provided additional and new livelihood activities (70% of the beneficiaries).

Bio-Pore for drought risk reduction: Bio-pore is an absorption hole created by inserting a vertical cylinder (10-20 cm diameters and 80-100 cm deep), with small pores in its surface, into the ground so that it does not exceed the soil water surface. The hole is filled with organic waste to push the formation of pores by land fauna or roots. The pores will receive rainfall and store it deep down under the soil. The main benefits of bio pores are rapid infiltration of flood water and its storage into soil for dry season, and better management of organic waste as a source of organic fertilizer to the soil. Tube-wells is drilled as an alternative source of irrigation during the period of water deficit (such as insufficient flow in irrigation canal) and drought. Each tube well can irrigate 10 ha of fields. Tube well enables farmers to grow crop in dry season and help to prevent losses.

Drip and sprinkler irrigation for improving efficiency: Promotion of drip and sprinkler irrigation has helped farmers to improve their economic status through stable crops during drought years. In the Tuan Tu village of Ninh Thuan province, Vietnam, a large number of farmers who migrated to urban areas in search of employment have returned to the village after the introduction of sprinkler irrigation. In addition, the Ninh Thuan province is promoting solar powered groundwater pumps which have gained much attention among the people and there is a growing demand to install more of these pumps. The solar powered groundwater pumps address the water scarcity while combining with the renewable energy that is available throughout the year and address well the costs of pumping among the poorer sections.

Figure 3.5.8: Sprinkler irrigation in an asparagus field in Vietnam

Source: JICA Project Team

Collaboration between water user groups and irrigation companies: In Vietnam, most reservoirs and water supply systems are managed by irrigation management companies and these companies keep close association with the water user groups formed under the catchment area of water supply systems. Irrigation companies are responsible for distributing water for agriculture production based on the cropping calendar made by the department of agriculture. The members of water user associations their water needs to the group leader who in turn will inform the irrigation management company (IMC) to release the needed water. The IMC takes all water related decisions depending on the water available in the reservoir, based on the area of land to be irrigated and demand of the farmers. Such a system, though not systematized across all the water supply systems in Vietnam but nevertheless is being increasingly adopted, seems to be helping the water supply companies to manage limited water resources during the drought.

Water licensing for demand management: Water licencing and pricing significantly helps in demand side management of the water resources. In terms of water licencing, the NWRB, the Philippines is able to regulate the amount of water allocated to all water users including government agencies. Under the Water Code of the Philippines (2005), the water security is ensured by promulgating the priority uses of water. Through this system, the available water allocated for domestic/municipal, irrigation, power generation, commercial uses, recreational, livestock etc. are prioritized. The water users are expected to apply for a permit, which takes about 4-6 months' time to issue water licences and the licences are issued to different agencies and reviewed under the Water Code. The Water Code clearly states the guidelines to be followed for the reconciliation of conflicts depending on availability of water, nature of complaint made, and adverse impacts on environment, etc.

Monsoon forum: Monsoon forum provides a unique opportunity to continuously interact with the agro-met information users and to integrate climate change issues as and when the new knowledge emerges. The Monsoon Forums are being organized by RIMES at national, sub-national level with UNHABITAT. One of it is in dry zone of Myanmar which gives the user feedback to DMH and UNDP brings project experiences in to the monsoon forum. Discussions are under way for a regional monsoon forum to link national to local level and experiences from the field through DMH (will be organized by end of this month). Monsoon forum has been conducted twice in a year, before and after monsoon season during which DMH does the verification process of weather forecasts. Monsoon forums have raised sufficient interest among the government agencies as well as the bi- and multi-lateral agencies. The Myanmese Government is very eager to continue this activity given the availability of funds.

Specialized Expert System for Agro-Meteorological Early Warning (SESAME): Developed by RIMES and UNESCAP, DMH and MOA of Myanmar have piloted in two townships. RIMES uses

the ECMFW forecasts data to support the agricultural outlook to issue a bulletin once in three days and ten days. DMH bulletin is based on the historical data and a simple projection. The online system with artificial intelligence develops the forecast with different parameters. The DMH agro advisory bulletin contains the summary of previous 10 days and the next part is for the next 10 days. SESAME project is based on ECMWF data, it uses 17 new weather station data and incorporates 3 and 10 days' forecasts. The system is operational for 3-5 days, the agro-meteorological center in Yangon generates the information and local agricultural officers will check. A web interface is also being developed to be used through a smart phone so that the farmers can use it on their phones.

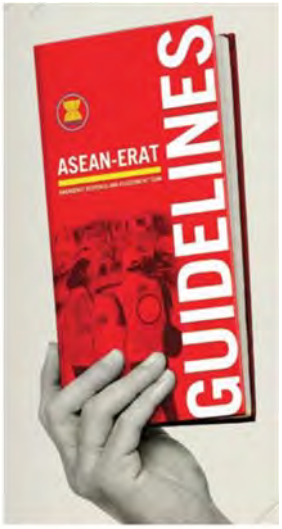
Comprehensive water management: Singapore has pioneered a comprehensive water management based on the principles of restoring and sustaining water cycle. Singapore has achieved a high level of water security by adopting a holistic approach of water resources management. Its National Water Agency (PUB) is a pioneer in diversifying water services through the philosophy of 'closing the water loop'. Singapore has adopted the "Source-Pathway-Receptor" approach for flood and storm water management. Flood management is carried out a) along pathway, e.g., through widening and deepening of drains and canals; b) at the source, e.g., through on-site detention; and c) through receptor at flood prone areas, e.g., through erecting flood barriers. Singapore is transforming a large part (currently 2/3rd) of the country into water catchments for large scale harvesting of rainwater through a network of rivers, canals and drains and finally channeling to 17 reservoirs.

Salinity intrusion monitoring, Viet Nam: ISET worked with city and local administrations in establishing a real-time salinity monitoring system that provides real-time data to different sectors in Can Tho city and send SMS alerts to water management authorities to operate the gates on rivers and canals arresting the saline water intrusion. 8 monitoring stations were established to monitor the salinity levels. The results persuaded the Cai Rang district to construct Dat Set dam for salinity control. The SMS alerts are helping water resource management authorities to operate the gates in time controlling the saline water intrusion. The data generated from the system is helping the decision making at the local and policy level and improved understanding of key salinity thresholds level.

3.6 Capacity building

Source: AHA center

There are several initiatives on capacity building on DRR and/or CCA at the regional level. DRM capacity building is at the core of AADMER and it is done at three levels. First is institutional capacity building such as establishment of ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) which an inter-governmental organisation for disaster management and emergency response in ASEAN region. The AHA Centre plays a key role in AADMER implementation and in the ASEAN DRM structure. Second is Intra-ASEAN capacity building, such as training to the national disaster management organization of the member states on *ASEAN's Standard Operating Procedure for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Operations* (SASOP) which facilitates the movement of humanitarian assistance within ASEAN. And thirdly, capacity building in ASEAN member states for building disaster-resilient nations and safer communities. It asks the member states to identify, prevent and reduce risks arising from hazards and undertake measures to reduce losses from disasters such as policy, plans, programs, legislative and other regulatory measures, strengthening local and national disaster management capability and coordination, public awareness and education, community participation and use of indigenous knowledge and practices.



Source: AHA center

Training and knowledge management systems are one of the building blocks under the AADMER working program. ACDM have identified three flagship projects under training and knowledge management. First is on 'identification of priority training needs through a regional training and knowledge management assessment covering the needs of NDMOs, local governments and civil society within the region'. After the first phase of the work program, ASEAN decided to prioritize training courses on community-based DRR and DRM and climate change adaptation, risk assessment and early warning and damage/loss assessment for the second phase of the work program (until 2015). Second flagship project, 'Training of ASEAN trainers and subject matter experts for ASEAN, including formation of AADMER trainer's pool' conducted a mapping of disaster management training institutions (DTMIs) in 2012 and created an ASEAN network of DTMIs know as ASEAN Disaster Management Training Institutes Network (ADTRAIN). The ADTRAIN is expected to become a center of excellence in training and knowledge management in ASEAN. The third flagship project is 'Setting up of the online ASEAN Resource Centre within the AHA Centre'. AHA centre has developed a course on "ASEAN Training of Trainers (TOT) on Disaster Recover" which aims to advance the capabilities of ASEAN Member States (AMS), mainly targeting national/central and sub-national government officials with responsibility for managing disaster recovery operations, for planning and conducting disaster recovery activities. The ASEAN has established the ASEAN-Emergency Response and Assessment Team (ASEAN-ERAT) and produced a guideline on ASEAN-ERAT. Based on that intensive training courses have been provided on various aspect of emergency response by combining classroom and field exercises. Four ASEAN ERAT introduction courses have been conducted and over 100 members from ten ASEAN Member States have benefited from such training. The AHA Centre also conducts AHA Centre Executive (ACE) Programme to prepare the future leaders of disaster management in the ASEAN. Specialised training and skill enhancements, on-ground deployment during disaster, study visit to Japan, learning from each other, and writing vision and strategy on disaster management are some of the features of the programme, which has produced 29 graduates from eight National Disaster Management Offices of ASEAN Member States. There is also a regional collaboration programme among the National Meteorological Services (NMSs) of ASEAN member countries, known as The ASEAN Specialised Meteorological Centre (ASMC), to enhance regional capacity and strengthen support in the provision of meteorological services. The ASMC was appointed to monitor and assess land and forest fires and the occurrence of transboundary smoke haze affecting the ASEAN region. The main roles of ASMC are to monitor and assess land and forest fires, as well as the occurrence of transboundary smoke haze for the ASEAN region and conduct seasonal and climate predictions for the ASEAN region.

Besides regional initiative, direct or indirect trainings have played an important role in the capacity development on DRR and/or CCA in all ASEAN Member States. As a result of that DRM Systems from nation, provinces, cities/ municipalities, districts to villages and communities have been established and are being strengthened in all the Member States. At the national level, most of the training is indirect type such as in the form of involvement in DRM as well as CCA activities, both structural and non-structural interventions. Improvement in hydro-meteorological observations, preparation of disaster hazard or risk maps, use of GIS and remote sensing, acquiring satellite data

(such as Himawari) and direct involvement in the design of flood prevention dikes indicate growing capacity of governments and their staff on DRR and/or CCA.

For instance, governmental agencies of the several countries such as Indonesia, Malaysia, the Philippines, Singapore and Viet Nam have conducted downscaling from Global Climate Models (GCMs) for all over the territories of their countries, usually through collaboration with research or academic institutes. The Center for Volcanology and Geological Hazard Mitigation (PVMBG) of the Geological Agency of the Ministry of Energy and Mineral Resources (ESDM) in Indonesia has prepared landslide hazard maps for all over the country and detailed ones for some areas. Malaysia and Thailand have established national level drought monitoring system. These capacity building activities signify readiness to share experiences and potentially provide training to other Member States. In some countries such as Indonesia, the Philippines and Viet Nam such know-how has also been transferred to provincial or district levels.

Most direct form of training on DRR and/or CCA, however, has been conducted at the local level, including provincial, district, and village or community level. These trainings are mostly aimed at strengthening local level planning on DRR and/or CCA preparedness and mitigation such as preparation of community-based DRR plan, community hazard maps, establishment of evacuation centres, climate field schools, formulation of water user groups, construction of local water storage ponds etc. Government and non-governmental agencies are involved in such training, while in most cases projects or programmes are designed with primary objective of training and community participation.

Telemetric rain gauge and extensometer installed by Regional Disaster Management Agency (BPBD) in Banjarnegara, Indonesia (Source: JICA Project Team)

Similarly, standalone interventions especially carried out during the recovery on DRR and/or CCA at the local levels are often tied with training to boost local DRR and CCA capacity, such as establishment of flood warning marks, evacuation centres, or cyclone proof housing in Viet Nam. The Regional Disaster Management Agency (BPBD) Banjarnegara in Indonesia is strengthening preparedness including warning and evacuation of the high-risk areas of landslide in the municipality. In addition, the BPBD let the community people maintain the telemetric rain gauges and extensometers installed in high risk areas of landslide in the community. Other concrete examples are hanging fertigation techniques transferred to farmers as a mitigation option against inundation in Malaysia, community involvement in watershed or forest conservation in Myanmar, Thailand and Viet Nam, and replantation of mangrove forests in the coastal areas (Bang Khum Thian) in northern part of the Gulf of Thailand, where community awareness and capacity are being strengthened. In Indonesia and the Philippines, Climate Field Schools are implemented mainly to train farmers to understand climate variability and improve their farm level decision-making. Considering increasing risk of damages to crops by floods, droughts and diseases/pests, experiences of crop insurance from Indonesia, Malaysia and Thailand could be tailored to develop a guideline for crops insurance for the ASEAN.

Another important capacity building needs is on securing funds to promote local actions on DRR and CCA and their integration. USAID Adapt Asia-Pacific is one of the very few examples of capacity

building projects to strengthen the capacity of governmental agencies in several countries (that also includes six ASEAN Member States) in the Asia-Pacific to prepare and implement climate change adaptation projects. Adapt Asia-Pacific was developing innovative capacity building initiatives that are focused and yet flexible enough to result in completed, sustainable projects that can attract international financing. Adapt Asia-Pacific helps countries to mainstream climate change adaptation into development planning across virtually all sectors, provide governments with the skills required to prepare and assess viable projects, and show them the ways in which they can assess international adaptation funds. For instance, they have trained over 40 mid-to-senior level government staffs from 12 countries in the Asia Pacific through Government Training Support Program (GTSP) on climate change adaptation in different sectors, including one on DRR. Other types of training programs are cost-benefit assessment of adaptation, economics of CCA, and regional consultation on CCA needs. The project has also published various materials such as 'Guide to Climate Change Adaptation Project Preparation'.

Source: City of Tacloban, tacloban.gov.ph

In the Philippines, there is a strong built-in funding system that mandates local government units (LGUs) to compulsorily set aside part (5 percent) of the estimated revenue as the Local Disaster Risk Reduction and Management Fund (LDRRMF) to support DRM activities at local level. The Quick Response Fund (QRF) is another built-in budgetary allocation that represents pre-disaster or stand-by funds (30 percent of LDRRMF) LGUs. For CCA actions, there are Indonesia Climate Change Trust Fund (ICCTF) and the Philippines' People's Survival Fund (PSF). ICCTF was established to enhance effectiveness and efficiency of Indonesia's coordination capacity in combating climate change in accordance with the National/ Local Action Plan on Mitigation (RAN/RAD-GRK) and the National Action Plan on Adaptation (RAN-API). The PSF was created to provide a long-term finance scheme for effectively addressing climate change. In the national budget for the financial year 2016, PHP 1.0 billion (approx. USD 19.9 million) was allocated for the PSF and successfully funded two projects in Dec 2016 with 60 more projects in the pipeline. 'Gawad Kalasag Awards' has been established in the Philippines to encourage best performing LGUs (with some small award funds) for their DRR planning, implementation and uplift the standard of disaster management in the country. Similarly, in Lao PDR, the government prioritise its limited funding to only those CBDRM activities based on demonstrated performance. In the Philippines and Indonesia, LGUs are also mandated to development and land use plans with DRR and CCA concepts and the local budget could be disbursed after approval by the national governments (HLURB in the Philippines; Min. of Home Affairs in Indonesia). These financial measures directly contribute to the capacity building on DRR and CCA and their integration by providing direct means of implementation.

4. Work Plan for Strengthening DRR and CCA Integration

This chapter explains what the work plan for strengthening DRR and CCA integration is and how it was developed through stakeholder consultative meetings. This chapter corresponds to the expected output No. 3 of the CN20 Project.

4.1 Work Plan for Strengthening DRR and CCA Integration

A Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration (hereinafter, Work Plan) was developed under this project that outlines the objective, scope, timeline, regional activities, targeted outputs and implementation structure toward achieving DRR and CCA integration in ASEAN (Annex 2). The Work Plan was endorsed by the 31st ASEAN Committee on Disaster Management (ACDM) Meeting on 17 October and subsequently reported to the 5th ASEAN Ministerial Meeting on Disaster Management (AMMDM) on 19 October 2017 in Luang Prabang, Lao PDR (Annex 3). It was also reported to the 20th ASEAN-Japan Summit on 13 November 2017 in Manila, the Philippines (Annex 4).

Prior to that, three National Workshops were organised – 31 May in Naypyitaw, Myanmar, 6 July in Hanoi, Viet Nam, and 12 July in Quezon, the Philippines – to discuss the national and regional needs and desired regional activities to realise it. The Project Team provided discussion materials including regional and country assessment on DRR and CCA integration and good practices recommendable for application. The ideas collected in these workshops were consolidated into a draft Work Plan which was further discussed at the Regional Forum held in Bangkok, Thailand on 5-6 September 2017. A refined Work Plan was further discussed at the 8th Meeting of the Working Group on Prevention and Mitigation the following day and then circulated to the ACDM members for endorsement through ad referendum. In this way, it was reported to the 31st ACDM Meeting and the 5th AMMDM mentioned above.

Following that, a Senior Official-Level Forum was held in Jakarta, Indonesia, on 16 November 2017 to prioritise immediate regional collaborative activities. Each ASEAN Member State expressed their possible contribution and expectation to the Work Plan as listed in Table 4.1.1 and the participants discussed how best to match them to design meaningful regional activities.

Table 4.1.1: Possible contribution and expectation expressed by the ASEAN Member States

Country	Possible contribution	Expectation
Indonesia	• Draft ministerial regulations: National Action Plan for Climate Change Mitigation and Adaptation and DRR 2017-2030; Master Plan for Integrated Public Works and Housing Infrastructure Development for 20 years • Training for flood control, flood countermeasures, eco-based flood management; landslide management on road structure; disaster resilient technologies; conducted by Education and Training Center Agency • E-monitoring and evaluation & reporting system for DRR and CCA projects • Indonesia Risk Map and Risk Index (GIS-based)	• Raising awareness of DRR design and plans at local level • E-monitoring system can be used for tagging DRR and CCA project more efficiently • M&E with SDGs and Sendai Framework indicators
Lao PDR	• Community-based DRM training; local disaster management plans • National risk profile and hazard mapping • CCA on agriculture; climate change projection and its impact on water and forestry sectors • Integration of DRR and CCA in the 8th National Socio-economic Development Plan 2016-2020	• Training on risk assessment and risk mapping with GIS application • Updating national disaster risk profile and assessment • M&E and reporting system for SDGs and Sendai Framework

Country	Possible contribution	Expectation
	• SDGs and Sendai Framework indicators incorporated in 5-year plans of MoNRE and MoLSW 2016-2020 • Guidelines for mainstreaming DRR into public investment planning and preparing urban master plans	• Mobilising resources for regional DRR and CCA programme
Malaysia	• Flood management: Hazard and risk maps; flood prediction and early warning system; river basin-based projects • Stormwater management: Urban stormwater management manual • Flood infrastructures: Stormwater Management and Road Tunnel (SMART); multi-purpose dam • Risk assessment tool: NAHRIM Hydroclimate Data Analysis Accelerator; NAHRIM Technical Guide No.1	• Meteorological expertise • Laws and regulations on DRR and CCA • Disaster risk data sharing on transboundary river basin • Training on monitoring and evaluation (M&E) of DRR and CCA projects
Myanmar	• Hazard, risk and vulnerability assessment report • Training module on building local level resilience to climate change in Myanmar • Myanmar Climate Change Strategy and Action Plan 2016-2030 • Myanmar Action Plan on DRR 2017-2020 • Disaster database and mobile application • Environment Quality Guideline 2015	• Training on hazard mapping and risk assessment using GIS • Integration of DRR and CCA laws and regulations • Local level climate change strategy and action plan • Disaster insurance system • Flood risk assessment for dam • Riverbank erosion control • M&E guideline
Philippines	• Pre-disaster risk assessment and hazard mapping; flood forecasting and early warning system; climate change impact analysis • Conduct of drills (training) and forum • Response mechanism (national-subnational coordination) • National building code • Structural and non-structural measures	• Exchange programme • Technical assistance • Forging of cooperation
Singapore	• Coastal protection measures: setting higher minimum reclamation level; building geo-bags and seawalls • Water resources management: diversifying water supply; water conservation programme; water efficiency scheme • Drainage management: Stormwater management system • Flood prevention measures: installing flood barriers; upgrading airport drainage system; reviewing resilience of power stations, transport and telecommunication infrastructure against flooding and temperature changes • Training programmes: ASEAN Strategic Policy Dialogue on Disaster Management; World Cities Summit, etc.	
Thailand	• National Disaster Prevention and Mitigation Plan 2015; Disaster Prevention and Mitigation Act 2007 • Community-based DRM Toolkit	• Risk assessment • Coordination of DRR and CCA agencies • Incorporation of climate risk in long-term DRR plans • M&E system with indicators
Viet Nam	• Application of geo-spatial technology/satellite image to develop flood risk maps; superstorm surge maps for coastal provinces; landslide risk maps for northern mountainous areas; community-based disaster risk assessment and risk mapping using GIS (and digitalising them) • Law on Natural Disaster Prevention and Control 2014 • Natural Disaster Prevention and Control Funds (50/63 provinces established it) • Forest Protection and Development Funds (41/63 provinces established it) • M&E indicators for community-based DRM programmes	• Application of geo-spatial technology to update risk assessment and risk mapping at community level • Sharing of satellite images • Integration of DRR and CCA in local development plans and national strategies and plans • Data sharing via bilateral and multi-lateral agreement

As shown here, every country offered their materials for regional contribution that covered various DRR and CCA aspects, such as risk assessment and risk mapping methodologies, flood and stormwater management measures, how it is mainstreamed in national and local policies, training programmes for integrated planning at national and local levels, monitoring and evaluation (M&E) of policies and projects with indicators linked to the Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction, and so on. In relation to that, expectations expressed by these countries also covered the similar items – they want to enhance their risk assessment and risk mapping capacities, improve awareness at local level, coordinate relevant agencies and their policies more effectively, and implement efficient M&E system to evaluate the impact properly.

As a result, following two collaborative activities focusing on 1) capacity building for planning and implementation with risk assessment and risk mapping, and 2) integration of laws and regulations with coordination with relevant agencies were selected with associated targets and activities in 2018-2020 as listed in Table 4.1.2:

Table 4.1.2: Priority Work Plan for 2020

Immediate collaborative activities	Target by 2020	Agreed activities		
		2018	2019	2020
Capacity building for planning and implementation of measures for flood, storm, landslide and drought hazards with focus on spatial approaches for risk assessment and risk mapping at the local level	• Improve hazard and risk assessments by integrating climate change projections • Projecting climate change in terms of rainfall, temperature and sea level rise and downscaling from Global Climate Models (GCMs) • Evaluation of climate change impacts on key sectors of ASEAN countries • Implementation of pilot programs on integration of climate change projections into hazard and risk maps and planning including community based disaster risk management (CBDRM) plans • Developing guideline for hazard and risk mapping integrating climate change projections including for CBDRM • Implement training programs on hazard and risk maps integrating the climate change projections	• Identify institutional mechanism to coordinate activities • Set budget, prepare concept notes for fund raising • Develop platform for sharing the information among stakeholders • Stock taking of current capacities including training needs assessments for hazard and risk mapping and integration of climate change projections • Sharing of knowledge on hazard and risk assessments integrating climate change projections including for CBDRM	• Develop databases required for risk and hazard mapping and downscaling of climate change projections • Develop methodologies for hazard and risk mapping integrating climate change projections • Conduct case studies for developing hazard and risk maps with climate change impacts including application at the CBDRM level • Develop training module for training and advocacy on integrated hazard and risk assessments and mapping, including exposure visits	• Develop guidelines for integrating climate change projections into hazard and risk maps • Guidelines for use of hazard and risk maps in planning including for CBDRM • Pilot projects for demonstration of the methodology and share experiences and for refining the methodology • Organize training programs, including OJT and exposure visits
Integration of DRR and CCA laws and regulations, where applicable, with coordination of relevant agencies for the effective implementation at the national and sectoral level	• Mainstreaming DRR and CCA in laws and regulations, and national socio-economic development plans and local development plans	• Stock taking of current capacities for integrating DRR and CCA into national development laws and regulations • Establish coordination mechanism for integrating DRR and CCA into laws and regulations at national and local level • Review regional examples of laws and regulations • Develop advocacy platform for sharing the information	• Set directions for integrating DRR and CCA into national and local laws and regulations • Training module development for integrating DRR and CCA into development laws and regulations • Prepare model laws and regulations	• Customize model law and regulations to each country contexts • Develop guidelines for integrating CCA and DRR into laws and regulations • Formulate national socioeconomic plans and local development plan, laws and regulations in the priority areas (pilot testing) • Conduct training programs and awareness generation workshops on integrating CCA and DRR into laws and regulations

It was also decided that the Priority Work Plan for 2020 will be implemented immediately in line with the AADMER Work Programme 2016-2020 and available resources. The Priority Work Plan for 2020 will also be reviewed annually and its continuation beyond 2020 will be discussed along with development of a new AADMER Work Programme. In addition, the Meeting Summary (Annex 5) confirmed the followings:

- The WG P&M will take lead in coordinating the implementation of the agreed Work Plan for 2020 listed in the table, with support from ASEAN Secretariat. The role of Climate Change International Technical and Training Center (CITC), Thailand Greenhouse Gas Management Organization (TGO), Bangkok, Thailand will be explored in hosting the required capacity building activities proposed as a part of this Priority Work Plan for 2020.
- The Co-Chairs of the WG P&M request ACDM members to upload the Meeting Summary and the Priority Work Plan for 2020 to their appropriate websites in their national language.
- The National Project Focal Point appointed in each ACDM member organisation will report the progress of the activities related to DRR and CCA integration in each country annually to the WG P&M until 2020 starting from March 2018.
- The WG P&M will monitor and review the progress in each country and submit a synthesised report to the ACDM Meeting annually starting from October 2018. These reports will be uploaded to the CN20 Project website managed by the WG P&M.

The decision-making flow of the Work Plan is summarised in Figure 4.1.1.

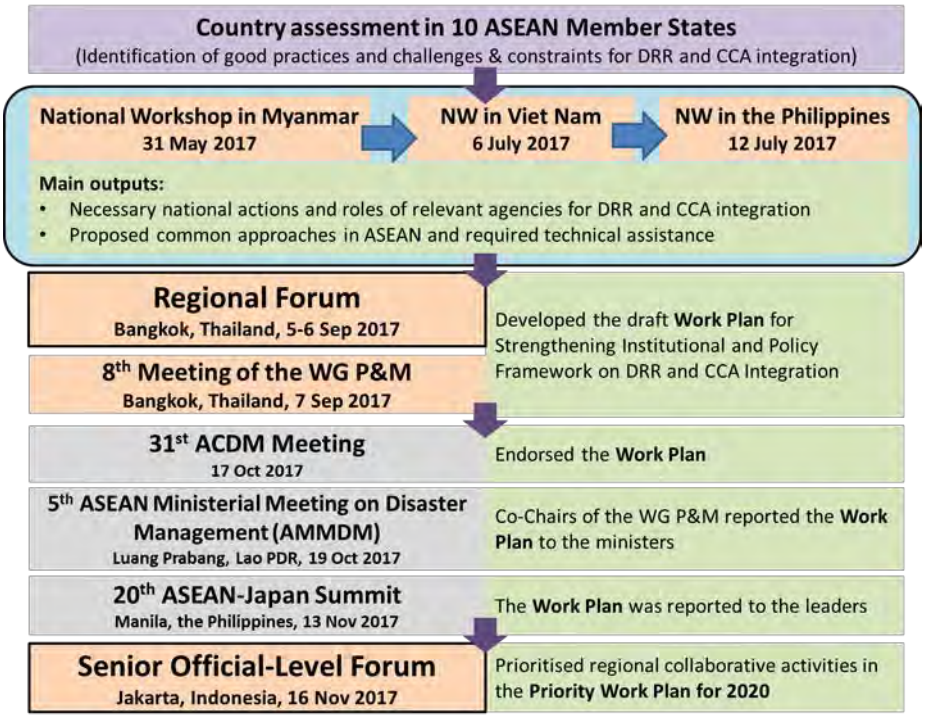


Figure 4.1.1: Development of the Work Plan through organising the National Workshops and Regional Forums

Key points of the Work Plan are summarised below:

Objective

The objective of the Work Plan is to mainstream DRR and CCA into national and regional activities thereby significantly reduce disaster risks and increase resilience through creating an enabling mechanism for capacity building, knowledge sharing and cross-sectoral collaboration leading to developing suitable policies, good practices, including data sharing platforms, among ASEAN member states.

Scope

The Work Plan focuses on effective integration, or incorporation, of climate change impact in development plans with particular focus on DRR. Suppose there are five components for managing and reducing disaster risk, namely institutional and policy development, risk assessment, planning, implementation and reviewing, like a cycle of plan-do-check-act (PDCA) management method, climate change impact assessment directly affects the risk assessment and planning but also other components as illustrated in Figure 4.1.2.

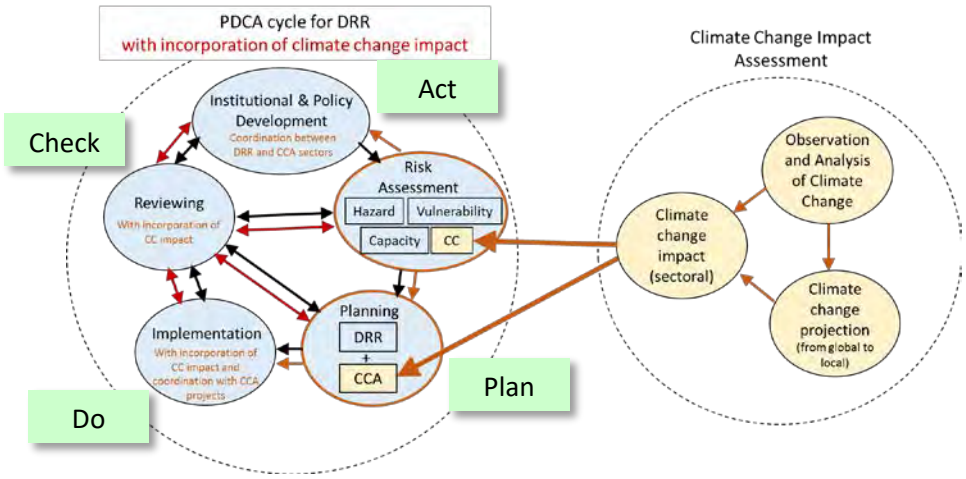


Figure 4.1.2: Incorporation of climate change impact in a PDCA cycle for DRR

Expected outputs

Through continuous implementation and revision of the PDCA cycle for DRR with improved climate change impact assessment and its incorporation, it is expected that the institutional capacity for DRR, including policy formulation, risk assessment, planning and implementation through coordination of multiple agencies at national and subnational levels, will be strengthened. Targeted outputs of the Work Plan are implementation of such demonstrable actions with engagement of multiple agencies catalysed and facilitated by national disaster management offices (NDMOs) and documentation and arrangement of cross-learning mechanism for their diffusion. By doing so, it is expected that the ACDM develops an autonomous knowledge management and capacity building system for building a disaster resilient and climate adaptive ASEAN in a long run.

Implementation period

The Work Plan will be implemented for three years from the date of its adoption along with the AADMER Work Programme 2016-2020 with annual revision and the Working Group on Prevention and Mitigation (WG P&M), which oversees the Priority Programme No. 3 ADVANCE, decides how to continue it beyond that.

Implementation structure

The WG P&M plays a central role with support from ACDM members. Practically, each ASEAN Member State plans and implements DRR and CCA activities in an integrated manner and the National Project Focal Point appointed by the ACDM National Focal Point in each Member State listed in Annex 6 reports the progress to the WG P&M annually. The WG P&M compiles and reports it to the ACDM Meeting and the ACDM Meeting provides suggestions for improvement. Other development partners and resource institutions may provide capacity building and technical assistance services through WG P&M's coordination. The WG P&M is responsible for the knowledge management, coordination of the stakeholders and overall management as shown in Figure 4.1.3.

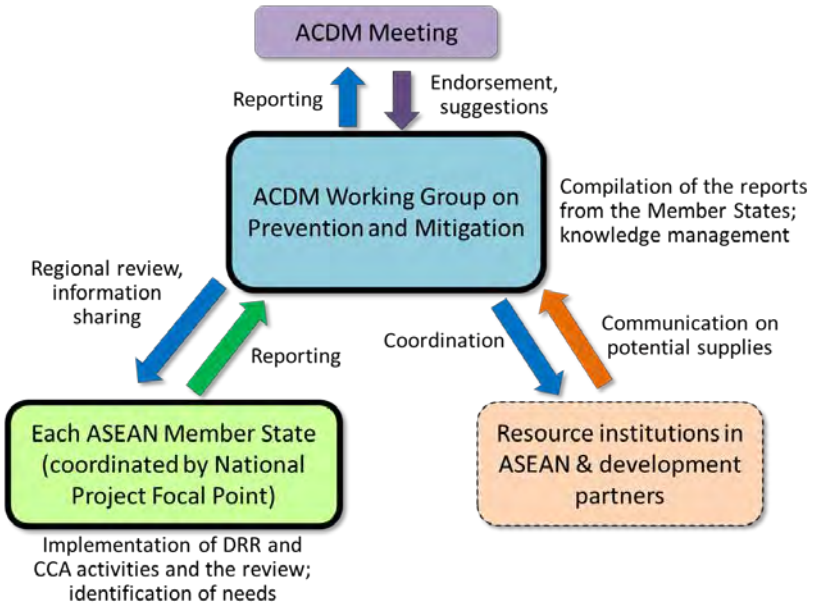


Figure 4.1.3: Implementation structure of the Work Plan

Detailed activities of the WG P&M and the National Project Focal Points are listed below:

Working Group on Prevention and Mitigation

The WG P&M is responsible for:

- Facilitate coordination of mutual cooperation activities among the Member States by referring to the Focal Point reviews;
- Facilitate collection, processing and dissemination of relevant information and knowledge, including the local knowledge, for DRR-CCA integration from the Member States and report it to the ACDM Meeting;
- Facilitate sharing of technical resources, matching regional needs and develop programmes for DRR and CCA integration with development partners;
- Enable capacity building measures for accessing global and regional finances for DRR and CCA integration activities in ASEAN Member States;
- Facilitate data management, standardisation of data collection, processing and use for robust decision-making, including improved resolution of hydro-met information collection at the local level and feeding into national and regional databases; and

- Facilitate development and adoption of integrated monitoring and evaluation frameworks through development of appropriate guidelines, tools and capacity building measures.

National Project Focal Point

Each Project Focal Point collects relevant information listed in Table 4.1.3 from line agencies, reviews and reports it to the WG P&M annually with particular focuses on:

- Promote management of data necessary for DRR-CCA integration and share the same with relevant agencies with specific focus on the vulnerable sectors, ecosystems and societies;
- Facilitate monitoring and evaluation of DRR and CCA related plans and activities and share among relevant agencies, including the DRR expenditure of line ministries, considering the need for inter-agency coordination;
- Promote capacity building through training programmes and provide related services regionally with specific focus on understanding resilience at the community level;
- Promote bottom-up approaches for DRR and CCA integration, as well as develop guidelines for mainstreaming DRR and CCA at the grass-root level;
- Enable stakeholder engagement for integration of DRR and CCA, including the engagement of the private sector by promoting various forums and networks; and
- Promote consolidation of climate change laws and regulations and put in place appropriate measures for monitoring the progress in the same.

Table 4.1.3: DRR and CCA activities to be implemented and reported by each ASEAN Member State

Activities		Review points*
1. Institutional and policy development		
1.1 Policies, laws and regulations	National socio-economic development plan	• Monitoring of Current National Socio-economic Development Plan
	DRR and CCA laws and regulations	• Progress of enactment and enforcement of individual DRR and CCA laws and regulations • Progress of enactment of integrated laws and regulations of DRR and CCA
	DRR and CCA related sectoral laws and regulations	• Progress of enactment and enforcement of relevant sectoral laws and regulations
1.2 Management system	National and subnational DRR and CCA management systems	• Progress in risk management system at national and local levels
1.3 Financial arrangement	Regular budgetary arrangements of line ministries for DRR and CCA	• Progress in budget allocation and monitoring of DRR and CCA expenditures
	Special funds for local and community-based DRR and CCA activities	• Progress in creation and operation of national and local DRR and CCA funds
	Payment for ecosystem services (PES) and insurance scheme	• Progress in PES and insurance measures
2. Risk assessment		
2.1 Climate change impact analysis	Observation and analysis of hydro-meteorological data	• Progress in monitoring systems and data sharing and analysis
	Climate change projection	• Progress in projection of climate change impacts on rainfall, sea level rise, etc.
	Standard values of CC impact	• Progress in setting standard values for climate change.
2.2 Hazard and risk mapping	Hazard and risk mapping of flood, storm surge, landslide and drought	• Progress in preparation of hazard maps considering the limitation of information disclosure by each Member State.
3. Planning and implementation**		
3.1 Disaster risk reduction	DRR plans and implemented projects for flood, storm surge, landslide and drought	• Progress in planning, implementation and updating prevention and mitigation measures. • Progress in legally authorized DRR and CCA plans.
3.2 Standard guideline for disaster and climate risk assessment and planning		• Progress in preparation of guidelines.
4. Monitoring and evaluation (by the National Project Focal Point)		
4.1 Data management	Basic disaster, hydro-meteorological, risk, vulnerability and socio-economic data are periodically managed, updated and shared with relevant agencies for synthetic analysis and decision making	
4.2 Reviewing	DRR and CCA related plans and activities are periodically reviewed for close coordination and knowledge sharing among relevant agencies	
4.3 Capacity building and needs assessment	Based on the reviewing results, capacity building needs are identified and corresponding training programmes are arranged using domestic resources; other required external technical assistances and identified resource institutions and agencies possible to provide capacity building services regionally are reported to the WG on P&M	

**Use appropriate SDG target indicators wherever possible while reporting (to be developed later)*

*** Planning and implementation are merged here as the review points for both components are similar.*

Immediate collaborative activities

Following immediate collaborative activities will be implemented under the Work Plan:

- Knowledge sharing and training on:
    - Capacity building for planning and implementation of measures for flood, storm, landslide and drought hazards with focus on spatial approaches for risk assessment and risk mapping at the local level;
    - Integration of DRR and CCA laws and regulations, where applicable, with coordination of relevant agencies for the effective implementation at the national and sectoral level;
    - Building capacity for accessing regional and global funds for integrating DRR and CCA;
    - Measures to share skills, knowledge and data on climate change impacts, implementation of river basin management, countermeasures for climate change impacts including policies; and
    - Developing guidelines and tools with indicators for monitoring and evaluation of programmes, policies and projects on integration of DRR and CCA.

Further challenges

In order to strengthen integration of DRR and CCA further beyond this Work Plan, following activities shall be planned in parallel:

- Linking the activities with the national reporting of the global frameworks including the Sustainable Development Goals (SDGs) and the Sendai Framework for DRR and use their designated indicators
- Strengthening collaboration with regional groups and organisations such as ACDM Working Group on Knowledge and Innovation Management (WG KIM), AHA Centre, ASEAN Working Group on Climate Change (AWGCC) and Climate Change International Technical and Training Center (CITC), among others
- Strengthening human resources development and capacity building for implementation of local and national socio-economic development plans after integrating DRR and CCA with appropriate budget and fund allocation

4.2 National Workshops

Three National Workshops were organised to discuss issues, challenges and necessary actions to strengthen DRR and CCA integration at national and regional levels. There were a number of participants from various DRR- and CCA-related ministries and agencies in each workshop as shown below:

Table 4.2.1: Main participants of the National Workshops

National Workshops	Participants from national agencies

Naypyitaw, Myanmar, 31 May 2017	36 participants from 20 departments/divisions of 11 ministries/agencies:
	• Ministry of Agriculture, Livestock and Irrigation (MOALI)
	  • Irrigation and Water Utilization Management Department (IWUMD)
	  • Rural Development Department
	  • Department of Agriculture
	• Ministry of Construction (MOC)
	  • Department of Road
	  • Department of Bridge
	  • Department of Building
	• Ministry of Education (MOE)
	  • Department of Basic Education
	• Ministry of Home Affairs (MOHA)
	  • General Administration Department (GAD)
	• Ministry of Health and Sports (MOHS)
	  • Public Health Department
	• Ministry of Natural Resources and Environmental Conservation (MONREC)
	  • Environmental Conservation Department (ECD)
	  • Department of Mines
	  • Forestry Department
	• Ministry of Planning and Finance (MOPF)
	  • Planning Department
	  • Foreign Economic Relation Department
	• Ministry of Social Welfare, Relief and Resettlement (MOSWRR)
	  • Relief and Resettlement Department (RRD)
	  • Department of Social Welfare
	• Ministry of Transport and Communications (MOTC)
	  • Directorate of Water Resources and Improvement of River Systems (DWIR)
	  • Department of Meteorology and Hydrology (DMH)
	• Natural Resources and Environmental Conservation Committee
	• Myanmar Red Cross Society

Hanoi, Viet Nam, 6 July 2017	21 participants from 11 departments/divisions of 5 ministries/agencies:
	• Ministry of Transport (MOT)
	  o Directorate for Roads
	• Ministry of Natural Resources and Environment (MONRE)
	  o General Department of Geology and Minerals
	  o General Department of Land Management
	  o Department of Water Resources Management
	  o Institute of Meteorology, Hydrology and Climate Change (IMHEN)
	  o Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE)
	• Ministry of Agriculture and Rural Development (MARD)
	  o Department of Natural Disaster Prevention and Control (DNDPC)
	  o Forest Protection Department
	• Ministry of Planning and Investment (MPI)
	  o Development Strategy Institute
	• Ministry of Construction (MOC)

	○ Urban Development Agency • Ninh Thuan Province ○ Implementation Unit for Capacity Development and ODA Water Resources Projects
Quezon, the Philippines, 12 July 2017	26 participants from 15 departments/divisions of 10 ministries/agencies • Office of Civil Defense (OCD) / National Disaster Risk Reduction and Management Council (NDRRMC) • Department of Agriculture (DA) ○ Field Program Operational Planning Division (FPOPD) ○ Bureau of Agriculture and Fishery Engineering • Department of Environment and Natural Resources (DENR) ○ Forest Management Bureau (FMB) ○ Land Management Bureau (LMB) ○ Mines and Geoscience Bureau (GMB) ○ River Basin Control Office (RBCO) • Department of Finance (DOF) • Department of Science and Technology (DOST) ○ Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) • Department of Public Works and Highways (DPWH) ○ Bureau of Design (BOD) ○ Flood Control and Sabo Engineering Center (FCSEC) • Metropolitan Waterworks and Sewerage System (MWSS) • National Economic and Department Authority (NEDA) • National Irrigation Administration (NIA) • National Water Resource Board (NWRB)

In each National Workshop, participants separated in three groups discussed the issues and necessary national and regional actions to improve DRR and CCA integration and shared each group's findings in a plenary session. Prior to the workshops, the JICA Project Team visited many of the agencies to explain the objectives and expected outputs of the workshop and to learn their views on the country assessment results of DRR and CCA integration status summarised by the Project Team.

In the National Workshop in Myanmar, participants discussed it along with all six assessment categories; whereas in the following workshops in Viet Nam and the Philippines, participants selected priority categories and discussed them in detail. As a result, in these workshops, "risk assessment" and "planning and implementation" were discussed in detail. Based on these discussion results, a draft Work Plan was developed and the discussion results of three National Workshops were attached as a reference.

Annexes 13 to 15 include supporting documents of the National Workshops in Myanmar, Viet Nama and the Philippines including the agenda, list of participants, presentation by the JICA Project Team, discussion outputs and the summary, and an assessment result of DRR and CCA integration status in each country.

4.3 Regional Forum

A Regional Forum was held to decide key components of the Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration including the objectives, review points of the country progress report, roles and responsibilities of the Working Group on Prevention

and Mitigation and ACDM members, immediate collaborative activities and further challenges. There were a total of 29 participants from six ASEAN Member States representing various DRR and CCA related national agencies as listed in the following table:

Table 4.3.1: Main participants of the Regional Forum

Country	Participants from national agencies
Cambodia	National Committee for Disaster Management (NCDM)
Indonesia	National Agency for Disaster Management (BNPB)
Lao PDR	Disaster Management Division, Social Welfare Department, Ministry of Labour and Social Welfare (MLSW) Department of Climate Change, Ministry of Natural Resources and Environment (MONRE) Department of Meteorology and Hydrology (DMH), MONRE
Malaysia	National Disaster Management Agency (NADMA), Prime Minister's Department Economic Planning Unit (EPU), Prime Minister's Department Development Division, Prime Minister's Department
Thailand	Department of Disaster Prevention and Mitigation (DDPM) Office of Natural Resources and Environmental Policy and Planning (ONEP), Ministry of Natural Resources and Environment (MONRE) Royal Irrigation Department (RID)
Viet Nam	Vietnam Disaster Management Authority, Ministry of Agriculture and Rural Development (MARD) Department of Climate change, Ministry of Natural Resources and Environment (MONRE) National Center for Hydro-meteorological Forecast Service, MONRE

In session 1, the JICA Project Team shared a summary of the assessment results of DRR and CCA integration status in ASEAN based on six assessment categories and good practices recommendable for application. The Project Team also explained the main outputs of the National Workshops and objectives and expected outputs of the Regional Forum by highlighting the features of the draft Work Plan. In Session 2, representatives from each country expressed their views on the Work Plan and commented on Project Team's assessment results and selected good practices. Following that, JICA introduced some integrated processes of DRR and CCA by citing some case studies in Japan and ASEAN, which depict how sectoral measures and plans need to be changed based on climate impact assessment in management of agricultural products, water resources and disaster risks. He also stressed the importance of a systematic approach to assess existing and new risks, quantification of future damages and usage of sophisticated technologies including weather satellite images to estimate hydrological changes more accurately. Participants shared their views on this presentation by referring to the situation of disaster and climate risk assessment in each country.

In Session 3, participants were grouped by each country to discuss the main components of the Work Plan and shared their ideas before closing of Day 1. As a result, following five immediate collaborative activities were confirmed that all require regional capacity building and knowledge sharing activities:

- Capacity building for planning and implementation of measures for flood, storm, landslide and drought hazards with focus on spatial approaches for risk assessment and risk mapping at the local level;
- Integration of DRR and CCA laws and regulations, where applicable, with coordination of relevant agencies for the effective implementation at the national and sectoral level;

- Building capacity for accessing regional and global funds for integrating DRR and CCA;
- Measures to share skills, knowledge and data on climate change impacts, implementation of river basin management, countermeasures for climate change impacts including policies; and
- Developing guidelines and tools with indicators for monitoring and evaluation of programmes, policies and projects on integration of DRR and CCA and conduct associated training.

After confirming these points at the beginning of Day 2, participants were again grouped in each country to elaborate the selected five activities further along with the following five specific questions:

1) What/which good practices are useful for sharing? What do you want to learn from others?
2) What kind of facilitation mechanism do you want for that? Do you want to visit other Member States? Can you accept those requests from others?
3) What kind of capacity building is the priority? What kind of technical assistance is needed?
4) What data sharing is beneficial? Risk assessment and hazard and risk mapping methodologies? An indicator set for monitoring and assessment of the impact of climate change on disaster?
5) What potential experiences/support/supply can you provide for the regional collaborative activities?

As a result, participants agreed with the following points, among others:

- Practices they want to learn from others include DRR and CCA data and information sharing mechanism for policy framework and risk assessment, community activities, transboundary river basin management system, etc.;
- An arrangement of technical workshops and field visits to learn good practices is preferred;
- Capacity building on improving understanding of DRR and CCA integration and mainstreaming it in multiple sectors with a set of indicators for monitoring and evaluation is required;
- Sharing of data and methodologies of risk assessment and risk mapping using standardised reporting templates can be beneficial for the region; and
- Visitors and trainees from other countries can be accepted to share their practices and experiences.

By incorporating these points, the Project Team further elaborated the Work Plan in consultation with the project steering committee members and it was shared with ACDM members by the ASEAN Secretariat for their endorsement through ad-referendum.

Annex 16 shows the agenda; list of participants; presentations by JICA and JICA Project Team; group work sheet; and a summary of the Regional Forum.

4.4 Senior Official-Level Forum

Following the endorsement of the Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration at the 31st ACDM Meeting on 17 October 2017 in Luang Prabang, Lao PDR, a Senior Official-Level Forum (SOLF) was held on 16 November 2017 in Jakarta, Indonesia, to decide detailed regional collaborative activities of the Work Plan. There were a total of 32 participants from eight ASEAN Member States representing various DRR and CCA related national agencies as listed in the following table:

Table 4.4.1: Main participants of the Senior Official-Level Forum

Country	Participants from national agencies
Indonesia	National Agency for Disaster Management (BNPB) Ministry of Public Works and Housing (PU)
Lao PDR	Disaster Management Division, Social Welfare Department, Ministry of Labour and Social Welfare (MLSW) Ministry of Public Work and Transportation (MPWT) Department of Climate Change, Ministry of Natural Resources and Environment (MONRE) Department of Meteorology and Hydrology (DMH)
Malaysia	National Disaster Management Agency (NADMA) Department of Irrigation and Drainage (DID) Stormwater Management and Road Tunnel (SMART) Control Center National Hydraulic Research Institute (NAHRIM), Ministry of Natural Resources and Environment (NRE)
Myanmar	Relief and Resettlement Department (RRD), Ministry of Social Welfare, Relief and Resettlement (MOSWRR) Environment Conservation Department (ECD), Ministry of Natural Resources and Environmental Conservation (MONREC)
The Philippines	Office of Civil Defense (OCD) / National Disaster Risk Reduction and Management Council (NDRRMC) Department of Public Works and Highways (DPWH) Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Department of Science and Technology (DOST)
Singapore	Singapore Civil Defence Force (SCDF)
Thailand	Department of Disaster Prevention and Mitigation (DDPM) Office of Natural Resources and Environmental Policy and Planning (ONEP), Ministry of Natural Resources and Environment (MONRE) Thailand Greenhouse Gas Management Organization (Public organization) Upper Northern Irrigation Hydrology Center, Royal Irrigation Department (RID)
Viet Nam	Vietnam Disaster Management Authority, Ministry of Agriculture and Rural Development (MARD) Disaster Management Policy and Technology Center, MARD Forest Protection Department, MARD

In Session 1, Co-Chair of the ACDM Working Group on Prevention and Mitigation explained the main points of the Work Plan and how it was endorsed at the 31st ACDM Meeting. The JICA Study Team supplemented it by explaining the outputs of the National Workshops and Regional Forum and the objectives and expected outputs of the SOLF. Following that, each country expressed their expectation and possible contribution to the Work Plan in Session 2. All countries prepared the presentations prior to the SOLF by coordinating multiple DRR and CCA related agencies.

After a lunch break, participants divided by each country prioritised the five immediate collaborative activities selected at the Regional Forum and listed up necessary activities in 2018-2020 to achieve them by taking into account of the expectation and possible contribution expressed by each country. In Session 3, each country presented the result of the discussion. All countries stressed the importance

of capacity building in DRR and CCA planning and implementation with particular focus on risk assessment and risk mapping and some countries highlighted the necessity of strengthening coordination of DRR and CCA agencies with particular focus on coordinated implementation of laws and regulations. As a result, a Meeting Summary with a Priority Work Plan for 2020 focusing on the two activities was adopted as shown in Table 4.1.1 as well as in Annex 5.

Key messages from the main participants, which are also captured in the press release of the forum, are listed below:

- Mr. Dicky Fabrian, Head of Legal and Cooperation Bureau, Indonesia's National Agency for Disaster Management: "Disaster risk reduction and climate change adaptation have several overlapping areas, which makes them easy to be integrated in approaches."
- Mr. Vilayphong Sisomvang, Co-Chair of the forum, representing Lao PDR: "Integrating disaster risk reduction and climate change adaptation in national and local development plans will help ASEAN tackle climate change impacts in a more effective manner."
- Mr. Saharat Wongsakulwiwat, Co-Chair of the forum, representing Thailand: "The collaborative actions outlined in the work plan will need to be prioritised and implemented by all relevant agencies and institutions through the coordination of the ACDM Working Group on Prevention and Mitigation. Once implemented effectively and practically, we will be able to create an enabling risk governance environment for long-term risk reduction."
- Dr. Hitoshi Baba, Senior Advisor from JICA: "Now, ASEAN states are much more focused on disaster risk reduction to secure societal safety. It is further required to adapt it against climate change impact by improving the capacity of risk assessment. Leadership of the ACDM Working Group on Prevention and Mitigation is essential for the implementation of the Work Plan."

Annex 17 shows the agenda; list of participants; presentation by the JICA Project Team; a draft template of the annual progress report; presentations by the ASEAN Member States on the expectation and possible contribution to the immediate collaborative activities; results of group exercise by each country; summary of the Senior Official-Level Forum, and the press release.

5. Conclusion and Recommendation

5.1 Status of DRR and CCA Integration in ASEAN

More coordination between DRR and CCA agencies required

The number of water-related disasters as well as the damages caused by that in ASEAN is increasing in last 30-40 years. Assessing the climate risk and incorporating it in national, local and sectoral DRR plans is inevitable to reduce disaster risk. Reflecting that, in the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme 2016-2020, "Advancing ASEAN community that is safe, resilient to disasters, and adaptive to climate change, with youth and good governance at the centre" is set as one of the priority programmes. Having that in mind, as the Project Team studied the status of DRR and CCA integration in institutional and policy framework in ASEAN through carrying out baseline studies and organising a series of consultative meetings and workshops with the stakeholders, one of the identified common constraints in ASEAN is weak inter-ministerial and inter-agency coordination. In terms of policies and plans, often the case CCA concept is incorporated in DRR plans and policies and the same for the DRR concept in CCA plans and policies. Similarly, national disaster management committees have members from climate change-related agencies and national climate change committees have members from DRR-related agencies. However, policy coordination or joint implementation of programmes and projects through mutual coordination are still rare in most ASEAN Member States.

The ASEAN Committee on Disaster Management (ACDM), a group of national disaster management offices (NDMOs), was assigned as a focal point for cross-sectoral cooperation on resilience building at regional level at the 26th ASEAN Summit in Malaysia in April 2015 as stated in the Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disaster and Climate Change. However, they are not necessarily the designated national focal point for DRR and CCA coordination in each country's institutional context. Often the case, their mandates and focuses are more on disaster management, including preparedness (early warning, education and awareness), response and recovery, but not prevention and mitigation nor coordination with the climate change agencies. In fact, prevention and mitigation of disaster risks in terms of implementation of structural and non-structural measures are generally managed by other ministries and agencies. For example, flood risks are by public works, rivers and irrigation agencies; landslide risks are by construction, roads and forest management agencies; drought risks are by water resources management and agricultural agencies; and climate risk assessment including hydro-meteorological data analysis is by hydro-meteorological and climate change agencies. Literally, ACDM members are supposed to coordinate all these agencies, however, they are not authorised in that way in many cases.

In some countries, the situation is better. For example, the National Disaster Management Agency (NADMA) in Malaysia established under the Prime Minister's Department has a convening power of all relevant ministries and agencies. Since it also coordinates closely with the Department of Irrigation and Drainage (DID), the Department of Public Works (JKR) and the Malaysian Meteorological Department, key agencies dealing with water-related disasters, their DRR system is functioning well. Similarly, the National Committee for Disaster Management (NCDM) in Cambodia headed by the Prime Minister has a convening and coordination power of other agencies. The Office of Civil Defense (OCD) in the Philippines, being the administrator of the National Disaster Risk Reduction and Management Council (NDRRMC) and having Local DRRM Offices throughout the country that are all mandated to develop Local DRRM Plans incorporating disaster and climate risks, also has a strong coordination power at both national and local levels.

On the other hand, for example, in Indonesia, inter-agency coordination is managed by the National Development Planning Agency (BAPPENAS) at the national level and by the Ministry of Agralian and Spatial Planning and the Ministry of Home Affairs at the local level; not by the National Disaster Management Authority (BNPB). In Viet Nam, the General Department of Natural Disaster Prevention and Control (GDNDPC) under the Ministry of Agriculture and Rural Development (MARD), being the secretariat of the Central Steering Committee for Natural Disaster Prevention and Control headed by the Minister of the MARD, has an advantage in close coordination with DRR-related agencies including the ones in charge of management of rivers, irrigation facilities and forests. However, their coordination with other agencies, including climate change risk assessment and hydro-meteorological data management agencies under the Ministry of Natural Resources and Environment (MONRE), is not so strong. In Myanmar, the Relief and Resettlement Department (RRD) under the Ministry of Social Welfare, Relief and Resettlement coordinates well with other DRR and CCA agencies through developing the Myanmar Action Plan on Disaster Risk Reduction (MAPDRR). However, their coordination capacity at the local level is constrained by the presence of their branch offices only up to Region/State and District levels but not in Township level. For promoting effective coordination of relevant agencies, these institutional arrangements in each country and the position of the ACDM members need to be taken into consideration.

While CN20 Project organised National Workshops in three countries, namely in Myanmar, Viet Nam and the Philippines, it was observed that it provided an important opportunity for those officials from various agencies in charge of disaster management, DRR and CCA to discuss necessary approaches against growing disaster and climate risks directly. In fact, group discussions in the workshop with a mixture of participants lasted about two hours beyond the scheduled one hour in all three countries. Similar comments were heard from the participants of the Regional Forum and the Senior Official-Level Forum – they took advantage of these opportunities to communicate with other agencies prior to and during the forums. In these regional forums, participants were also able to learn each country's status of DRR and CCA integration including the strengths and weaknesses as well as their relative position in the region. From this, it can be inferred that, although DRR and CCA integration is regarded necessary direction in principle, in reality, the first step, coordination of relevant agencies, is still a challenge in many countries. Yet, it was also recognised that there is a potential to improve the situation by setting up a regional programme that allows officials from relevant agencies to share their approaches and experiences and learn from each other.

Mutual learning potential among ASEAN Member States

As explained above, there is a potential to improve DRR and CCA integration in ASEAN by facilitating mutual learning. As seen in the assessment of DRR and CCA integration status in each country and the selected good practices in previous sections, some countries are advanced in some aspects and they can be tutors or resource persons for others by sharing their experiences. For example, in terms of **risk assessment** of flood and drought, the Department of Irrigation and Drainage (DID) in Malaysia and the Southern Institute for Water Resources Planning (SIWRP) under the Ministry of Agriculture and Rural Development (MARD), Viet Nam, are advanced by incorporating climate risk in it. Their hydro-meteorological assessment is supported by the works of other technical agencies – the National Hydraulic Research Institute of Malaysia (NAHRIM) in Malaysia and the Institute of Meteorology, Hydrology and Climate Change (IMHEN) and the National Hydro-Meteorological Service (NHMS) in Viet Nam, respectively. As a set, these agencies can provide useful knowledge with others. Similarly, the Philippine Atmospheric, Geophysical and Astronomical

Services Administration (PAGASA) in the Philippines has a potential to provide similar level of services and the Department of Mineral Resources (DMR) under the Ministry of Natural Resources and Environment (MONRE), Thailand, can provide detailed landslide risk assessment and risk maps.

When focusing on **application of these disaster and climate risk in local development plans**, approaches in the Philippines and Indonesia are also good references for others. In the Philippines, local governments need to prepare a Comprehensive Land-Use Plan (CLUP) by incorporating disaster and climate risk that needs to be approved by the Housing and Land Use Regulatory Board (HLURB). Similarly, the National Development Planning Agency (BAPPENAS), the Ministry of Agrarian and Spatial Planning, and the Ministry of Home Affairs oversee local development plans in Indonesia. Similar application at pilot project sites is also seen in other countries: for example, in Saravane, Sekong and Attapue Provinces in Lao PDR, Ayeyarwady, Bago and Yangon in Myanmar, and Ho Chi Minh City, Da Nang City and Can Tho City in Viet Nam.

In terms of **developing guidelines for planning and designing** by incorporating disaster and climate risk, the Ministry of Public Works and Housing (PU) in Indonesia, the Department of Irrigation and Draining (DID) in Malaysia, and the Department of Public Works and Highways (DPWH) in the Philippines are advanced and they have also implemented some pilot projects. These three countries are also advanced in terms of **river basin management**: for example, River Basin Organizations (*Balai Besar*) and Public Corporations (*Jasa Tirta*) are set up for major river basins for water resources management and coordinated operation of dams in Indonesia; master plans are formulated for major 18 river basin by the River Basin Control Office (RBCO) in the Philippines; and the DID is overseeing river management from upstream to downstream in Malaysia. As for water resources management and flood and drainage management systems, the Public Utility Board (PUB), Singapore's National Water Agency, also possesses useful experiences.

When focusing on **funding** for DRR and CCA activities, a prominent case is the Local DRR and Management Fund in the Philippines that mandates local governments to set aside 5% of their estimated revenue for quick response and pre-disaster preparedness and post-disaster recovery activities that resulted in proactive investment in DRR interventions. Similarly, the Natural Disaster Prevention and Control Fund was established in 50 provinces out of 63 in Viet Nam and also the Forest Protection and Development Fund was established in 41 provinces that supports forest management and reforestation activities. Funds for supporting development of local CCA plans and implementation of them were also developed in the Philippines and Indonesia: the People's Survival Fund (PSF) and the Indonesia Climate Change Trust Fund (ICCTF), respectively. In terms of **monitoring and evaluation** of climate-related expenditures, a programme called the Climate Public Expenditure and Institutional Review (CPEIR) is implemented in Cambodia, Thailand and Viet Nam and the Climate Change Expenditure Tagging (CCET) in the Philippines. In Indonesia, e-monitoring system is implemented to evaluate the outputs of DRR and CCA projects.

Institutional arrangements for DRR and CCA integration were already described above: most countries have relevant laws, regulations and policies and associated institutional setup from national to local levels. Degree of coordination among those agencies varies from country to country as stated as well. As seen here, these practices are all good references for others and also potential seeds for designing a regional mutual-learning programme.

Development of a Work Plan

Having these constraints and potentials in mind, three National Workshops, a Regional Forum and a Senior Official-Level Forum were organised to develop a regional action plan to push this agenda forward. Through that, issues, challenges and needs for DRR and CCA integration at local and national levels were discussed and necessary actions were consolidated in five regional activities, which were further narrowed down to the following two immediate collaborative activities:

1) Capacity building for planning and implementation of measures for flood, storm, landslide and drought hazards with focus on spatial approaches for risk assessment and risk mapping at the local level; and
2) Integration of DRR and CCA laws and regulations, where applicable, with coordination of relevant agencies for the effective implementation at the national and sectoral level.

In addition to that, it was also agreed that each ACDM member compiles the progress of DRR and CCA integration in each country in various aspects, including institutional and policy development, risk assessment, planning and implementation, and capacity building, through coordination and communication with DRR and CCA line agencies, and reports it to the ACDM Working Group on Prevention and Mitigation (WG P&M) annually. It is expected that this exercise will not give additional burden to ACDM members and the WG P&M who synthesises them, but it gives an opportunity to use it as an annual country report and a synthesised regional report for submitting to the United Nations Office for Disaster Risk Reduction (UNISDR), the secretariat of the Sendai Framework for Disaster Risk Reduction 2015-2030. The first selected activity corresponds to Priority 1: Understanding disaster risk, and Priority 3: Investing in disaster risk reduction for resilience, and the second one to Priority 2: Strengthening disaster risk governance to manage disaster risk of the Sendai Framework for Disaster Risk Reduction 2015-2030.

Obviously, the leading and coordination role of the WG P&M is essential to make these activities meaningful. In terms of the commitment for the implementation, it was endorsed by two layers: the endorsement of the Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration at the 31st ACDM Meeting and its confirmation by the ministers at the 5th ASEAN Ministerial Meeting on Disaster Management (AMMDM) in Lao PDR in October 2017; and its recognition by the leaders at the 20th ASEAN-Japan Summit in the Philippines in November 2017.

Output of the CN20 Project

As listed in the following table, expected outputs of the CN20 Project were all met: 1) good practices on DRR and CCA were documented and it was shared at national workshops and regional forums; 2) status of DRR and CCA integration was assessed in each country and it was reviewed at national workshops and regional forums; 3) Senior Official-Level Forum was organised with participation of various DRR and CCA agencies; and as a result, 4) the Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration was developed for implementation in 2018-2020.

Table 5.1.1: Output of the CN20 Project

Expected Output	Activity	Output
1. Documentation of good practices in institutional strengthening and policy development on linking DRR and CCA in ASEAN Member States	1.1 National workshop on good practices in integrated plan and policy development, funding mechanisms; and risk assessments for DRR and CCA in the Member States 1.2 Identification of common approaches to strengthen institutional and policy development for DRR and CCA 1.3 Publishing the documented good practices	• Three national workshops and two regional forums were held to share good practices on DRR and CCA integration; • The Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration was developed to implement selected regional collaborative activities for 2020; and • Good practices were compiled and published as a report titled "One Against Disaster and Climate Risks: A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN".
2. Assessment of the implementation of national action plans on DRR and CCA and the effectiveness of national platforms	2.1 National workshop to review the progress of the implementation of the national action plan on DRR and CCA 2.2 Organisation and conduct of a regional forum on the progress and lessons learned by the Member States 2.3 Documentation of the outcomes of national workshops and the regional forum	• Three national workshops and two regional forums were held to share the result of country assessment on DRR and CCA integration and to discuss how to strengthen it; as a result, the Work Plan was developed; • Results of the national workshops and regional forums were uploaded to the project website for information sharing.
3. Senior official-level roundtable discussions on policy and programme interventions to strengthen the connection and coherence of DRR and CCA efforts at all level	3.1 Preparatory meetings for the senior official-level forum, including arrangement with media 3.2 Holding of the senior official-level forum with broadcast media coverage	• Preparatory meeting for the SOLF was held on 6 September 2017 after the Regional Forum and the SOLF was held on 16 November 2017; and • Press release was issued after the SOLF and the Co-Chairs of the WG P&M requested each ACDM member to upload the Meeting Summary of the SOLF to their website with an introduction in their national language together with the Work Plan and links to the Chairman's Statement of the 20th ASEAN-Japan Summit and the project website

5.2 Way Forward

Implementation of the Work Plan

As the Work Plan is laid out with commitments, **the next step is its steady implementation**. A common demand for implementing these activities is knowledge sharing and capacity building. People want to know what, and how, others are doing and learn from others. Facilitating such mutual-learning, as agreed in the Priority Work Plan for 2020, is a big task. For example, developing such a training programme will require a baseline study on demand and supply (i.e. who can offer what), compilation of available resources for training use, identification of resource persons and institutions, developing training programmes and organising it through coordination with the stakeholders and participants, and archiving the results and lessons learned as regional knowledge.

Here, as explained above, good practices identified by the Project Team as well as the possible contributions presented by each country at the Senior Official-Level Forum can be used as potential resources. In addition to that, implementing pilot projects for risk assessment and risk mapping at selected sites as hands-on training is also a useful approach as agreed in the Priority Work Plan for 2020. Dispatching experts from other countries can also be incorporated. For that, it requires selection of pilot project sites, coordination of relevant stakeholders in the targeted areas, and identification of appropriate experts and resource persons.

Roles and responsibilities of the ACDM Working Group on Prevention and Mitigation

For the implementation of these activities, it requires extensive coordination works. The Work Plan needs a dedicated secretariat to design the activities, coordinate relevant stakeholders, and run it. It is the role of the WG P&M, particularly the Co-Chairs, to lead it. However, as seen in Chapter 1, it is unrealistic to expect the WG P&M to undertake all the roles with current institutional setup as they have no dedicated staff or budget for the secretariat service and they are already outstretched for overseeing more than ten ongoing projects implemented by various development partners. Substantial support from the AHA Centre as well as the ASEAN Secretariat cannot be counted on either. Therefore, it is inferred that, with current capacity, the best the WG P&M can deliver are submission of a synthesised regional progress report on DRR and CCA integration annually based on the reports submitted by the ACDM members and playing a catalytic role by sharing it and other information with ACDM members and other partners in expectation of their voluntary interaction.

In order to push it forward, the Priority Work Plan for 2020 needs to be packaged as a concept note including the above-mentioned activities with clearly defined targets and associated roles and responsibilities of the WG P&M and ACDM members, so that it can be communicated with potential development partners for their support. Since integration of DRR and CCA is a well-known concept for addressing disaster and climate risks jointly for efficient use of available resources, it has a potential to attract external support in this way. As listed in the Priority Work Plan for 2020, there are a number of activities required in 2018 to kick-start the two regional activities, including:

For the risk assessment and risk mapping with integration of climate change projection:

- Stock taking of current capacities and assessment of training needs of ACDM members;
- Sharing of knowledge including community-based disaster risk management;
- Identification of relevant case studies and methodologies applied; and
- Identification of training modules and project sites for exposure visits.

For the integration of DRR and CCA laws and regulations with coordination of relevant agencies:

- Stock taking of current capacities for integrating DRR and CCA into national development laws and regulations;
- Reviewing regional examples of laws and regulations; and
- Identification of training modules.

For both activities:

- Developing platform for sharing the information among stakeholders; and
- Setting budget and preparing concept notes for fund raising.

It is expected that, under the leadership of the Co-Chairs, the WG P&M members start discussing how best these activities could be implemented; what can be done with current institutional setup; what available resources can be used for that; and which components need to be packaged for seeking assistance from potential partners. Seeking collaboration with other ASEAN Working Groups,

particularly with the ASEAN Working Group on Climate Change which oversee a number CCA projects in the region, is also an area to be explored through the coordination of the ASEAN Secretariat. Since the working group meetings are held twice a year, a realistic target for developing such an implementation plan is by the 9th Meeting of the WG P&M in March-April 2018.

In a long run, in a view of development of the AADMER Work Programme beyond 2020, it is also expected that the WG P&M will strengthen its capacity, in particular the human resources and budget, so that they can implement the Work Plan continuously since strengthening resiliency of the national and local governments and communities through integrating DRR and CCA will require continuous effort. It is also expected that, through these activities, the WG P&M will manage the knowledge accumulated and thereby be a regional knowledge centre, with support of the AHA Centre through its revision of focal areas.