CN20 Project
AADMER Work
Programme Phase 2

One Against Disaster and Climate Risks

A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN

One Against Disaster and Climate Risks

A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN

Published: November 2017

Concept Note 20 Project:
ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme (2013-2015) Concept Note 20 and AADMER Work Programme 2016-2020 Priority Programme 3

Produced by JICA Project Team:

Institute for Global Environmental Strategies (IGES) Regional Centre
604 SG Tower 6th Floor, 161/1 Soi Mahadlek Luang 3. Rajdamri Road, Patumwan,
Bangkok, 10330, Thailand

CTI Engineering International Co., Ltd.
Tachibana Annex Building
2-25-14 Kameido,Koto-ku
Tokyo 136-0071, Japan

Citation

ASEAN and JICA. 2017. One Against Disaster and Climate Risks: A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN. Bangkok, Thailand: ASEAN and JICA.

ACKNOWLEDGEMENTS

The JICA Project Team gratefully acknowledges the proactive guidance provided by the ASEAN Committee on Disaster Management (ACDM) Working Group on Prevention and Mitigation, the ASEAN Secretariat, and the ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) in carrying out this study. The study would not have been possible without their coordination and the generous support from various national focal points of the JICA project who provided the required technical and logistical assistance to the JICA Project Team. The project team is also grateful for the valuable time and expertise provided by various other government ministries, agencies and nongovernmental, national and international organisations. Their support was crucial in building up this repository.

The members of the JICA Project Team are: Toshizo Maeda, Team leader, Disaster risk reduction; Takashi Furukawa, Storm and flood risk management/assessment (hydrology and civil engineering); Binaya Raj Shivakoti, Wind and flood risk management/assessment (non-structural measures); Prabhakar Sivapuram, Drought risk management/assessment (hydrology and agriculture); Hirokazu Sakai, Drought risk management/assessment (non-structural measures); and Takehiko Ogawa, Climate change adaptation measures, organisations and legal institutions.

FOREWORD

In 2015, the Government of Japan, through the Japan International Cooperation Agency (JICA), committed to support two priority projects under the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme Phase 2 (2013-2015).

One of the projects is the Concept Note No. 20 (CN20): "One against Disaster and Climate Risks: Strengthening Institutional and Policy Framework on DRR and CCA Integration." The overall objective is to foster the integration of DRR and CCA at all levels of government by sharing information, knowledge and good practices in ASEAN Member States. This publication is a key output of CN20, the activities of which have been carried over in the Priority Programme 3 of the AADMER Work Programme 2016-2020.

We are grateful that a team of dedicated DRR and CCA experts from the JICA Project Team comprising Institute for Global Environmental Strategies (IGES) and CTI Engineering International Co., Ltd. have been working closely with government officials in all the Member States to conduct baseline surveys and assess how well national action plans on DRR and CCA are implemented.

Through numerous field visits, stakeholder consultations and documentation review, they have helped us identify and document many good practices where DRR and CCA synergies were implemented in the Member States. This publication serves as a repository of all these good practices.

More importantly, we hope that this collection of good practices will be useful to ministries and agencies of all the Member States and citizens and practitioner looking to learn from, and understand how the ASEAN Community is strengthening DRR and CCA towards building greater resilience across the region.

Sincerely,

Mr. Prasong Vongkhamchanh
Director General, Social Welfare Department, Ministry of Labour and Social Welfare, Lao PDR

Mr. Chayabol Thitisak
Director General, Department of Disaster Prevention and Mitigation, Ministry of Interior, Thailand

Co-Chairs of the Working Group on Prevention and Mitigation, ASEAN Committee on Disaster Management (ACDM) and Co-Chairs of the CN20 Project Steering Committee

CONTENTS

FIGURES

TABLES

ABBREVIATIONS

AADMER	ASEAN Agreement on Disaster Management and Emergency Response
ADB	Asian Development Bank
ADPC	Asian Disaster Preparedness Center, Thailand
ASEAN	Association of Southeast Asian Nations
BAAC	Thailand's Bank for Agriculture and Agricultural Cooperatives
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency), Indonesia
BMKG	Badan Meteorologi, Klimatologi, dan Geofisika (Meteorological, Climatological, and Geophysical Agency), Indonesia
BPBD	Badan Penanggulangan Bencana Daerah (Local Disaster Management Agency), Indonesia
BPIW	Regional Infrastructure Development Agency, Ministry of Public Works, Indonesia
CCA	Climate change adaptation
CCB	Climate Change Bureau (Ho Chi Minh City, Viet Nam)
CCCA	Cambodia Climate Change Alliance
CCCO	Climate Change Coordination Office (Can Tho, Da Nang & Quy Nhon, Viet Nam)
CCET	Climate Change Expenditure Tagging
CDP	Comprehensive Development Plan
CFS	Climate field schools
CCC	Climate Change Commission
PCCC	Philippine Climate Change Commission
PDP	The Philippine Development Plan
CLUP	Comprehensive Land Use Plan
DANIDA	Denmark's Development Cooperation
DBM	Department of Budget Management,the Philippines
DDPM	Department of Disaster Prevention and Mitigation, Thailand
DGR	Department of Groundwater Resources, Thailand
DGWR	Directorat Jenderal Sumber Air/ Directorate General of Water Resources, Ministry of Public Works, Indonesia
DMH	Department of Meteorology and Hydrology (Lao PDR)
DID (JPS)	Department of Irrigation and Drainage (Jabatan Pengairan dan Saliran), Malaysia
DMR	Department of Mineral Resources, Thailand
DRM	Disaster risk management
DRR	Disaster risk reduction
DPWH	Department of Public Works and Highways, the Philippines
DWRM	Department of Water Resources and Meteorology

ECHAM4	Atmospheric General Circulation Model
ECMWF	European Centre for Medium- Range Weather Forecasts
EM-DAT	Emergency Events Database
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FCMC	Flood Control Management Cluster, Department of Public Works and Highways, the Philippines
FD	Forestry Department
FMC	Flood Mitigation/Management Committee
FRM	Flood risk management
GCMs	Global Climate Models
GHG	Greenhouse gases
GP	Good Practice
HWL	Highest water level
ICCTF	Indonesia Climate Change Trust Fund
IDR	Indonesian Rupiah
IGES	Institute for Global Environmental Strategies
IMHEN	Viet Nam National Institute of Meteorology, Hydrology and Environment
ISET	Institute for Social and Environmental Transition, Viet Nam
IWUMD	Irrigation and Water Utilization Management Department, Myanmar
JICA	Japan International Cooperation Agency
JPS (DID)	Jabatan Pengairan dan Saliran (Department of Irrigation and Drainage), Malaysia
LCAP	Local Climate Change Action Plans
LDRRMF	Local Disaster Risk Reduction and Management Fund (the Philippines)
LGUs	Local government units
LRM	Landslide risk management
MADA	Muda Agricultural Development Authority, Malaysia
MARD	Ministry of Agriculture and Rural Development, Viet Nam
MCM	million cubic meters
MOA	Ministry of Agriculture
MoHA	Ministry of Home Affairs
MOREC	Ministry of Resources and Environmental Conservation, Myanmar
MOU	Memorandum of Understanding
MRC	Mekong River Commission
NAHRIM	National Hydraulic Research Institute of Malaysia
NDMC	National Disaster Management Committee, Brunei Darussalam
NDRRMC	National Disaster Risk Reduction and Management Council, the Philippines
NDVI	Normalized Differential Vegetation Index
NDWI	Normalized Differential Wetness Index
NEDA	National Economic and Development Authority, the Philippines
NIA	National Irrigation Authority, the Philippines

OCD	Office of Civil Defense, the Philippines
ODA	Overseas Development Assistance
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration, the Philippines
PCIC	Philippine Crop Insurance Corporation
PDP	Philippine Development Plan
PHP	Philippine Peso
PRB	Pengurangan Risiko. Bencana/Disaster Risk Reduction (Indonesia)
PRECIS	Providing Regional Climates for Impacts Studies
PSF	People's Survival Fund (the Philippines)
PU	Kementerian Pekerjaan Unum dan Permahan Rakyat/ Ministry of Public Works and Housing, Indonesia
PUB	Public Utilities Board, Singapore
QRF	Quick Response Fund
RAN-API	National Action Plan on Adaptation, Indonesia RAN/RAD-GRK National/Local Action Plan on Mitigation, Indonesia RBM River Basin Management
REDD+	Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
SESAME	Specialized Exert System for Agro-Meteorological Early Warning
SIDA	Swedish International Development Cooperation Agency
SIWRP	Southern Institute for Water Resources Planning (Viet Nam)
SMS	Short Message Service
SPI	Standard Precipitation Index
SRES	Special Report on Emissions Scenarios
START	SysTem for Analysis, Research and Training
TimMAPI	Climate Change Mitigation and Adaptation Team (Indonesia)
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
UPMO	Unified Project Management Office
VOM	Valenzuela–Obando–Meycauayan (the Philippines)
WII	Weather index insurance
WRF	Weather Research and Forecasting
WRM	Water resources management
WUA	Water Users' Association

SUMMARY

The Member States are highly vulnerable to climate change as is evident from the rise in disaster events and their impacts during the recent years, and in the emerging research on climate change projections. The Member States are on a pathway to rapid economic and social development and the developmental prospects of these countries will be at risk if threats posed by climate change are not addressed adequately with a sense of urgency. Integration of disaster risk reduction (DRR) and climate change adaptation (CCA) in national and local development plans will address the threats of climate change in an effective manner since they set an enabling risk governance environment for long-term risk reduction (Figure 1).

Recognising the need to integrate DRR and CCA into policies and institutions in The Member States, JICA has supported implementation of a project for 'Strengthening Institutional and Policy Framework on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Integration'. The project aims to assess the current level of integration of CCA elements into DRR policies and related institutions and identify good practices that could be replicated throughout the region for maximising risk reduction.

The JICA Project Team has identified a number of good practices that provide DRR and CCA integration opportunities for the Member States through literature review, interviews with relevant stakeholders and field visits (Figure 2). The team selected practices that are transferable, applicable and a good reference for all the Member States for wider dissemination covering floods, storms, landslides and droughts. They included integrated downscaled climate projections into risk assessments and practices coordinating DRR and CCA policies, management strategies and funding systems. They have high proportion of CCA and DRR benefits compared to business-as-usual practices.

Selected goodpractices are presented in these six categories: laws, regulations and policies; institutional arrangement; financial arrangement; riskassessment; planning and implementation; and capacity building. The good practices are described for their DRR and CCA benefitsand factors for scalability accompanied with the source for further information.

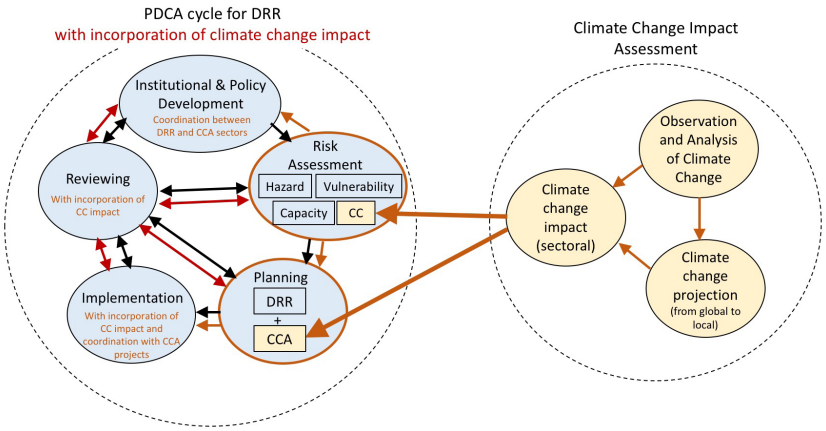


Figure 1. Integration of climate change elements into the existing decision-making framework for disaster risk reduction

Source: JICA Project Team

Topology of Good Practices

A glance at the good practices indicates that the ASEAN region has been making big strides in DRR and CCA. While achieving full potential in several areas is far from reality, the progress made is commendable and the Member States are at an optimal stage to review their efforts and make course corrections to set the proper direction in the years to come.

Laws, regulations and policies: Some of the Member States are able to address DRR and CCA integration right into their development plans (as in the case of the Philippine Development Plan) that gives impetus to all the line ministries and related agencies to address these issues into sectoral plans and strategies. These policies also help mobilise required financial resources for national and sub-national government bodies to actually implement programmes and projects addressing DRR and CCA. At another level, other Member States, as in the case of the Philippines, Viet Nam, Indonesia and Cambodia, are developing sector-specific action plans that bring the agenda of climate change to individual sector level for making actual difference in the activities these line ministries perform. These sectoral plans are setting precedence for accountability and increasing the ownership of interventions at the ministry level. The local level DRR and CCA plans are present in most of the Member States. DRR plans at the community level are more prominent in the region than the local level CCA plans. These local level plans are providing an opportunity for integrating DRR and CCA at the local level even though such examples are yet to emerge clearly.

Institutional arrangement: Mere promulgation of laws, regulations and plans are of no use if the supporting institutional mechanisms do not exist and unless the Member States are progressively harmonising their institutional mechanisms in line with the newly set laws and regulations. These institutional arrangements span from national level to local level in accordance with the set laws and regulations. The national DRM systems of the Philippines, Cambodia and Indonesia can be seen as well developed from the national level to the local level down to the community level. These institutional systems, some of which are originally developed with a focus on response, are increasingly modelled after disaster risk mitigation, long-term risk reduction and building resilience. In addition to the dedicated institutional systems for DRR, line ministries are making efforts to streamline their own ministries by integrating planning departments, as in the case of Regional Infrastructure Development Agency (BPIW) of the Ministry of Public Works and Housing (PU) of Indonesia, which is successful in setting policies, plans, strategies, standard operating procedures and guidelines at the sectoral level. Similarly, cross-sectoral coordination is being improved as in the case of the Philippines where the Memorandum of Understanding is being drawn between the National Disaster Risk Reduction and Management Council (NDRRMC) and the Philippine Climate Change Commission for effective cooperation and collaboration. At the local level, the river basin management offices in Indonesia are helping in promoting cross-boundary coordination and collaboration for river basin management and can play a major role in integrating DRR and CCA.

Figure 2. There is a large scope for scaling up innovative risk financing including microfinance and insurance

Source: JICA Project Team

Financial arrangement: Financing is an important ingredient for policies and plans to shape them into tangible projects and programmes leaving long-lasting impacts on the ground. However, limited funding is found to be one of the important root causes for limited implementation in the region. Member States are innovating in funding risk reduction by putting in place a range of practices, including establishing national to local level disaster risk reduction funds, as in the case of the Philippines, Indonesia and Cambodia, to financial inclusion measures (Figure 2), as in the case of the Philippines and Indonesia, where the poor and vulnerable are provided with access to microfinance that the formal banking sector is unable to reach out with. Public-private partnerships in particular are helping the Member States to implement measures such as risk insurance and microfinance, and these measures are rapidly on the rise with more and more countries expanding measures to fund risk reduction (e.g. the Philippines and Indonesia). Innovative measures such as expenditure tagging are helping countries to track, monitor and evaluate the budgetary allocations made to DRR and CCA activities (e.g. Vietnam and the Philippines.) These measures will go a long way in reforming risk governance in general.

Risk Assessment: Risk assessments inform stakeholders of the probable impacts associated with a given level of disaster so that appropriate

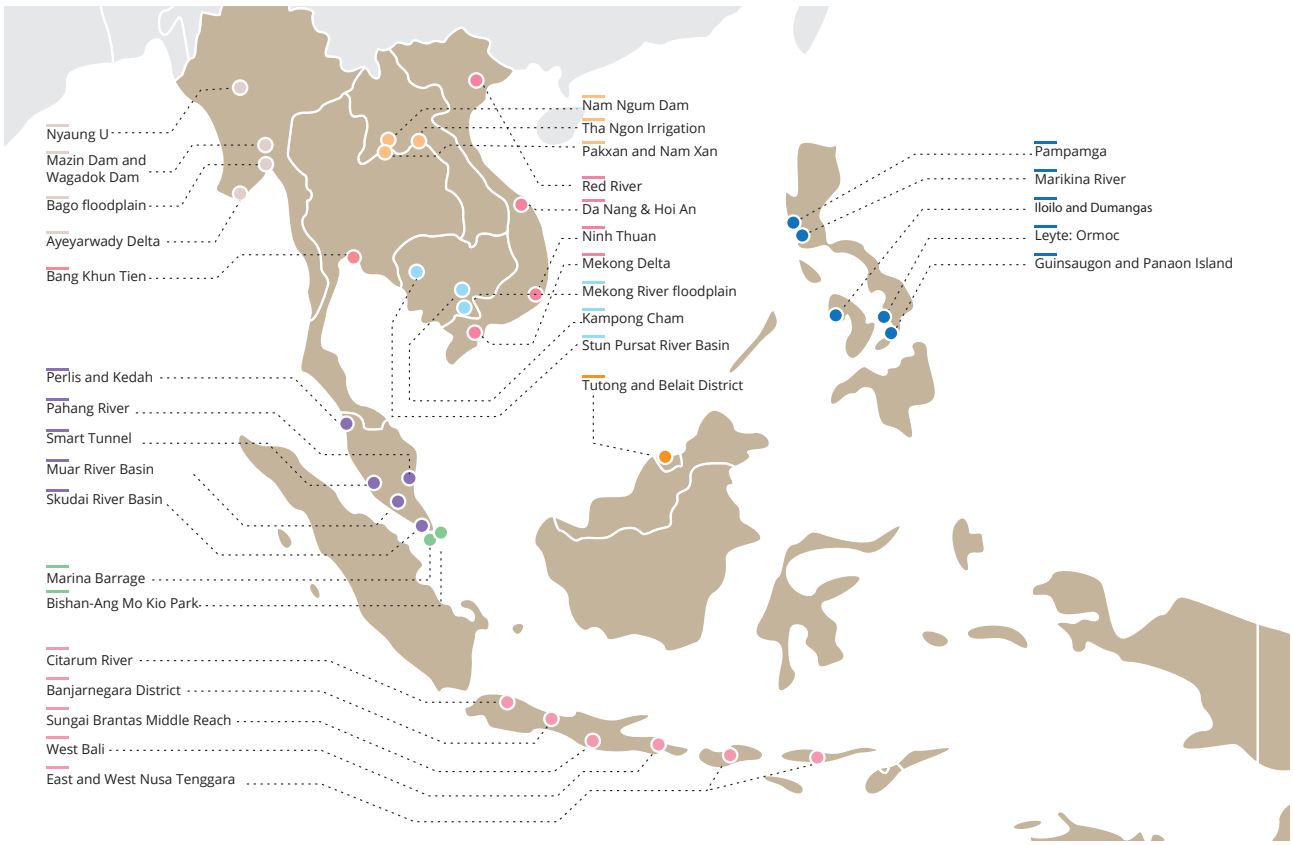


Figure 3. Sites visited by the JICA Project Team to identify good practices, September 2016 – February 2017
Source: JICA Project Team

strategic decisions can be made. Putting in place a dependable disaster impact database is the first step for the robust risk assessments, with or without climate change impacts. Countries in the region have initiated measures to integrate, standardise and harmonise disaster loss and damage and weather and climate-related databases. In Indonesia, a disaster loss database developed based on open-source software provided ability to do simple analysis of historical disaster losses and to understand disaster trends and impacts. At the regional level, the Mekong River Commission hosts a hydrological data sharing and flood forecasting system that helps alert the Lower Mekong Countries. The Southeast Asia START Regional Center hosts a climate data distribution system to help climate change impact, vulnerability and adaptation assessments covering several Southeast Asian countries. While hazard mapping is being slowly improved in the region, the landslide hazard mapping in Thailand deserves special attention as it covers from the national to village scales clearly delineating the landslide susceptibility areas and defining landslide risk villages. Risk assessment is an integral part of the DRR planning that is often done based on the knowledge on the historical disaster impacts. Incorporating the future climate changeimpacts on the intensity and duration of natural hazards into risk assessments is necessary for effective risk reduction. In this regard, the flood hazard mapping in Malaysia utilises available climate change projections to depict the probable flood impacts associated with a given level of floods in the future (Figure 3). Similarly, coastal inundation maps were developed by the National Institute of Meteorology, Hydrology and Climate Change (IMHEN), Viet Nam based on the projected sea level rise.

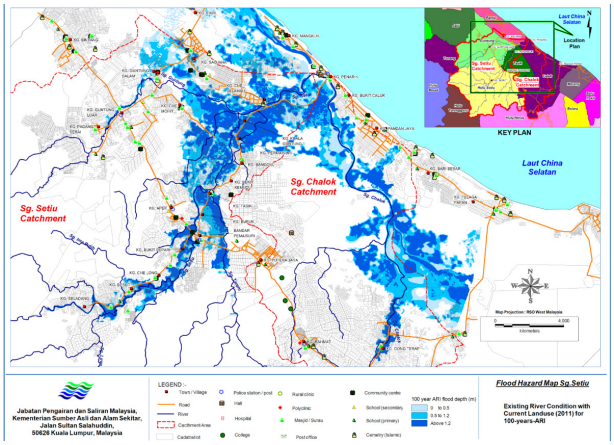


Figure 4. Integrating climate change projections into hazard mapping is an impactful policy tool
Source: JPS and NAHRIM, Malaysia

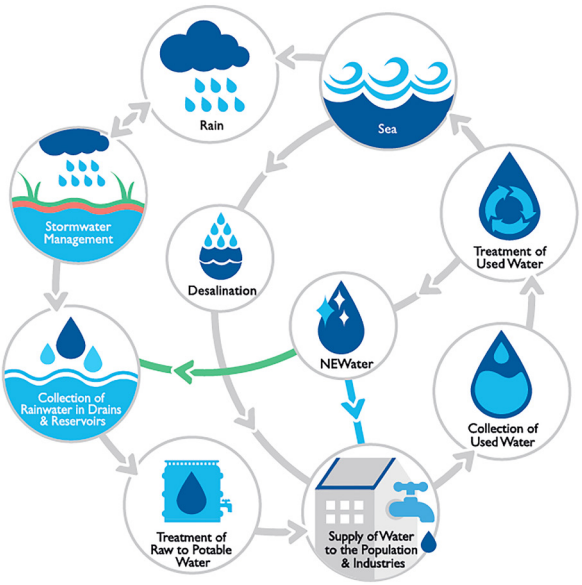


Figure 5. Closing the water loop is the way forward for the ASEAN region as a whole

Source: PUB Singapore

Planning and implementation: Planning and implementation aggregates all the knowledge and resources for tangible interventions at national and sub-national levels. The ASEAN region excels in this area in particular among all the areas under which good practices are described largely, as indicated through the number of good practices in this category, due to the prolonged commitment of the Member States to strengthen on-the-ground implementation and the rich presence of development partners that are willing to work with local governments and communities. Among all the good practices described under planning and implementation, practices for flood prevention and mitigation occupy the most followed by storms, landslides and droughts. Most of the practices are related to infrastructure development with few notable examples under environmental and social categories showing rising interest during recent years. Incorporating climate change considerations in design guidelines is a new area where the Department of Public Works and Highways (DPWH), the Philippines, sets an example for rest of the region. While flood resistant housing has spread in the region as a result of years of living with floods, examples from Cambodia, Viet Nam, Brunei Darussalam and the Philippines showcase the need to integrate flood resistant features into building by-laws and codes. The Bago River flood control efforts in Myanmar are unique where a combination of retarding basin, artificial channel, and a series of reservoirs along the Bago River and its tributaries has been able to mitigate floods effectively, while flood problems caused by the neighbouring Sittaung River still needs to be addressed in an integrated manner. Dams are increasingly being designed for their multiple functions and benefits maximising economic and social aspects, as in the case of Jatilhur Dam on the Citarum River in Indonesia, where integrated operation with the upper two hydropower dams has been undertaken. Water user associations are helping in judicial use of limited available irrigation water in several Member States that are instrumental in introducing efficient water management practices (e.g. Cambodia, the Philippines and Indonesia). The 'closing the water loop' approach of Singapore deserves to be mentioned here for its comprehensive approach to addressing water related issues (Figure 5). Conjunctive use of recycled and fresh irrigation water has helped mitigate drought impacts in the Perlis region of Malaysia and the expansion of conservation agriculture is helping subsistence farmers in buffering crops from rainfall-related shocks in Indonesia. The location-specific agro-meteorological advisory system has benefited several farmers in avoided crop losses and gain high resource use efficiency in the central dry zone of Myanmar. Prudent use of groundwater is helping to tap the abundant groundwater resources during water scarce periods for millions of farmers in several the Member States (e.g. the Philippines, Indonesia, Viet Nam, Myanmar).

Capacity Building: Human technical capacity is the ultimate limiting factor that needs to be addressed for efficiency and effectiveness of interventions and this is the area where least number of good practices could be found. While several DRR and CCA training programmes can be found in the region, their sustainability is questionable due to fragmented implementation and the lack of coherent approaches. Indonesia in particular seems to have addressed the issue with multi-stakeholder approaches in capacity building and the climate field schools are certainly noteworthy to be mentioned here. Collaboration with national and local governments and with other development partners is being increasingly utilised in capacity building measures in almost all the Member States.

Way Forward

Overall, the range of good practices from policy level to local level presented in this publication indicates the right direction that the region is moving. However, there is still plenty of scope for scaling them vertically and horizontally in terms of number of needy areas to be reached out targeting the location-specific conditions (horizontal scaling) and in terms of covering all relevant administrative levels to reach optimal policy formulation and for their effective implementation on the ground (vertical scaling). Such expansion of good practices requires concerted efforts at the national level

and regional cooperation building upon what has already been put in place under various ASEAN initiatives.

In response to such a demand, the Working Group on Prevention and Mitigation has developed a Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration which focuses on incorporation of climate change impact assessment in the DRR decision-making process by promoting associated activities including knowledge sharing and capacity building on planning and implementation, risk assessment and risk mapping, spatial planning, integration of relevant laws and regulations, financing, knowledge and data sharing, and monitoring and evaluation. It is expected that the Work Plan will be implemented effectively by actively using the resources listed in this publication and engaging the relevant agencies and institutions.

Contact for more information

JICA Project Team:
Institute for Global Environmental Strategies (IGES)
CTI Engineering International Co., Ltd.

Directed by the ASEAN Committee on Disaster Management (ACDM) Working Group on Prevention and Mitigation, the ASEAN Secretariat and the Japan International Cooperation Agency (JICA)

INTRODUCTION

Why link DRR and CCA?

The number of climate-related disasters occurring in the Member States (Figure 6) has been increasing over the past several decades.[1] This is partly due to growing populations living in hazard prone-areas and partly due to more intense, severe and longer impacts of climate change. In particular, recent climate projections indicate more severe consequences in terms of the intensification of disasters in the region.[2] Because of this direct effect of climate change on disasters, linking disaster risk reduction (DRR) and climate change adaptation (CCA) becomes a necessity.

DRR and CCA have several overlapping areas, which makes them easy to be integrated in approaches. Both DRR and CCA include vulnerability and risk assessments and they aim to reduce vulnerabilities and improve capacities so that the impacts of disasters are reduced. Both are relevant from national level to local level and need policies, guidelines and laws to affect needed change. 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. These DRR and CCA functions of interventions 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. Recognizing and

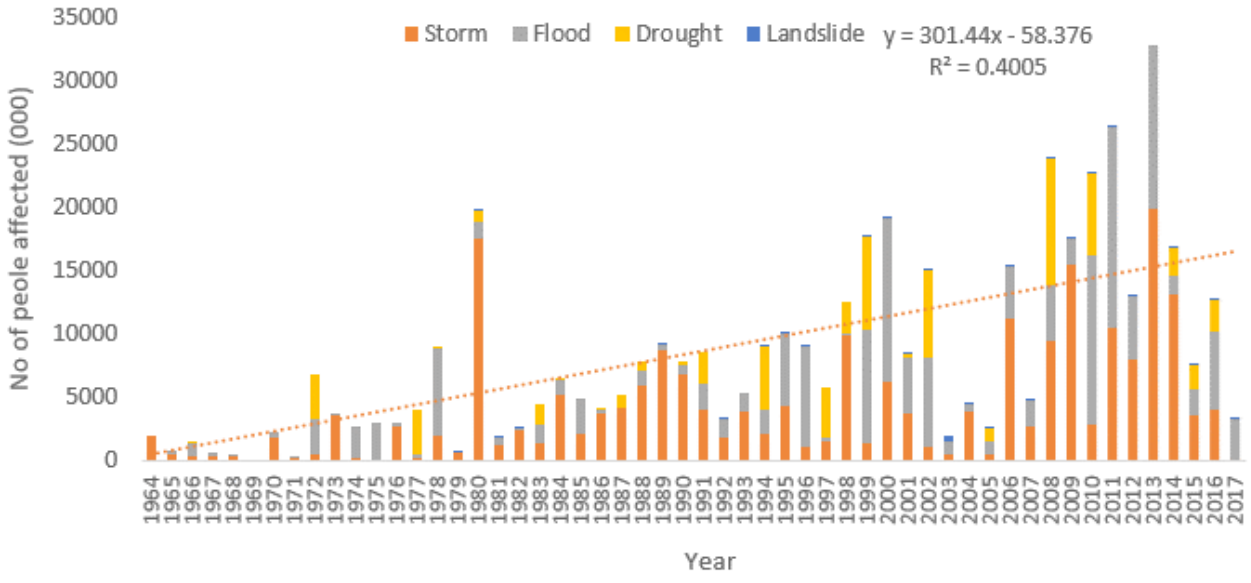


Figure 6. Trend in the number of disaster-affected people in ASEAN (prepared by the project team)
Data Source: EM-DAT, 2017

1 EM-DAT. 2017. The International Disaster Database. Brussels, Belgium: Centre for Research on the Epidemiology of Disasters. Available at http://emdat.be/emdat_db/

2 The World Bank. 2013. Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience. Washington DC, USA. Available at http://documents.worldbank.org/curated/en/975911468163736818/Turn-down-the-heat-climate-extremes-regional-impacts-and-the-case-for-resilience-full-report

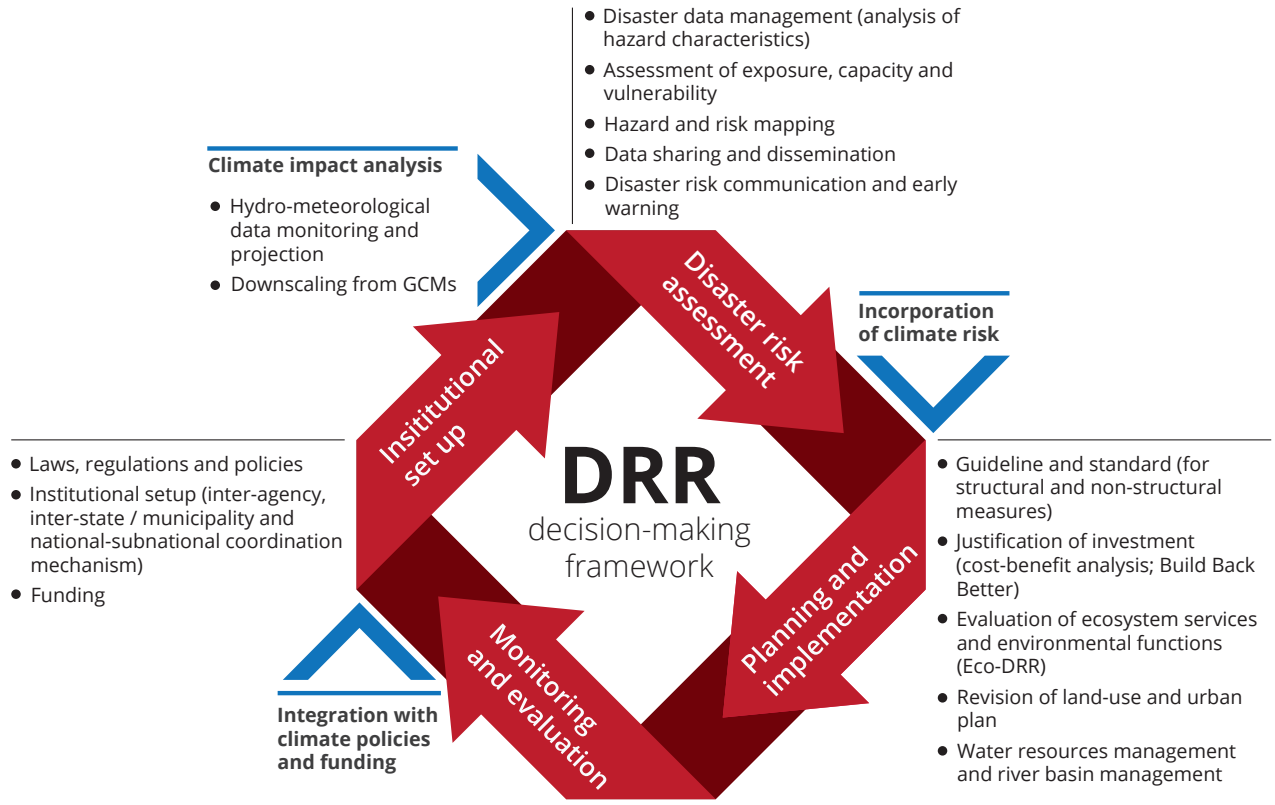


Figure 7. DRR decision-making framework with CCA coupling points
Source: JICA Project Team

maximizing such multiple functions essentially integrates DRR and CCA into interventions at all levels.

Recognizing the above discussed needs, synergies and compatibility, incorporating CCA considerations in every aspect of the DRR cycle is essential for reducing overall disaster risks and maximising the investment of limited resources into climate change. The DRR cycle (Figure 7) 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. The necessary processes include climate impact analysis in disaster risk assessments, 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, if any, 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.

Identification of good practices

As a part of the JICA-funded project on 'Strengthening Institutional and Policy Framework on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Integration (CN20)', 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. The team selected practices that have DRR and CCA synergies. Importantly, these practices are transferable, applicable, and a good reference for all the Member States. A range of practices were selected for 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.

Categorization

Selected good practices are presented in six categories using the framework presented in the Table 1, largely derived from the framing concept

Table 1. Categories for DRR and CCA integration

Key words from the aims and specific objectives of the CN20 Project[3]	Categories		Priorities for Action of the Sendai Framework for DRR
Umbrella laws and regulations	Institutional setup	Laws, regulations and policies	Priority 2
Institutional and policy framework			
Relationships between national agencies responsible for DRR and CCA		Institutional arrangement	
Partnership in linking DRR and CCA at all levels			
Joint funding mechanism		Financial arrangement	
Participatory risk assessment	Risk assessment		Priority 1
Integrated planning of DRR and CCA	Planning and implementation		Priority 3
Support joint training and meetings	Capacity building		Priority 1-4

Source: JICA Project Team

set by the project. These six categories also correspond to the Priorities of Action of the Sendai Framework for DRR. Each of these categories are described in Table 2.

Description of good practices

The description of good practices include the following structure: a) general description of the practice; b) climate hazards addressed by the practice; c) DRR and CCA benefits; and d) scalability potential. The scalability potential was described in terms of a) acceptability (social and political); b) economic viability and sustainability; and c) institutional and policy needs. The description was developed based on direct consultations with relevant stakeholders or expert judgement from the project team whenever necessary.

- **Description of practice:** Provides a brief narrative on what constitutes the practice and its design elements, if any, to provide a comprehensive view to the reader. Due to page limitations of the publication, only a brief account of the practice was provided.
- **Climate hazards addressed by the practice:** Provides an idea if the practice is specific to address specific hazards or can be applicable to a range of hazards.
- **DRR and CCA benefits:** Describes important DRR and CCA benefits offered by the practice, both qualitatively and quantitatively wherever available.
- **Scalability potential:** Scalability potential of the practice depends on the practice itself and the enabling environment within which a particular practice operates. Hence descriptions were provided on specific bottlenecks, if any, that may hinder the scaling up of a particular practice. It also provides an idea about possible geographical areas as to where a particular practice could be scaled up.
  - *Social and political acceptability:* Describes specific social and political factors that may hinder the general acceptability of a practice to come into being.
  - *Economic viability and sustainability:* Describes factors affecting a particular practice's economic viability and sustainability as cost is an important consideration for the uptake of the practice and its long-term sustainability.
  - *Institutional and policy needs:* Support from existing institutions and policies are important determinants for a practice to perform well.

3 For more details on the CN20, please refer to: https://www.drrandcca.com/

Table 2. Description of six categories of good practices presented in this publication

Category	Description
Laws, regulations and policies	Identifies those national policies, strategies and plans that incorporates and promotes DRR and CCA integration
Institutional arrangement	Presents good practices pertaining to • Examples of integration of horizontal (i.e. ministries/agencies) and vertical (i.e. national, district, municipality to village/community) DRM systems. • Examples where climate change-related risks are well considered among the DRR agencies related to flood, storm, landslide and drought risk reduction in terms of prevention and mitigation (including investments) as well as water resources management, including river basin management and river management. • Examples of CCA agencies and national climate change committees and related coordination systems among DRM and DRR agencies
Financial arrangement	Presents good funding practices for promotion of DRR and CCA
Risk assessment	Presents cases pertaining to • Disaster data that is systematically collected and analysed • Well established meteorological observation systems that analyse climate change impacts on rainfall etc. • Hazard and risk maps for storm, flood, landslide and drought are prepared for the country and regions/provinces levels; including those that incorporate climate change impacts; and good practices in dissemination and use of hazard and risk maps leading to their integration in development and land-use plans
Planning and implementation	Presents cases pertaining to • Formulation and implementation of DRR plans, including structural and non-structural measures, incorporating climate change risks; or those DRR plans that have high potential for integration of climate change risks with a stage-wise implementation • Development and use of guideline and standard that help promote integrating climate change risks into DRR plans
Capacity building	Good practices pertaining to training of relevant officials and stakeholders for integrating DRM, DRR and CCA

Source: JICA Project Team

1

LAWS, REGULATIONS AND POLICIES

Sub-category	Definition
National development plan (1.1)	DRR and CCA concepts are incorporated
DRR laws, regulations, plans and policies (1.2)	Enacted with consideration of CCA
CCA laws, regulations, plans and policies (1.3)	Enacted with consideration of DRR
Relevant sectoral laws, regulations and policies (1.4)	DRR and CCA concepts are incorporated in land-use and urban plans, building codes, water resources and river basin management, forestry management, etc.

GP*-1.1: The Philippine Development Plan 2017-2022

Description of practice: 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 aims 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.

* GP is Good Practice.

Figure 8. Philippine Development Plan 2017-2022 (GP1.1)

Source: National Economic and Development Authority, the Philippines

DRR and CCA benefits: 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.

Scalability potential: The PDP 2017-2022 has very high potential to be scaled-up to improve the integration of DRR and CCA in the next PDP 2023-2028. ASEAN states are increasingly incorporating the DRR and CCA concerns in their national development plans indicating that such integration is possible for a wide range of countries.

- *Social and political acceptability:* Since the PDP is the basic socio-economic national development plan based on the political consensus, it has social and political acceptability.
- *Economic viability and sustainability:* Ability of the government to provide necessary finances will determine the sustainability of the measures envisaged in the plan. Since the integration of DRR and CCA will be implemented under the PDP, which is the most important national development plan, and there are fewer risk factors on economic viability and sustainability.
- *Institutional and policy needs:* PDP as an upstream national development policy emphasizes the integration of DRR and CCA. The implementation of PDP requires agencies such as NEDA to work with various implementation agencies at sectoral and sub-national levels. Cabinet clusters and inter-agency committees required to implement PDP are already in place.

Source/Contact: NEDA. 2017. The Philippine development plan 2017-2022. Manila, the Philippines: The National Economic and Development Authority. Available at http://www.neda.gov.ph/tag/philippine-development-plan-2017-2022/

GP-1.2: Sectoral climate change action plans in Cambodia

Description of practice: The 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.

DRR and CCA benefits: 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.

Scalability potential: The fact that all the ministries have developed the sectoral action plans indicates the salability potential of the initiative.

- *Social and political acceptability:* Due to

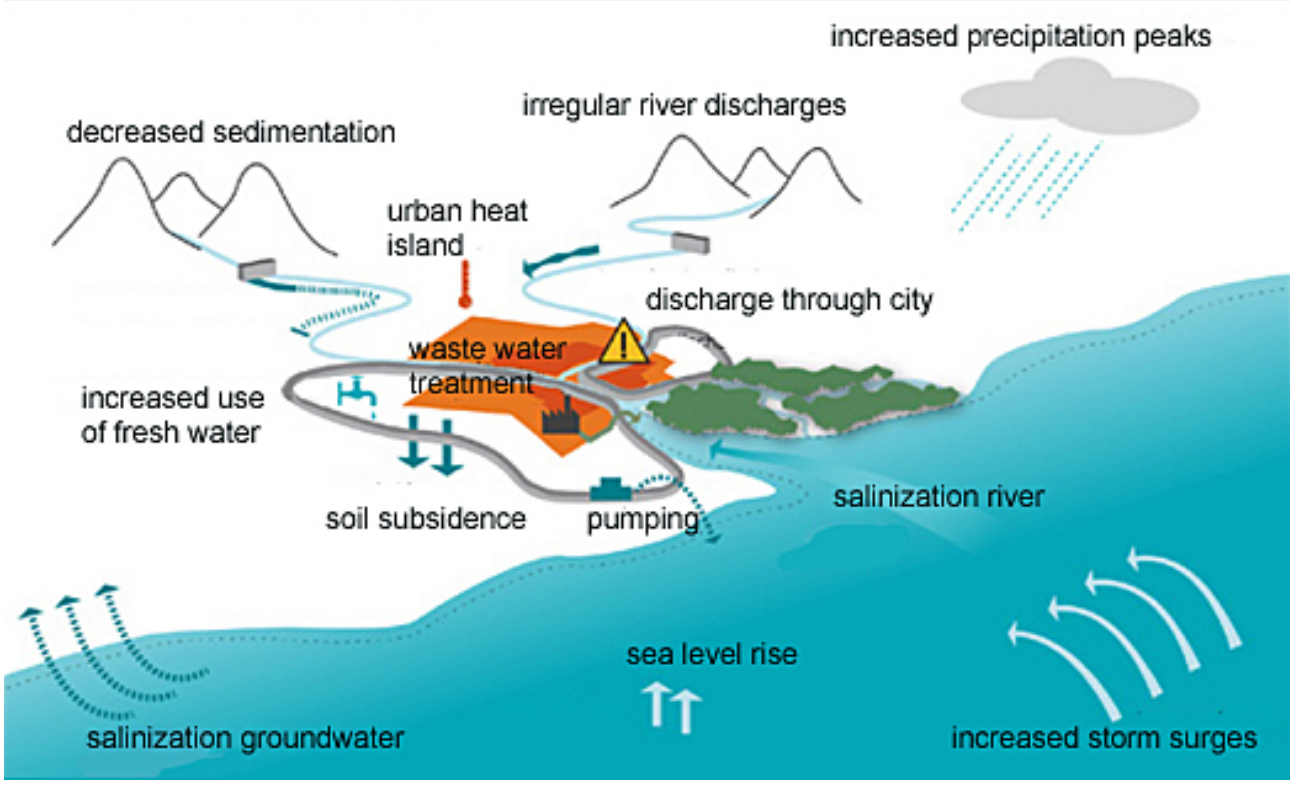


Figure 9. Climate Change Impacts for Ho Chi Minh City
Source: Climate Change Bureau, Ho Chi Minh City, Viet Nam

ownership and accountability associated with the individual ministries, there is a greater political acceptability for sectoral action plans as compared to the unified action plans developed outside the ministries.

- *Economic viability and sustainability:* Sectoral action plans reduces the burden on coordination required to develop a unified action plan cutting across all the ministries. However, developing individual action plans entail ensuring avoiding the redundancy and duplication of actions and greater coordination while implementing these plans.
- *Institutional and policy needs:* There are strong and specific institutional and policy needs to strengthen the coordinated implementation on the ground in addition to the coordinated development of sectoral action plans.

Source/Contact: Department of Climate Change. 2014. Climate change action plan. Department of Climate Change, Ministry of Environment, Government of Cambodia. Available at http://www.camclimate.org.kh/en/documents-and-media/library/category/128-climate-change-action-plan.html

GP-1.3: Local CCA action plans, Viet Nam

Description of practice: 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.

DRR and CCA benefits: 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.

Scalability potential: The local climate change

focal points as well as the local climate change adaptation plans can be scaled up to improve the integration of DRR and CCA at local levels.

- *Social and political acceptability:* Since the local climate change focal points as well as the local climate change adaptation plans are operated and formulated in response to local needs, there exists a clear-cut social and political acceptability.
- *Economic viability and sustainability:* Since the local climate change focal points as well as the local climate change adaptation plans are operated and formulated under the budgetary support of the local government units, there are less risk factors on economic viability and sustainability.
- *Institutional and policy needs:* Specific institutional and policy needs required to operate and formulate the local climate change focal points as well as the local CCA plan are properly met in the policy direction.

Source/Contact: Climate Change Bureau (CCB), Ho Chi Minh City and the Climate Change Coordination Office (CCCO), Can Tho, Da Nang, Quy Nhon, Viet Nam

GP-1.4: Sectoral law and regulations in Viet Nam, the Philippines and Indonesia

Description of practice: 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 the 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 administrative reform is the enactment of Water Law No. 7/2004. Efforts such as the regulations, guidelines as well as shortand long-term plans issued by local and central governments have been attempted to implement the IWRM as prescribed by the Water Law.

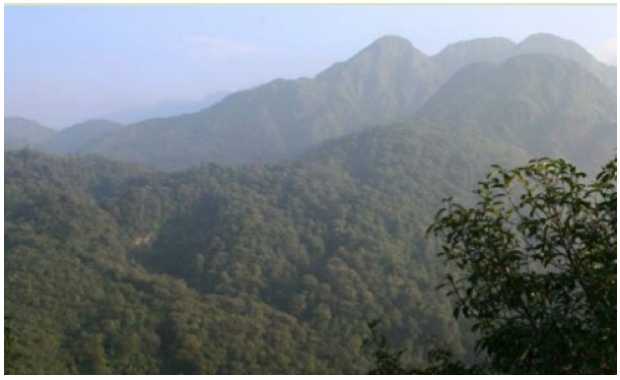


Figure 10. Forest in Phong Nha – Quang Binh, Viet Nam (GP-1.4)

Source: "Viet Nam Forestry", VNFOREST

DRR and CCA benefits: 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.

Scalability potential: The incorporated sectoral laws and regulations into the DRR and CCA legal framework can be integrated into a more comprehensive DRR and CCA law in future.

- *Social and political acceptability:* Since the incorporated sectoral laws and regulations are part of the basic legal framework for the integration of DRR and CCA, there exists a clear cut social and political acceptability.
- *Economic viability and sustainability:* Since the integration of DRR and CCA will be implemented under the incorporated sectoral laws and regulations, there are no known associated risk factors related to economic viability and sustainability.
- *Institutional and policy needs:* There are strong and specific institutional and policy needs required to integrate DRR and CCA under the incorporated sectoral laws and regulations, which is in line with the basic legal direction.

Source/Contact: Decree No. 99 and Decision No. 799 of Viet Nam, Resolution No. 915 of the Philippines and Water Law No.7 of Indonesia

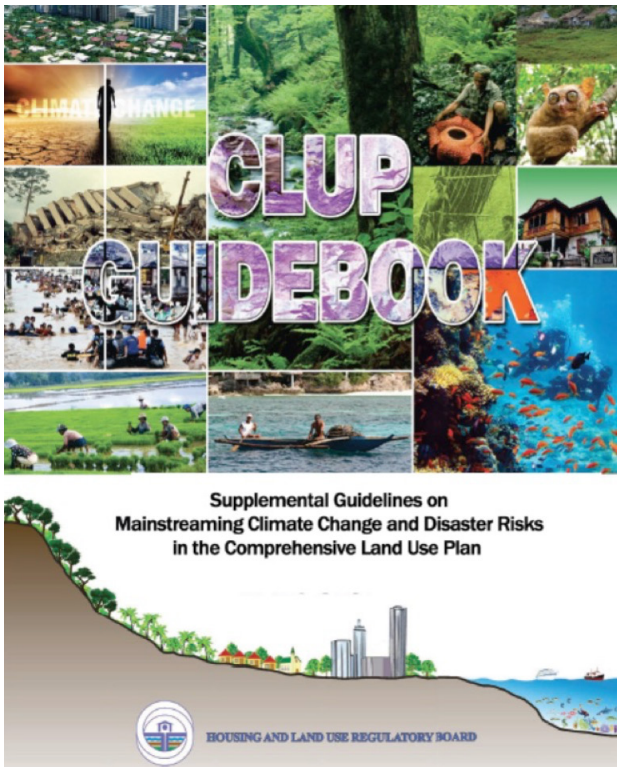


Figure 11. Supplementary guideline for Comprehensive Land Use Plan including DRR and CCA aspects (GP-1.4)

Source: HLURB, Philippines

2

INSTITUTIONAL ARRANGEMENT

Sub-category	Definition
National DRM system (2.1)	• 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
Horizontal CCA system (2.2)	A national CCA committee has been setup for inter-ministerial coordination and it also coordinates with the DRM committee
River Basin Management (2.3)	A multi-stakeholder transboundary DRM system has been setup for floods, storms and droughts

GP-2.1a: National disaster risk management system, the Philippines

Description of practice: 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.

DRR and CCA benefits: 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.

Scalability potential: Several ASEAN states, including Indonesia and Cambodia, have started implementing similar vertically integrated institutional mechanism both within the DRM as well as in CCA areas.

- *Social and political acceptability:* NDRRMC is an innovative governmental organization and has wide political acceptability.
- *Economic viability and sustainability:* Since the NDRRMC is operated under the full budgetary support of the government, there are no known risk factors on economic viability and sustainability.
- *Institutional and policy needs:* Specific institutional and policy needs required to operate the NDRRMC are already in place. The NDRRMC can be enlarged by further strengthening its functions of rendering technical assistance and capacity development services at local levels.

Source/Contact: The National Disaster Risk and Management Council, the Philippines. Available at http://www.ndrrmc.gov.ph.

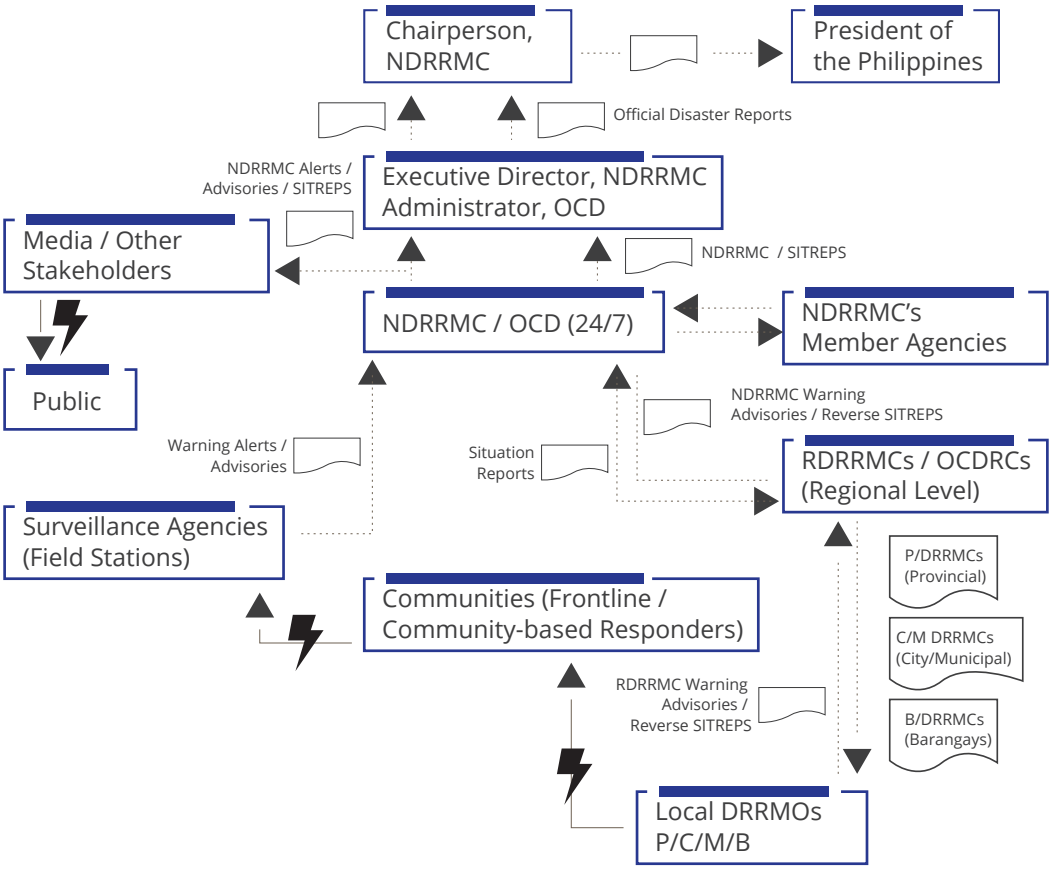


Figure 12. Institutional structure for DRM in the Philippines (GP-2.1a)

Source: The National Disaster Risk and Management Council, the Philippines[4]

GP-2.1b: Integration of DRR and CCA by the Ministry of Public Works and Housing (PU), Indonesia

Description of practice: 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 mid term 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 (#6/P/BM/2014), the climate change risks is incorporated in the technical guideline.

DRR and CCA benefits: 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.

Scalability potential: There is a close intra ministerial horizontal network that can be scaled up to cover all related line ministries.

- *Social and political acceptability:* Since the close intra-ministerial horizontal network is the innovation of the governmental organizational structure, there exists a clear-cut social and political acceptability.
- *Economic viability and sustainability:* Since the integration of DRR and CCA will be

4 Available at http://www.ndrrmc.gov.ph

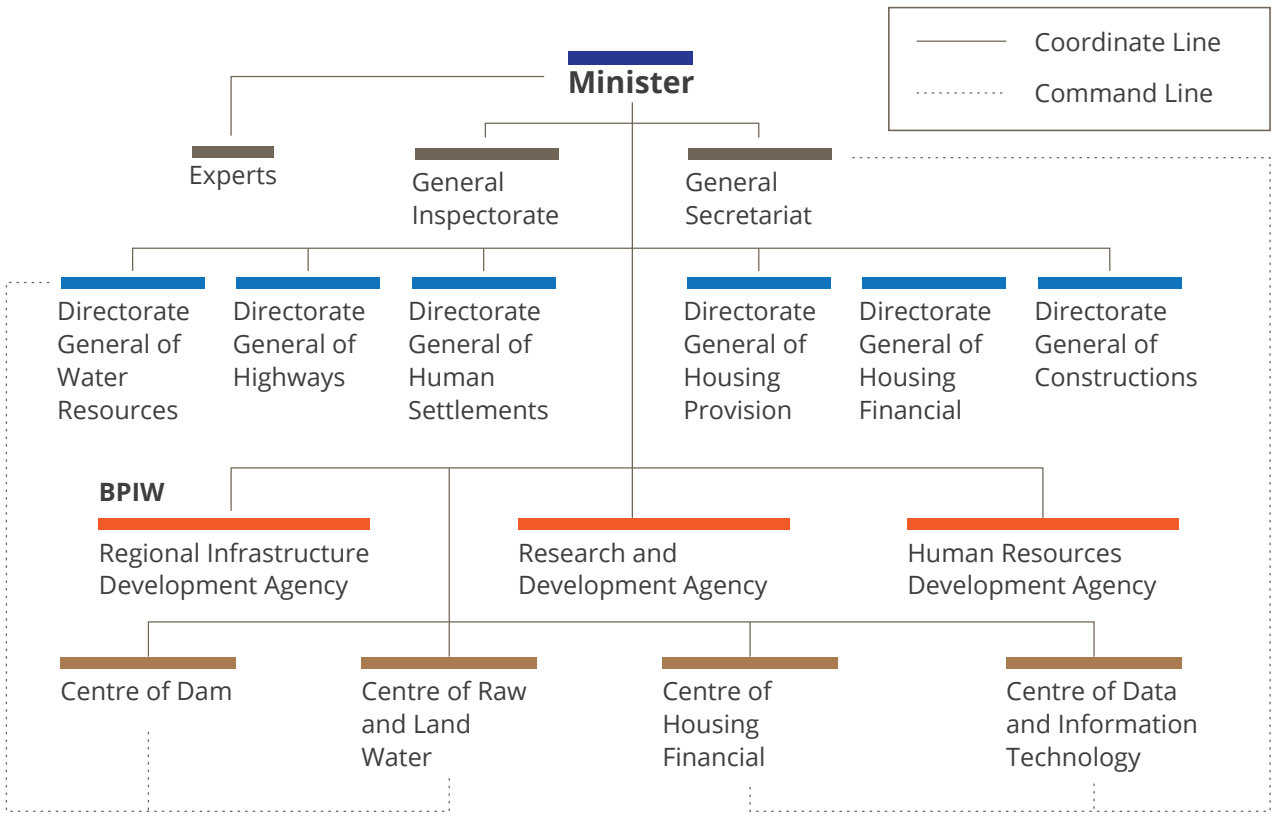


Figure 13. Structure of PU showing the Regional Infrastructure Development Agency (GP-2.1b)
Source: Ministerial Regulation, Ministry of Public Works and Housing No.25, Indonesia

implemented under a close intra-ministerial horizontal network, there are less risk factors on economic viability and sustainability.

- *Institutional and policy needs:* Specific institutional and policy needs, which call for intra-ministerial concerted coordination required to integrate DRR and CCA under a close intra-ministerial vertical network, are properly achieved in the case of PU, Indonesia.

Source/Contact: Ministry of Public Works and Housing. 2015. Ministerial Regulation No.25. Jakarta, Indonesia: Ministry of Public Works and Housing.

GP-2.2: Institutional coordination between DRM and CCA focal points, the Philippines

Description of practice: 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.

DRR and CCA benefits: 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.

Scalability potential: There is a close intra-ministerial horizontal network that can be scaled up to cover all related line ministries.

- *Social and political acceptability:* Since the close intra-ministerial horizontal network is the innovated governmental organizational structure, there exists a clear-cut social and political acceptability.
- *Economic viability and sustainability:* Since the integration of DRR and CCA will be implemented under a close intra-ministerial horizontal network, there are less risk factors on economic viability and sustainability.
- *Institutional and policy needs:* There are strong and specific institutional and policy needs which highly demand concerted inter-agency coordination among various related agencies. In addition, the close inter-agency horizontal network as exemplified in the case of NDRRMC and CCC in the Philippines also implies requirements to institutionally integrate DRR and CCA.

Source/Contact: Climate Change Commission. 2016. Climate change adaptation and disaster risk reduction in The Philippines. Manila, the Philippines: Climate Change Commission. Available at http://climate.gov.ph/convergence/cca-drr-summit.

GP-2.3: River basin management offices (Balai), Indonesia

Description of practice: 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.

Climate hazards addressed by the practice: Floods and droughts

DRR and CCA benefits: 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.

Scalability potential: There is high scalability to other river basins in other ASEAN countries.

- *Acceptability (Social and political):* Almost all of the ASEAN member countries have directions for developing river basin management systems for comprehensive and systematic management of the river basins; therefore, the concept of river basin management system itself has high acceptability from social and political points of view.
- *Economic viability and sustainability:* Idealistically, overlapping work by different agencies related to DRR and CCA will be minimized by comprehensive and systematic river basin management, and is sustainable.
- *Institutional and policy needs:* It is necessary to coordinate between different governmental agencies for developing river basin management systems. Formulating and enacting of legal framework for river basin management is also necessary for applying and implementing river basin management.

Source/Contact: DGWR of PU, Indonesia

Figure 14. Coverage area of the Brantas River Basin Management Office as an example of coverage areas of River Basin Management Offices in Indonesia (GP-2.3)

Source: Direktorat Jenderal Sumber Daya Air Balai Besar Wilayah Sungai Brantas

3

FINANCIAL ARRANGEMENT

Sub-category	Definition
Financial arrangement for DRR (3.1)	Funds are allocated for DRR activities with a monitoring and tracking system
Financial arrangement for CCA (3.2)	Funds are allocated for CCA activities with a monitoring and tracking system
Insurance, microfinance and payment for ecosystem services (3.3)	Insurance, microfinance, and payment for ecosystem services are implemented

GP-3.1: Local DRRM funds, the Philippines

Description of practice: 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.

DRR and CCA benefits: 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.

Scalability potential: The built-in local funding system can be enlarged by increasing compulsory part of the estimated revenue as LDRRMF.

- *Social and political acceptability:* Since the built-in local funding system can be used for community-based DRR activities, they have social and political acceptability. Although local governments with limited financial capacity may find this policy difficult to follow, the national government is providing necessary support to fulfil local DRR needs in such cases, which are socially and politically acceptable.
- *Economic viability and sustainability:* Continuous support by the government is necessary for addressing residual risk factors, if any, for economic viability and sustainability.
- *Institutional and policy needs:* The operation of LDRRMF is being technically and institutionally supported by NDRRMC to implement DRR in consideration of CCA, and the continuous fund raising through LDRRMF meets the policy needs at local levels.

Source/Contact: NDRRMC. 2013. Joint Memorandum Circular No. 2013-1, the Philippines. Manila, the Philippines: National Disaster Risk Reduction and Management Council. Available at http://www.ndrrmc.gov.ph/attachments/article/1320/JMC_No_2013-1_re_Allocation_and_Utilization_of_LDRRMF.pdf.

GP-3.2a: Indonesia Climate Change Trust Fund (ICCTF)

Description of practice: 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.

DRR and CCA benefits: Some of the 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

Scalability potential: The ICCTF can be scaled up by rendering technical assistance at local levels. MoHA is to incorporate relevant indicators in the guideline of local development plan for replicating good projects.

- *Social and political acceptability:* Since the ICCTF can be used for community-based activities, general social and political acceptability is expected.
- *Economic viability and sustainability:* Depending on the commitment by the government, there are few risk factors on economic viability and sustainability such as the budgetary limitation in the future.
- *Institutional and policy needs:* Institutional and policy needs required to operate the ICCTF are met by continuous fund raising through ICCTF.

Source/Contact: ICCTF. 2015. Indonesia Climate Change Trust Fund, Indonesia. Available at http://icctf.or.id/knowledge-center/.

GP-3.2b: People's Survival Fund, the Philippines

Description of practice: 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) and RA 10174 (2011), 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.

DRR and CCA benefits: The PSF contributes to raising and mobilising finances which can be utilised for a wide range of adaptation projects in the field of water resources management, land management, infrastructure development, natural ecosystems conservation, forecasting and early warning systems, institutional development for droughts and floods, and among others based on the risk and vulnerability assessment.

Scalability potential: The PSF can be scaled up by rendering technical assistance at local levels.

- *Social and political acceptability:* Since the PSF can be used for community-based activities, there exists a clear-cut social and political acceptability. There is a need to reduce the requirements for LGUs to access the fund.
- *Economic viability and sustainability:* Since the PSF will be continuously supported by the government, there are less risk factors on economic viability and sustainability.
- *Institutional and policy needs:* Specific institutional and policy needs required to operate the PSF are properly met by continuous fund raising. The LGUs need technical assistance to prepare funding proposals.

Source/Contact: People's Survival Fund. 2016. Proponent's Handbook, A Guide on How to Access the People's Survival Fund. Manila, the Philippines: Climate Change Commission. Available at http://psf.climate.gov.ph/wp-content/uploads/2016/12/PSF-AmendedHandbook.pdf.

GP-3.2c: Climate Change Expenditure Tagging (CCET), the Philippines

Description of practice: 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.

DRR and CCA benefits: The introduction of an expenditure tagging and tracking system contributes to the efficient allocation and mobilisation of financial resources for integrating DRR and CCA.

Scalability potential: The practice has already been taken up by Viet Nam and is under consideration in other ASEAN countries as well.

- *Social and political acceptability:* Since the CCET is the officially approved budget monitoring tool, there exists a clear-cut social and political acceptability.
- *Economic viability and sustainability:* Since the CCET supports proper budgetary management on climate change expenditures, there are less risk factors on economic viability and sustainability.
- *Institutional and policy needs:* Specific institutional and policy needs required to introduce the CCET are already met in the financial direction provided by the government, including training of staff to implement the policy.

Source/Contact: Le. H. and K. Baboyan. 2015. Climate Budget Tagging: Country-driven initiative in tracking climate expenditure. Bangkok, Thailand: UNDP. Available at https://www.climatefinance-developmenteffectiveness.org/sites/default/files/event/CFSDforum2015/climate/Climate%20Budget%20Tagging%20_July%202015_DRAFT.pdf.

GP-3.3a: Microfinance in Flores Island, Indonesia

Description of practice: 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.

Climate hazards addressed by the practice: All kinds of natural hazards that affects the lives and livelihoods of poor and vulnerable.

DRR and CCA benefits: 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.

Scalability potential: Highly scalable to areas with high poverty and limited reach of formal financial services. Several ASEAN countries have made inroads to promote microfinance programs including the Philippines, Viet Nam, Cambodia, Malaysia and Lao PDR.

- *Social and political acceptability:* Highly acceptable socially and politically due to the benefits discussed above.
- *Economic viability and sustainability:* Viability and sustainability depends on how members of the groups invest the microfinance that they gained access to and hence is highly linked to the institutional and policy environment.
- *Institutional and policy needs:* Microfinance agencies need better resources to reach out to larger sections of needy households; develop skills to train beneficiaries on business management skills and income diversification skills; and invest in community mobilization and monitoring and evaluation.

Source/Contact: Koperasi Kredit Sube Huter, Nangablo, Maumere, Indonesia

Figure 15. Meeting of Sube Huter microfinance community in Sikka Regency of Flores Island (GP-3.3a)

Source: JICA Project Team

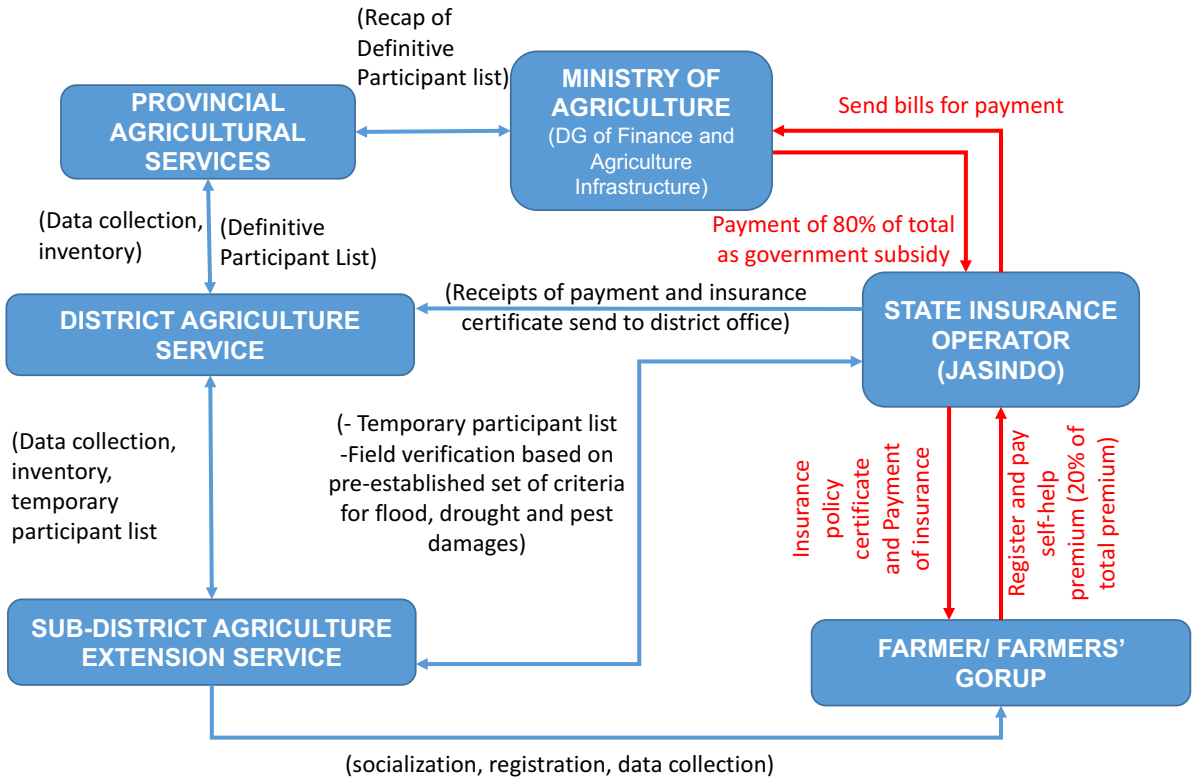


Figure 16. Implementation mechanism of rice crop insurance (GP-3.3b)
Source: MOA, Indonesia

GP-3.3b: Crop Insurance in the Philippines, Indonesia and Thailand

Description of practice: 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. 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 has 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.

Climate hazards addressed by the practice: Typhoons, floods, droughts

DRR and CCA benefits: 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).

Scalability potential: Highly scalable depending on the availability of weather data and installation of reliable weather stations. It is also being piloted in Thailand, Indonesia and Myanmar.

- *Social and political acceptability:* Highly acceptable socially and politically due to avoidance of adverse selection and moral hazard associated with the traditional insurance programs.
- *Economic viability and sustainability:* Highly viable due to reduced costs, highly sustainable due to the possibility of immediate payouts and increased trust among the subscribers. High basis risk needs to be addressed through dense weather stations.
- *Institutional and policy needs:* Quality weather and crop loss data, relatively dense weather observatories and regulations needed for operation of weather index insurance.

Source/Contact: PCIC, the Philippines; Directorate of Finance and Agriculture Infrastructure, Ministry of Agriculture (MOA), Indonesia; Thailand's Bank for Agriculture and Agricultural Cooperatives (BAAC).

GP-3.3c: Payment for forest environmental services, Viet Nam

Description of practice: In Vietnam, 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 cash 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.

DRR and CCA benefits: 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.

Scalability potential: The payment system for forest environmental services can be scaled up in other ASEAN countries and within Viet Nam by involving other domestic stakeholders, thereby further promoting fund raising required for the DRR and CCA integration.

- *Social and political acceptability:* Since the payment system for the forest environmental services ICCTF can be used for national, local and community-based activities, there exists a clear-cut social and political acceptability.
- *Economic viability and sustainability:* Due to the commitment by the government, there are less risk factors on economic viability and sustainability. The fact is that a central fund and 41 provincial funds have been already created, and district/commune funds are being established.
- *Institutional and policy needs:* There are strong and specific institutional and policy needs, which call for creating the financial mechanism required to integrate DRR and CCA generated from forest services, in Viet Nam. More concretely, in addition to the current payment system, a surcharge is required to promote activities as well as projects related to the integration of DRR and CCA.

Source/Contact: Vietnamese Academy for Forest Sciences, Hanoi, Viet Nam.

Pham, T.T., K. Bennett, T.P. Vu, J. Brunner, N.D. Le and D.T. Nguyen. Payments for forest environmental services in Vietnam. Bogor, Indonesia: Center for International Forestry Research (CIFOR). Available at http://vafs.gov.vn/en/2013/10/payments-for-forest-environmental-services-in-vietnam/.

4

RISK ASSESSMENT

Sub-category	Definition
Disaster database (4.1)	Disaster data is recorded and used for science-based analysis
Hydro-meteorological data management and climate risk analysis (4.2)	Climate risk is analysed based on hydro-meteorological monitoring and efforts are made to integrate downscaling from Global Climate Models (GCMs)
Hazard and risk mapping (4.3)	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
Data sharing and dissemination (4.4)	Disaster and climate risk data including hazard and risk maps are accessible to wide variety of stakeholders
Early warning system and disaster risk communication (4.5)	Prediction, forecasting and early warning systems are setup and disaster risks are communicated through traditional media, social media and mobile phone networks

GP-4.1: Web-based and Open-source Disaster Loss Database, Indonesia

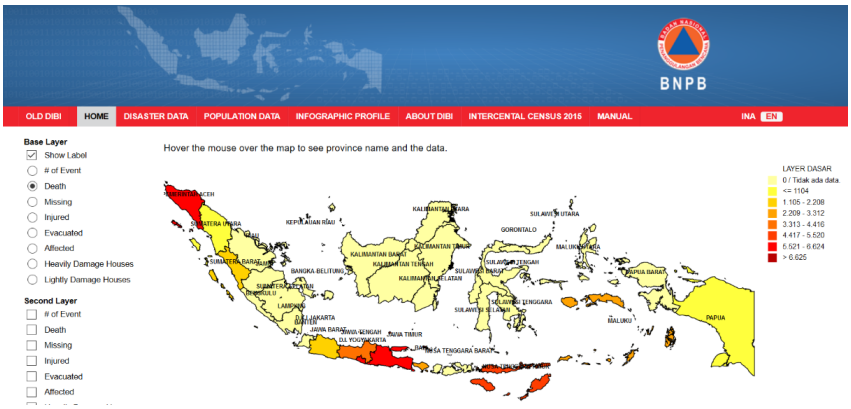


Figure 17. Disaster Loss Database (GP-4.1)

Source: BNPB

Description of practice: 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.

Climate hazards addressed by the practice: All kinds of disasters

DRR and CCA benefits: Disaster loss databases (DLDB's) are essential for countries to report on Sendai Framework Targets, especially on the first four out of seven targets, which refer to the imperative of reducing disaster losses and impacts. Accounting for losses will allow countries to monitor progress against such targets,

and can be used as powerful knowledge tool for disaster risk analysis.

Scalability potential: Highly scalable to all ASEAN countries. Several ASEAN countries including Cambodia, Indonesia, Lao PDR, Myanmar and Viet Nam have already put in place similar databases.

- *Social and political acceptability:* Highly acceptable due to well-established, reliable and cost-efficient methodology. Users of the database can access data and analytical reports on-line. Reports are furthermore distributed in paper format. Data can be aggregated or disaggregated using the web interface, according to the user's convenience.
- *Economic viability and sustainability:* Initial investment is required for the collection of detailed and homogeneous data about disasters at all scales using DesInventar and for capacity building of the staff. As the DesInventar is free, open-source and well-established methodology, economic viability and sustainability is high.
- *Institutional and policy needs:* Initial investment and operation and maintenance system are required.

Source/Contact: Badan Nasional Penanggulangan Bencana (BNPB), Indonesia.

GP-4.2a: Climate data distribution system, Southeast Asia START Regional Center, Thailand

Description of practice: The Climate Data Distribution System gives future climate data (temperature and rainfall) in the Southeast Asia region from several climate scenarios, which are developed from future climate projections using PRECIS regional climate model. The simulation of future climate is based on initial data from ECHAM4 Global Circulation Model under SRES A2 and B2 GHG scenarios. 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.

Climate hazards addressed by the practice: Storm, flood, landslide, drought

DRR and CCA benefits: The system provides easy access to future hydro meteorological data (temperature and rainfall) with an effective visualization. The data is indispensable for evaluating climate change impact and taking the impact into DRR and CCA planning and implementation.

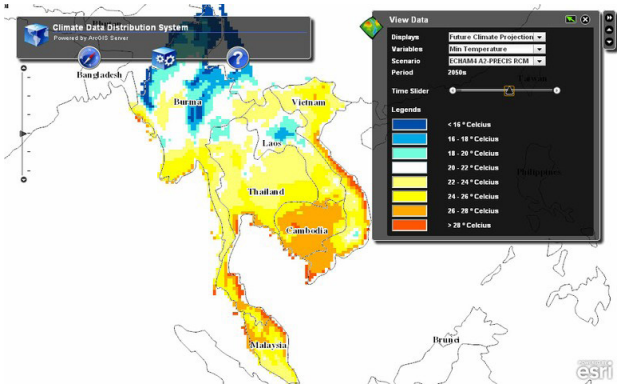


Figure 18. Climate data distribution system (GP-4.2a)
Source: SEA START RC

Scalability potential: Scalable to all ASEAN countries in coordination with other downscaling activities.

- *Social and political acceptability:* START (SysTem for Analysis, Research and Training) is a global network that supports multidisciplinary research on the interactions between humans and the environment, and works in conjunction with various stakeholders creating ownership.
- *Economic viability and sustainability:* It may require international cooperation or regional collaboration since large investment for research activities, building the system and capacity development are necessary.
- *Institutional and policy needs:* Investment for system development, operation and maintenance, training and capacity building of staff, and continuous study on climate change impacts.

Source/Contact: Southeast Asia START Regional Center (SEA START RC), Bangkok, Thailand.

GP-4.2b: Regional collaboration for GCM downscaling

Description of practice: This good practice is the Southeast Asia Regional Climate Downscaling (SEACLID)/CORDEX Southeast Asia Project. 13 Countries and 17 Institutions are involved in the project. They include NAHRIM, MetMalaysia (Malaysia), BMKG (Indonesia), DMH (Lao PDR), MRI, Kyoto Univ. (Japan), among others. 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.The resolution of the 1st phase was: 25 km × 25 km. The 2nd Phase (plan): 3 km x 3 km resolution over key vulnerable areas.

Climate hazards addressed by the practice: Storm surge, flood, landslide, drought

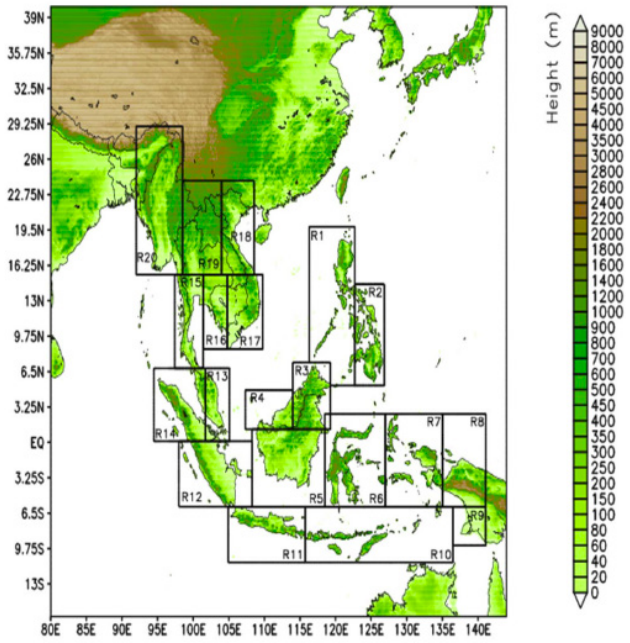


Figure 19. Twenty sub-regions used for the regional model (GP-4.2b)

Source: SEACLID

DRR and CCA benefits: High-resolution climate change scenarios are the basic requirement for climate change impact, vulnerability and risk assessment studies at local and regional scales. Generation of such information requires downscaling of coarser general circulation model (GCM) outputs using regional climate model (RCM). Due to requirement of multiple GCMs, multiple RCMs and multiple emission scenarios for quantification of uncertainties in future climate projection, regional downscaling is a time-consuming and resource-expensive exercise. Given the overlapping domains, having a collaborative effort is in the best interest of countries within the Southeast Asia (SEA) region. This collaborative practice will satisfy such requirements effectively and efficiently.

Scalability potential: Scalable to all ASEAN countries.

- *Social and political acceptability:* Agreements on role-sharing arrangement, expense sharing and so on are required.
- *Economic viability and sustainability:* This kind of regional collaboration has advantage in cost-efficiency and knowledge accumulation.
- *Institutional and policy needs:* Investments for continuous study on climate change impacts and coordination activities among member states are required.

Source/Contact: The Southeast Asia Regional Climate Downscaling (SEACLID) / CORDEX Southeast Asia Project, Bangi, Malaysia.

GP-4.3a: Flood hazard mapping with climate change impacts, Malaysia

Description of practice: Flood hazard or risk maps without climate change impact are prepared by the Department of Irrigation and Drainage (JPS) of Malaysia based on hydrological and hydraulic simulation. Taking a step further, the National Hydraulic Research Institute of Malaysia (NAHRIM) carried out the study on flood hazard mapping under future conditions including climate change impact. 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.

Climate hazards addressed by the practice: Flood

DRR and CCA benefits: Assessment of climate change impacts is a primary technical step to integrate DRR and CCA. Hazard and risk mapping with climate change impacts is an effective standard tool for risk assessment.

Scalability potential: Highly scalable to all ASEAN countries.

- *Social and political acceptability:* Technical knowledge sharing and initial training are necessary. Climate change impacts have great uncertainty. For example, projected future rainfall including climate change impacts have a range of values based on various scenarios.
- *Economic viability and sustainability:* Large investment is required if projected future hydro meteorological data have to be prepared by themselves, but if not (for example, using outputs from regional collaborative GCM downscaling such as SEACLID-CORDEX), necessary funding will be relatively small.
- *Institutional and policy needs:* Funding for study or technical transfer to develop the methodology and capacity building is necessary.

Source/Contact: Department of Irrigation and Drainage (JPS), Ministry of Natural Resources and Environment, Malaysia; National Hydraulic Research Institute of Malaysia (NAHRIM).

GP-4.3b: Inundation map with and without sea level rise caused by climate change, Viet Nam

Description of practice: Climate change impact predictions in Viet Nam are being carried out by the Viet Nam National Institute of Meteorology, Hydrology and Environment (IMHEN), which

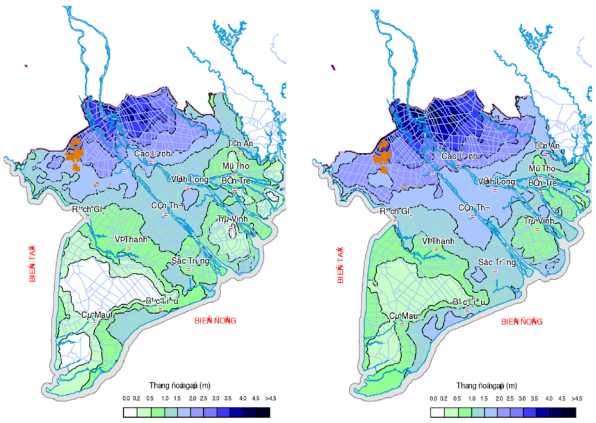


Figure 20. Inundation map without (left) and with sea level rise (right) by 30 cm in 2050 (GP-4.3b)

Source: SIWRP, MARD

developed three scenarios for the country: Low emission (B1), Average emission (B2) and High emission (A2). The figure 20 shows inundation maps with and without sea level rise estimated by 30cm in 2050 based on SRES B2 Scenario.

Climate hazards addressed by the practice: Storm surge, floods

DRR and CCA benefits: Risk assessment with consideration of the future climate change impacts constitutes the primary technical step to integrate DRR and CCA. Hazard and risk mapping with climate change impacts is an effective standard tool for risk assessment.

Scalability potential: Highly scalable to all ASEAN countries.

- *Social and political acceptability:* Technical knowledge sharing and initial training are necessary. Since sea level rise has been already gradually observed, the hazard maps incorporating projected future sea level rise would be more acceptable due to their higher utility in decision making and risk reduction.
- *Economic viability and sustainability:* Large investment is required if projected future hydro meteorological data have to be prepared by countries themselves, but if not (for example, using outputs from regional collaborative GCM downscaling such as SEACLID-CORDEX), necessary funding will be relatively small.
- *Institutional and policy needs:* Funding for carrying out the study or technical transfer to develop the methodology and capacity building is necessary.

Source/Contact: Southern Institute for Water Resources Planning (SIWRP), MARD, Viet Nam.

GP-4.3c: Landslide hazard maps, Thailand

Description of practice: Thailand has been a pioneer among the ASEAN countries in developing detailed landslide hazard maps at the national, provincial and village levels. These maps were developed by DMR using a customized mathematical model for analysis. GIS and remote sensing tools were used for analyzing and modeling to delineate and categorize landslide susceptible areas and define villages with landslide risk. Hazard maps at community levels are provided to vulnerable villages with explanation and landslide waring volunteer network has been built in each village.

Climate hazards addressed by the practice: Landslide

DRR and CCA benefits: If climate change impacts are incorporated into the threshold values of landslide, it will be a better practice for the basic information for landslide risk management under the condition of climate change impacts.

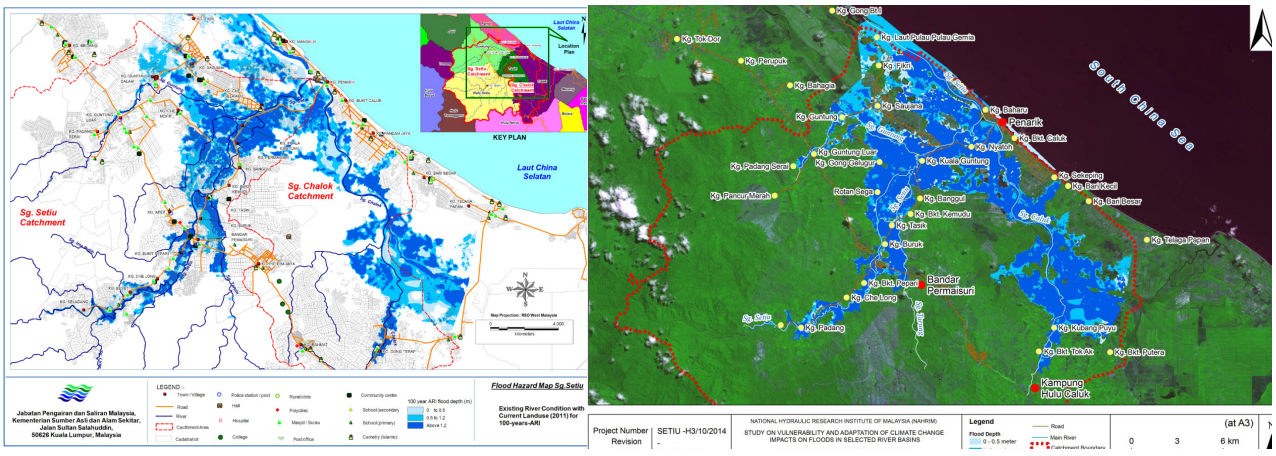


Figure 21. Hazard map of 100-year flood without (on the left) and with (on the right) climate change impacts (GP-4.3a)

Source: JPS and NAHRIM, Malaysia

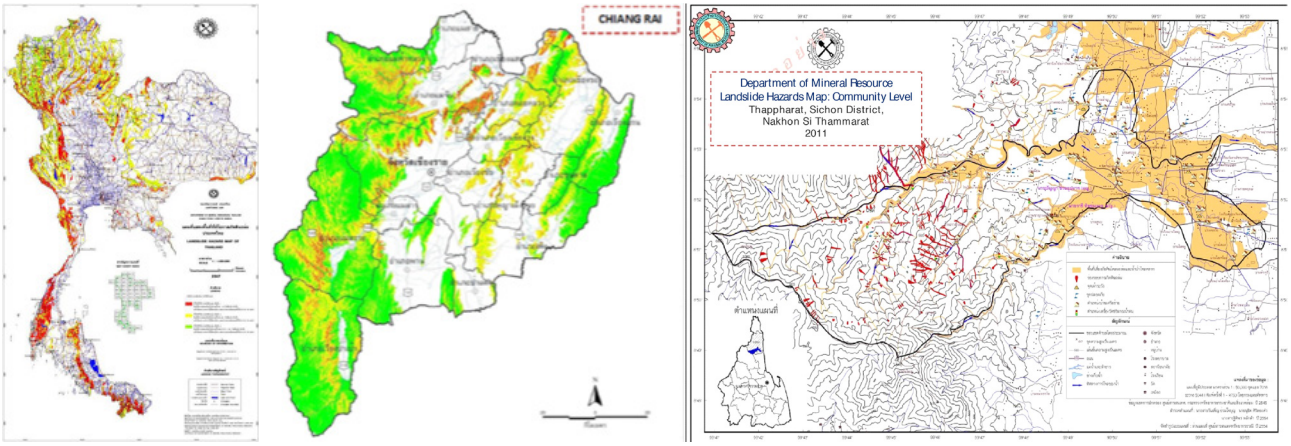


Figure 22. Landslide hazard map at country (left), provincial (middle) and community (right) levels (GP-4.3c)
Source: DDPM and DMR, Thailand

Scalability potential: Highly scalable to all ASEAN countries.

- *Social and political acceptability:* Landslides hazard maps at country and provincial level are important in planning and decision making by policymakers and maps at community level are important to prevent and mitigate landslides damage.
- *Economic viability and sustainability:* Resettlement from hazard area can dramatically decrease disaster damage. The cost for preparing hazard maps is less than probable disaster damage incurred in absence of these maps.
- *Institutional and policy needs*: Since hazard zoning will influence the price of land, national regulation and uniform guidelines for landslide hazard mapping is required.

Source/Contact: Department of Disaster Prevention and Mitigation (DDPM) and Department of Mineral Resources (DMR), Thailand.

GP-4.4a: GIS-based web portal site of hazard maps, the Philippines

Description of practice: The Project NOAH (Nationwide Operational Assessment of Hazards), the flagship disaster prevention and mitigation program of the Department of Science and Technology, 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.

Climate hazards addressed by the practice: Storm surge, flood, landslides

DRR and CCA benefits: 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 system can provide end-users and relevant agencies an easy access to necessary information. And effective visualization will help users' better understanding.

Scalability potential: Scalable to all ASEAN countries.

- *Social and political acceptability:* Technical knowledge sharing and initial training are necessary. Since hazard maps may include sensitive information, the agreement on disclosure of hazard maps is required.
- *Economic viability and sustainability:* Initial investment is necessary for building the system, and continuous O&M cost is required.
- *Institutional and policy needs:* Investment for system development, operation and maintenance, training and capacity building of staff is required.

Source/Contact: The University of the Philippines Nationwide Operational Assessment of Hazards (UP-NOAH), the Philippines.

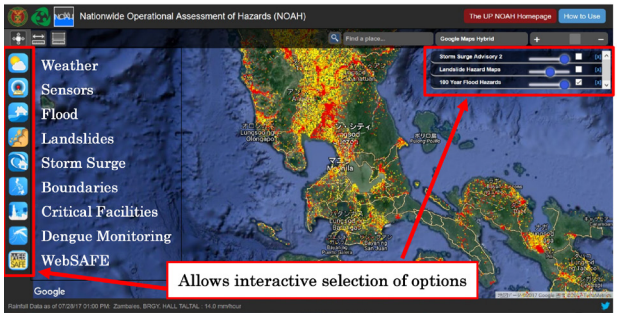


Figure 23. Web GIS based portal site of hazard maps (GP-4.4a)
Source: UP-NOAH

GP-4.4b: Hydrological data sharing and flood forecasting, Mekong River Commission (MRC)

Description of practice: The data sharing system shows the location and status of 23 hydrological stations. Clicking on a station will bring viewers to individual station information: observed and forecasted water levels, as well as yearly observations. This information is supplied as a service to the governments of the MRC member states, so that it may be used as a tool within existing national disaster forecast and warning systems.

Climate hazards addressed by the practice: Flood

DRR and CCA benefits: This system provides effective data sharing of water level stations which is often not easy to be obtained in international rivers. Data accumulation will lead to better planning in DRR. Water level data can also give quick flood forecast in downstream and such forecast is realistic and effective especially in case of long rivers.

Scalability potential: Scalable to river management for long river.

- *Social and political acceptability:* International agreement on hydrological data sharing and data standardization is required in case of transboundary rivers.
- *Economic viability and sustainability:* Initial investment is necessary for building the system and continuous O&M cost is required.
- *Institutional and policy needs:* Investment for system development, operation, maintenance, and data standardization guidelines are required.

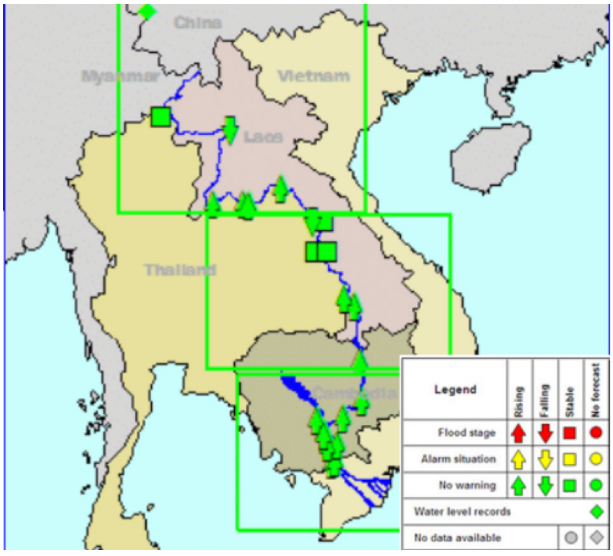


Figure 24. Hydrological data sharing and flood forecasting (GP-4.4b)
Source: MRC

Source/Contact: Mekong River Commission (MRC), Phnom Penh, Cambodia.

GP-4.5a: National Flood Forecasting and Warning System, Malaysia

Description of practice: The Malaysian government's Department of Irrigation and Drainage (DID) provides a flood forecasting and warning service to the public. It is developing a programme based on the phased implementation of systems, which together form a new National Flood Forecasting and Warning System (NaFFWS) for its key river basins. The objective of the new NaFFWS is to develop and maintain an effective and efficient integrated flood forecasting and river monitoring system (iFFRM), with flood warning dissemination, using national network data, telemetry data, radar data and rainfall forecasts. This iFFRM tool is designed to enable effective decision support by DID.

Climate hazards addressed by the practice: Flood

DRR and CCA benefits: The results are used to inform and warn DID staff, so that they can take immediate action to provide an effective and proactive emergency response. Results are also passed to DID web pages, and to dedicated smartphone applications, enabling forecasts to be disseminated more widely. Early warning provides as much lead-time as possible for the affected residents to take appropriate preparatory actions to prevent loss of life and minimise damage property.

Scalability potential: Highly scalable to all ASEAN countries

- *Social and political acceptability:* Early warning system enables people to take effective preparedness and response action. Dissemination of disaster warning through social media such as smart phone offers easy access to relevant emergency information.
- *Economic viability and sustainability:* Initial investment is necessary for building the system and continuous operation and maintenance (O&M) costs are required.
- *Institutional and policy needs:* System development, O&M, and data standardization are required.

Source/Contact: Department of Irrigation and Drainage (DID), Malaysia.

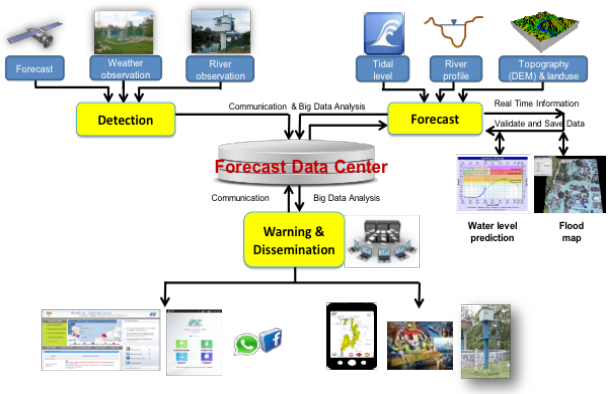


Figure 25. Dissemination of advisory and warning (GP-4.5a)

Source: DID, MONRE translated by JICA Project Team

GP-4.5b: Satellite-based drought monitoring and early-warning system

Description of practice: Drought is a slow-onset hazard and is often difficult to detect at early stages. Addressing this issue, the Institute of Industrial Science of University of Tokyo has developed a satellite-based drought monitoring and warning system that helps all the major Member States to monitor drought and as an early-warning mechanism. The regional partners from Indonesia (Indonesian Center for Agricultural Land Resources Research and Development) and Thailand (Geoinformatics Center, Asian Institute of Technology) have collaborated with Tokyo University in developing this system. The system assesses the drought conditions using MODIS-based drought codes and Keetch-Byram Drought Index (KBDI) that is based on the net effect of evapotranspiration and precipitation to compute the moisture deficiency in the soil.

Climate hazards addressed by the practice: Drought

DRR and CCA benefits: This drought monitoring is based on the real-time drought conditions using the remote-sensing methodologies and hence do not consider the future climate change conditions. However, the real-time drought monitoring helps governments and local institutional stakeholders to prepare and mitigate the possible drought impacts well in time due to its early warning capabilities. Drought prediction is possible if combined with weather forecasts. Such actions will have long-term impact on the wellbeing and resilience of communities since impacts on their social and economic conditions are mitigated consideration. With increased spatial resolution, the system can be used for local level decision making. Ability to capture historical droughts over the time can help in understanding the drought characteristics of a region and put in place appropriate drought risk reduction measures.

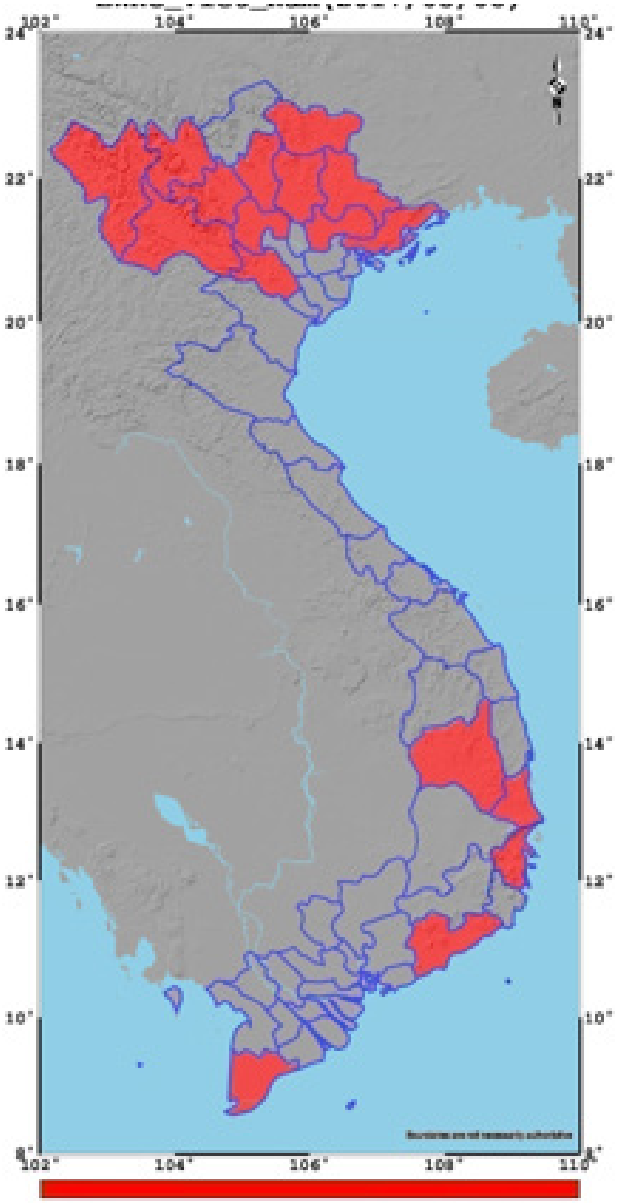


Figure 26. Satellite-based early warning of drought shown for Viet Nam (GP-4.5b)

Source: University of Tokyo

Scalability potential: Highly scalable to all ASEAN countries

- *Social and political acceptability:* Early warning system enables people to take effective preparedness and response action. There is a potential to disseminate early warning through social media for easy access to relevant stakeholders.
- *Economic viability and sustainability:* Even though remote-sensing data is costly, open source remote-sensing data provides a cost-effective option especially at relatively lower resolutions. Already some of the member states such as the Philippine, Thailand and Indonesia have initiated measures to adopt this system and improve for their country-specific conditions.

- *Institutional and policy needs:* There is a need for major drought-prone countries of the Member States to recognize and use this system for the immediate and long-term drought risk reduction measures in respective countries.

Source/Contact: Institute of Industrial Science, University of Tokyo, Japan

GP-4.5c: Specialized Expert System for Agro-Meteorological Early Warning (SESAME), Myanmar

Description of practice: Current weather forecasts have low skill and value and often are at low resolution hence are not assisting farmers in their daily, weekly and seasonal cropping decisions. To address this issue, location-specific weather information has been generated for 3 and 10-days duration along with Agri-weather advice to farmers with the location-specific agronomic practices and weather forecast in 2 townships by DMH starting from 2013-14. The skill of the forecast was improved by using the advanced forecasting techniques such as ECMWF Deterministic Forecast and WRF models.

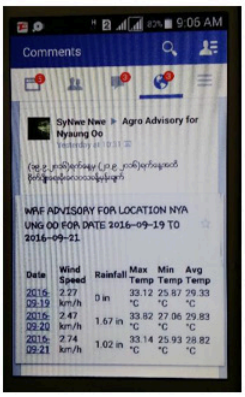
Climate hazards addressed by the practice: Droughts, high temperature, low temperature, typhoons

DRR and CCA benefits: High skill of weather forecasting is helping farmers to design their cropping practices and operation calendar avoiding suboptimal days. As a result, 30% of farmers in two townships successfully avoided losing crop by adjusting the crop practices compared to those who did not receive weather forecast during the two years of the project. World Bank and UNDP have picked it up as a best case for further scaling up. Direct provision of location-specific weather information to farmers is helping build the awareness and trust on the application of weather information in crop management and integrating well with the local agriculture advisory services. Extension service agents could able to improve their knowledge and skill in advising farmers according to the reliable weather information.

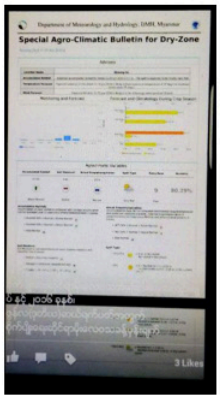
Scalability potential: Highly scalability depending on the application of high skill weather information.

- *Social and political acceptability:* Highly acceptable due to the direct benefits to farmers and extension services.
- *Economic viability and sustainability:* Initial costs for developing the downscaled weather information should be taken care and sustainability depends on the skill of the weather forecast and the usability of the information generated by the farmers.
- *Institutional and policy needs:* Technical capacity building is necessary for generating the downscaled weather information and necessary infrastructure to conduct required calculations and dissemination of information to the functionaries on the ground.

Source/Contact: DMH, Yangon and RIMES, Bangkok, Thailand.



3-day forecast



10-day forecast

Farmers are trained on using the system through farmer field school

Figure 27. Specialized Expert System for Agro-Meteorological Early Warning (SESAME), Myanmar (GP-4.5c)
Source: JICA Project Team

5

PLANNING AND IMPLEMENTATION

Sub-category	Definition
Design guidelines (5.1)	Guidelines and standards incorporating disaster and climate risk are developed and used
Land-use and urban planning (5.2)	Land-use and urban plans are prepared by incorporating disaster and climate risk and with an assessment of ecosystem services
Disaster-resilient investments (5.3)	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 (5.4)	Drought risk reduction measures including water saving and agricultural measures are implemented

GP-5.1a: Design guidelines incorporating climate change, Department of Public Works and Highways (DPWH), the Philippines

Description of practice: The Department Order of 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 (40km2 drainage area and above), shall be 50 year flood with sufficient freeboard to contain the 100 year flood, b) for small rivers (below 40km2 drainage area), shall be 25 year flood with sufficient freeboard to contain the 50 year flood.

Climate hazards addressed by the practice: Floods

DRR and CCA benefits: Flood safety level can be improved by taking into consideration the climate change impacts.

Scalability potential: There is scalability potential. However, it is necessary to check whether the proposed flood control measures will be feasible in technical and economic points of view.

- *Social and political acceptability:* Acceptable and this can be one of the guidelines for planning and designing flood risk management facilities.
- *Economic viability and sustainability:* Necessary to design economical and sustainable flood control facilities. Additional finances may be necessary to accommodate the revised guidelines.
- *Institutional and policy needs:* The Philippine Government has a policy of considering climate change in their DRR. Hence, incorporating CCA into flood control is already among the high institutional and policy priorities of the Philippines

Source/Contact: Unified Project Management Office (UPMO) - Flood Control Management Cluster (FCMC), DPWH, the Philippines.

GP-5.1b: Flood and storm resistant houses in Cambodia, Brunei, Viet Nam, and the Philippines

Figure 28. Elevated house beside the river (flood prone area with small flood velocity) (GP-5.1b)

Source: JICA Project Team

Description of practice: Flood and storm resistant houses can be found in many ASEAN countries. Many of them are historical practices such as elevated houses in the inundation areas in Mekong Delta in Cambodia. In Brunei, for building houses in flood prone areas where inundation from rivers with small velocity occurs, it is required as a practice like a regulation to build elevated houses. The requirement does not include additional height for water level rise by climate change. However, the elevated houses are also effective in cases of water level rise by climate change. Flood warning and evacuation assistance are also provided to the people living in the inundation areas from the government side in the case of bigger floods. This is one of the potential good practices against climate change impacts. In Danang, Viet Nam, Storm Resistant Houses were introduced in typhoon prone communities with the funding from the Rockefeller Foundation in 2011 and Women's Union was chosen to lead the project due to their good record of accomplishment on financial services and management of funds. In Singapore, PUB assists and advises building owners to humps and flood barriers to protect their basement levels from floodwaters. The water-level sensors in the basement carparks are linked to an alarm system to warn about flooding.

Climate hazards addressed by the practice: Floods and storms

DRR and CCA benefits: This practice will positively benefit people living in flood prone areas, because their houses are above the flood water level, stronger to resist storms or buildings with humps and flood barriers to protect their basement levels from floodwaters. These houses will enable to conduct normal household operations during normal floods without causing much disturbance to social life and minimizing the evacuation needs. However, in case of bigger floods beyond normal scale, these houses will be also flooded. Therefore, combination with flood warning and evacuation systems is also very important.

Scalability potential: There is high scalability potential for applying this practice to flood prone areas with small flood velocity. Elevated housing architecture can be found in many ASEAN countries including Cambodia, Viet Nam, Indonesia and the Philippines.

- *Social and political acceptability:* This practice is acceptable by people who are living in flood prone areas with small flood levels or areas affected by storms.
- *Economic viability and sustainability:* This practice has economic viability to flood and storm prone areas with small population density and where flood mitigation infrastructures are too costly to be constructed. Moderately similar investment may be necessary for erecting houses on stilts compared to normal houses.
- *Institutional and policy needs:* Flood and storm warning and evacuation assistance are also necessary to be provided to people living in hazard prone areas.

Source/Contact: National Disaster Management Committee (NDMC), Brunei Darussalam; PUB Singapore, Women's Union Danang, Viet Nam.

GP-5.2a: Flood control planning in the Mekong delta by 2020, Vision to 2030, Viet Nam

Description of practice: Design flood is the 2000 year flood which with a 100-year return period. Sea water level rise by climate change is also considered. In order not to increase flood water level in the Cambodian border by constructing flood control structures in the Viet Nam side, introducing floodwater through sluice gates to inland delta area from the river for retention is proposed, so that the flood water level along the rivers will not raise (non structural measures).

Climate hazards addressed by the practice: Floods

DRR and CCA benefits: Flood damage to Autumn–Winter paddy fields will be reduced by implementing the flood control plan.

Scalability potential: Basic concept of not increasing flood water level by utilizing retarding

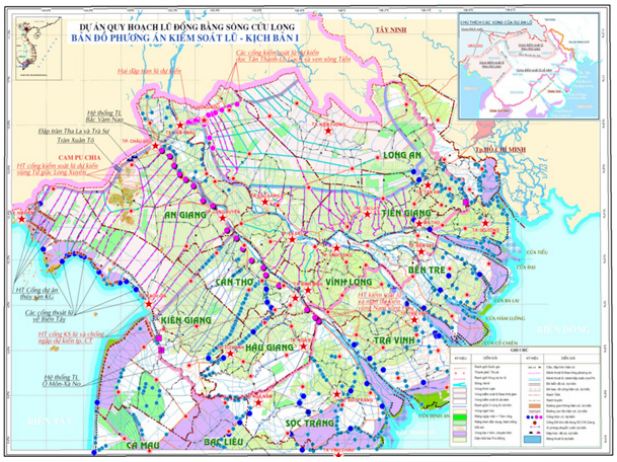


Figure 29. Flood control plan in the Mekong Delta by 2020, Vision to 2030 in Viet Nam (GP-5.2a)

Source: SIWRP, Viet Nam

function in the flood prone areas has scalability potential for applying the concept to similar flood prone areas.

- *Social and political acceptability:* The above concept of flood control planning is acceptable by the people and political entities as well as the neighbouring upstream or downstream countries.
- *Economic viability and sustainability:* There is economic viability and sustainability. Flood retardation areas have opportunity costs and hence to be implemented based on technical feasibility and economic viability studies.
- *Institutional and policy needs:* Implementation of the plan by the Government is necessary due to the opportunity cost considerations as well as consideration of landuse management.

Source/Contact: Southern Institute for Water Resources Planning (SIWRP), Ministry of Agriculture and Rural Development (MARD), Viet Nam

GP-5.2b: Pahang river flood control project in Malaysia

Description of practice: This is one of the potential good practices for CCA integration by stage-wise improvement in the future. This flood control and drainage project locates about 7km from the mouth of the Pahang River in Pekan City where floods have occurred in the past, 2007 being the biggest flood. Design flood water level is the Max. WL in 2007 (max. within the past 50 years). The project constructed river dikes with river wall (length of 4.5km) to make polder to protect the flood prone area, as well as gravity drainage from the inland area of polder. Wetland in the polder is reserved as a retention area, integrated as a non structural measure.

Figure 30. Pahang river in the downstream reach: River dike with river wall in the right bank side (GP-5.2b)

Photo by: JICA Project Team

Climate hazards addressed by the practice: Climate hazards addressed by the practice: Floods and storms

DRR and CCA benefits: The flood control and drainage measures will benefit the project area by mitigation floods and accommodating the ecosystem functions by integrating the non-structural measures.

Scalability potential: The project has integrated approach of structural measures for flood control and drainage as well as non structural measures of reserving wetland area in the inland flood area. There is a need to develop proper guidelines for scaling up such new approaches.

- *Social and political acceptability:* The project has acceptability from social and political points of view. Combination of structural measures with non-structural measures including land use management and river basin conservation is effective for prevention and mitigation of flood damage with climate change impacts as well.
- *Economic viability and sustainability:* The project has economic viability and sustainability due to integration of physical and non-structural elements.
- *Institutional and policy needs:* Integration of structural and non-structural elements needs appropriate guidelines to be put in place for proper implementation of the idea.

Source/Contact: JPS (DID), Malaysia.

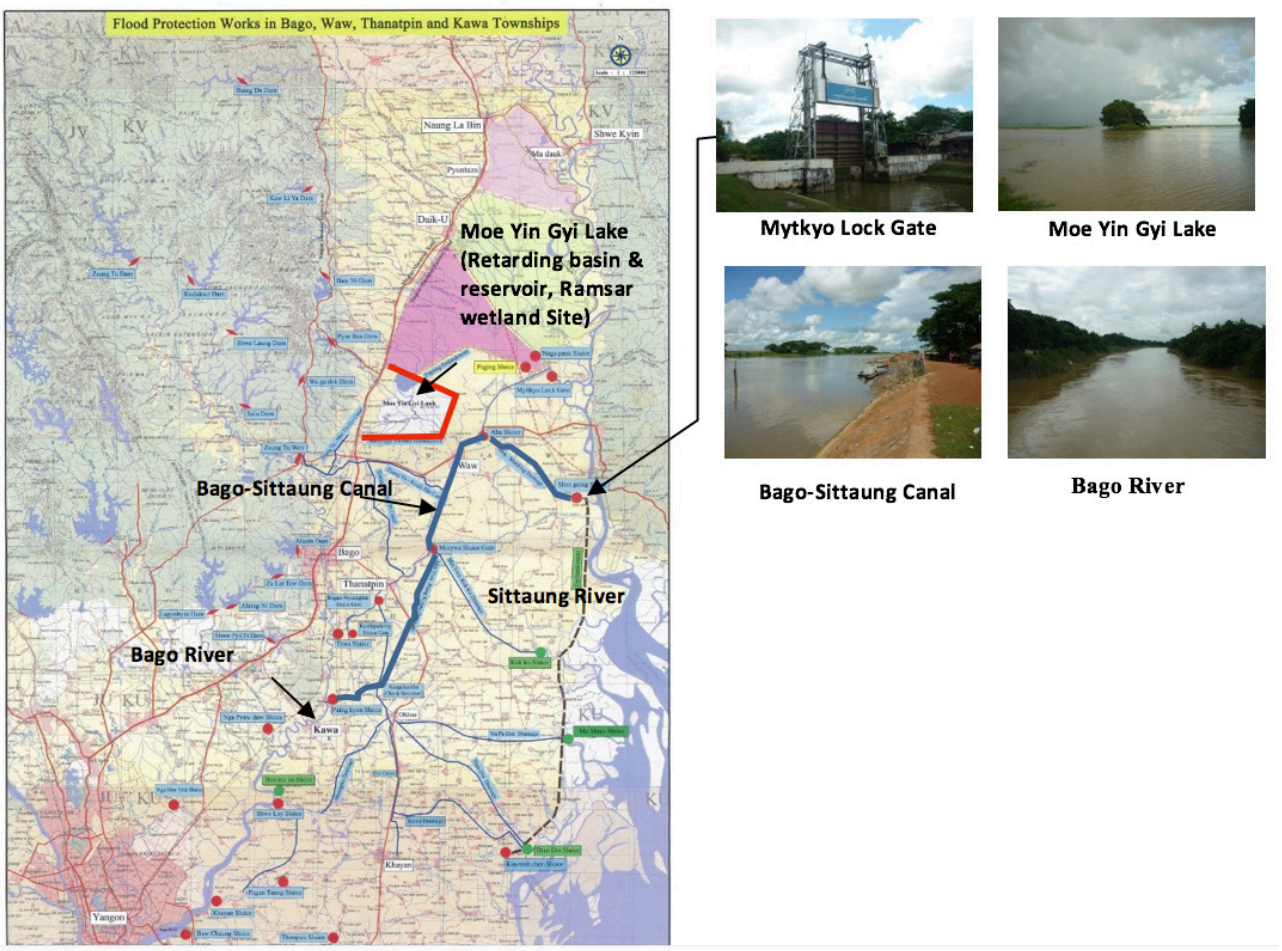


Figure 31. Bago River flood control and navigation canal system (Bago Sittaung Canal) (GP-5.2c)
Source: Map from IWUMD | Photos by: JICA Project Team

GP-5.2c: Bago River flood control in Myanmar

Description of practice: This is a potential good practice for CCA integration by possible stage wise improvement against climate change impacts in the future. The Bago River Flood Control System is a complex system also affected by the floodwater from the Sittaung River and the system is important for water resources management in the area. Bago Sittaung canal is useful for retention of water for water transportation. Moe Yin Gyi Lake and Ramsal wetland site are used for retarding and water storage, and several flood control dams and water use dams were constructed for irrigation, etc. Bago Sittaung Canal and Moe Yin Gyi Lake were constructed about 140 years ago and there is an accumulation of experience of how these systems interacted with the climate change over these years.

Climate hazards addressed by the practice: Floods and droughts

DRR and CCA benefits: Floods have been mitigated to some extent. Some flooding problems remain while the drought and related water scarcity were significantly reduced due to retention and distribution of water to places where it is needed.

Scalability potential: The above practice is for specific areas. Hence, there is a limited scalability potential.

- *Social and political acceptability:* The above practice has been highly accepted by people and political entities over the past 140 years.
- *Economic viability and sustainability:* These flood control systems have lasted for 140 years indicating their sustainability and viability. However, as the existing system is complex, reviewing the system and updating the integrated flood and drought risk management plan is necessary to be formulated for more effective implementation of flood prevention and mitigation in the area especially with climate change impacts.
- *Institutional and policy needs:* Meteo-hydrological observation system is very much insufficient and does not cover the upstream sub-river basins in the area. Hence, cooperation with other agencies especially

for strengthening the meteo-hydrological observation systems for covering the whole Bago River Basin as well as the related stretch of the Sittaung River is necessary.

Source/Contact: IWUMD, Myanmar.

GP-5.2d: Landslide disaster risk management in Banjarnegara municipality, Indonesia

Description of practice: The Banjarnegara municipality (Kabupaten) in Central Java Province is a mountainous area. About 70% of the municipal area belongs to the high-risk area of landslide. On December 14, 2014, a large deep landslide occurred at Sampang District due to heavy rain, causing more than 135 deaths. Currently, monitoring of rainfall and slope movement is being conducted. Also, land use management in the disaster areas is conducted so as not to build houses in the disaster area again. These measures are among the basic measures for landslide risk management (LRM), and will be also effective in the case with climate change impacts.

Climate hazards addressed by the practice: Rain induced landslide

DRR and CCA benefits: It is rather difficult to link climate change impact on landslide phenomena. Therefore, it is important to provide non structural and structural measures against landslide even without climate change and such measures will benefits to the people by mitigating damage by landslides.

Scalability potential: There is a high scalability potential for areas with similar landslide problems. However, the combination of non structural measures such as land use management in the high-risk areas of landslide and structural measures such as check dams and sand retarding basin is necessary to be considered for mitigating damage by landslides.

- *Social and political acceptability:* There is high acceptability of the above measures against landslides, because land use management in high risk areas is commonly conducted in the areas with landslide problems.
- *Economic viability and sustainability:* The above land use management is viable from the economic point of view, and sustainable.
- *Institutional and policy needs:* There are many similar high-risk areas in Banjarnegara municipality. It is necessary to manage the high-risk areas of landslide including the restriction of land use such as not building houses in high-landslide risk areas and allow agricultural activities in normal time. For this, it is necessary to upgrade landslide hazard maps so that the hazard maps can show high-risk areas in detail based on more detail topographic maps.

Figure 32. Banjarnegara municipality landslide at Sampang district in Banjarnegara municipality in Central Java, Indonesia (GP-5.2d)

Source: BPBD

Source/Contact: BPBD Banjarnegara Municipality, Indonesia.

GP-5.2e: Landslide disaster management in Guisaugon in southern Leyte province, the Philippines

Description of practice: Large deep sliding of the mountain slope with debris flow occurred in Guisaugon, Saint Bernard Municipality, Southern Leyte Province, on 17February 2006, due to the prolonged heavy rainfall, killing 1,100 people including 250 schoolchildren. The people of Barangay Guisaugon and the surrounding 6 barangays were relocated. Land use management in dangerous areas including prohibition of building houses and only allowing farming such as rice cultivation has been conducted by the municipality.

Climate hazards addressed by the practice: Rain induced landslide

DRR and CCA benefits: It is important to provide non-structural and structural measures against landslide even without climate change. These measures will benefit people by mitigating damage by landslides.

Scalability potential: There is high scalability potential for the areas with similar landslide problems. However, combination with non structural and structural measures is necessary to consider for mitigating damage by landslides.

- *Social and political acceptability:* There is high acceptability of the above measures against landslides.
- *Economic viability and sustainability:* The above land use management is viable from the economic point of view, and sustainable.

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

Source: San Bernard Municipality

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

Source: JICA Project Team

Figure 33. Landslide disaster area in Guisaugon, Saint Bernard Municipality, Leyte, the Philippines (GP-5.2e)

- *Institutional and policy needs:* It is necessary to manage the high-risk areas of landslide including restriction of land us based on detailed landslide hazard and risk maps as much as possible

Source/Contact: Saint Bernard Municipality in Southern Leyte Province, the Philippines.

GP-5.2f: Integrated operation of Jatilhur dam in the Citarum river, Indonesia

Description of practice: Jatilhur Dam in the Citarum River is a multipurpose dam with gross storage of 3,000 Million Cubic Meters (MCM), supplies about 80% of water for drinking in Jakarta and other areas, and supplies a large amount of irrigation water. Integrated operation has been conducted with upstream hydropower dams like the Cirata Dam (gross storage: 2,165 MCM) and the Saguling Dam (gross storage: 881 MCM) for stable water supply as well as flood control.

Figure 34. Jatilhur Dam (Reservoir and Spillway) in Citarum River, Indonesia (GP-5.2f)

Source: JICA Project Team

Climate hazards addressed by the practice: Floods and droughts.

DRR and CCA benefits: If CCA is incorporated in the integrated operation of the above dams, enough safety level against floods and drought to the downstream areas of Jatilfur Dam can be ensured even with climate change.

Scalability potential: The concept of integrated operation of dams has high scalability potential for application in dams in other river basins.

- *Social and political acceptability:* Acceptable without any major problem due to minimal impacts during the establishment of such dams. Integrated operation of dams will be effective for efficient water resources management and flood risk management in river basins.
- *Economic viability and sustainability:* Integrated operation of dams does not need huge investment and can produce additional benefits than the normal dam operation.
- *Institutional and policy needs:* In order to realize integrated operation of dams with different purposes in countries, institutional and policy set-up between different agencies responsible for dams for cooperation for the integrated operation of dams against floods and droughts are very much necessary.

Source/Contact: Jasa Tilta II, Indonesia.

Slit Dam in the Anilao River Upstream Reach

River Improvement in the Mid-stream to Downstream Reaches of the Anilao River

Figure 35. Flood control facilities in Ormoc City, Leyte Province, the Philippines (GP-5.3a)
Source: JICA Project Team

GP-5.3a: Slit dam in the upstream of Anilao river, Ormoc City, the Philippines

Description of practice: In November 1991, severe damage including 4,922 deaths and 3,000 missing people occurred in Ormoc City due to the flash floods from Anilao River and Malbasag River caused by overflow from the rivers as well as clogging of bridges by floating logs and debris during Typhoon Uring. Three slit dams were constructed to capture floating logs and debris. River improvement was conducted in the mid stream to the downstream reaches of these rivers. Maintenance of the slit dams including removal of logs and debris and that of the improved river reaches including dredging and cutting vegetation have been conducted by Ormoc City through the Flood Management Committee (FMC). Under the FMC, easement zones (bank areas) along the rivers have been managed under cooperation by the community (barangay) people, so as not to build illegal houses in the bank areas.

Climate hazard addressed by the practice: Flash floods with floating debris

DRR and CCA benefits: These practices have benefited the people of Ormoc City by ensuring additional safety to people, assets and economy against floods. There is a need to assess the climate change adaptation potential of these interventions.

Scalability potential: This practice has high scalability potential to rivers with similar flash flood and floating log problems.

- *Social and political acceptability:* There is high acceptability, because the people of Ormoc City accepted the project and cooperated for maintaining the facilities including easement zones (bank areas) of the improved stretches of the rivers.
- *Economic viability and sustainability:* This practice has economic viability and sustainability.
- *Institutional and policy needs:* A Flood Management Committee (FMC) has been established in Ormoc City, and it has maintained the slit dams and improved river reaches along the rivers for maintaining the easement zones with the cooperation of communities.

Source/Contact: Ormoc City Disaster Risk Reduction and Mitigation Office, Leyte, the Philippines.

GP-5.3b: Polder wall for protecting Valenzuela–Obando–Meycauayan (VOM) area from inundation by high tide and river flood, Metro Manila, the Philippines

Description of practice: 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.

Climate hazards addressed by the practice: Sea water level rise and floods

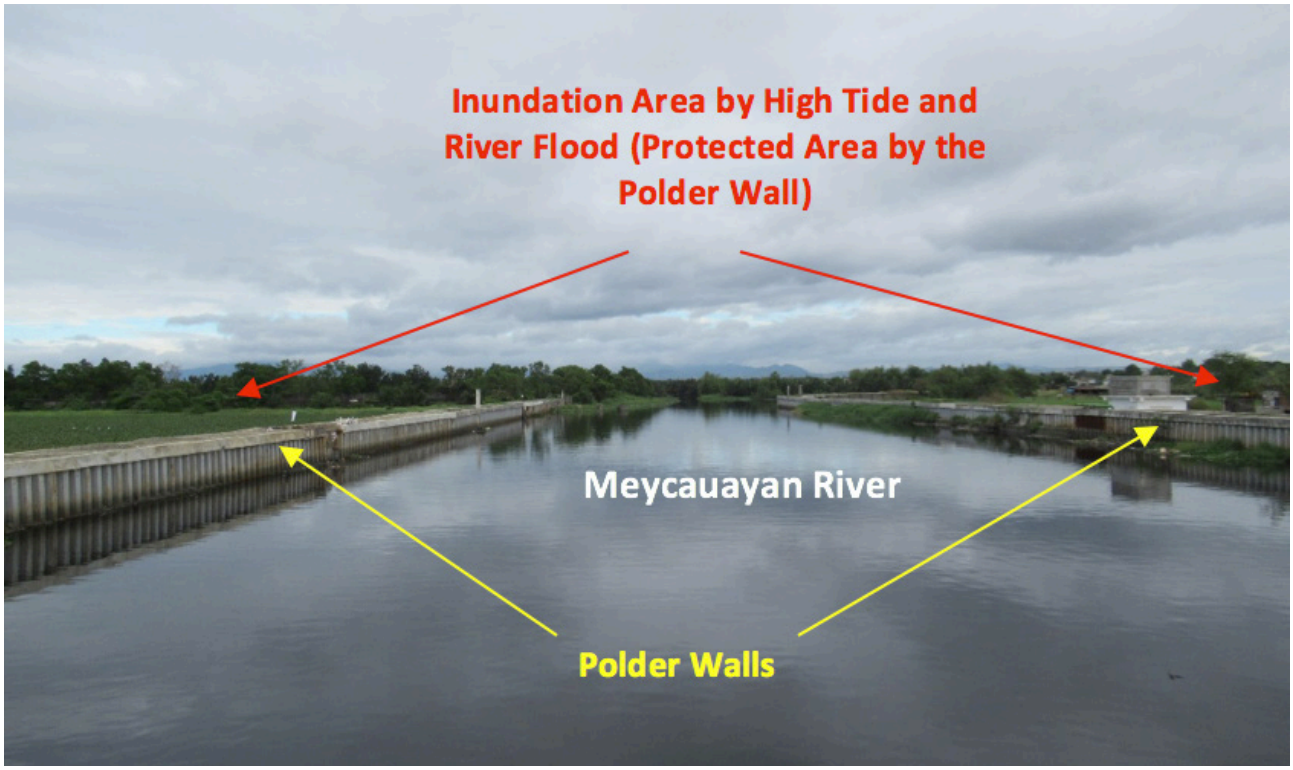


Figure 36. Polder wall including height for sea water level rise in VOM Area, Metro Manila, the Philippines (GP-5.3b)
Source: JICA Project Team

DRR and CCA benefits: This practice will provide several flood risk reduction benefits to the people, assets and economy in the inundation areas affected by high tide, sea water level rise and floods.

Scalability potential: This practice has scalability potential for the areas affected by sea water level rise and floods.

- *Social and political acceptability:* This practice has acceptability from social and political points of view. Drainage pumps are also necessary to be installed to drain rainwater for preventing inland floods.
- *Economic viability and sustainability:* Initial costs are high but benefits will outweigh in the end.
- *Institutional and policy needs:* Enough budget for maintaining the facility is necessary.

Source/Contact: Flood Control Management Cluster (FCMC), UPMO, DPWH, the Philippines

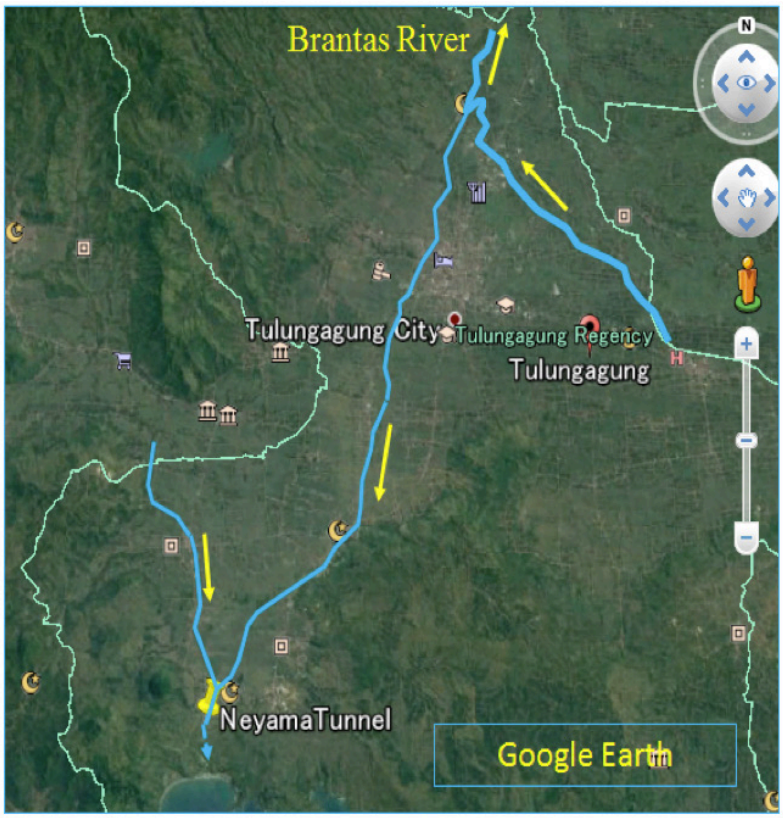
GP-5.3c: Polder dike for protecting Ben Tre province, Viet Nam

Description of practice: Ben Tre Province is one of the provinces in Mekong Delta where floods and droughts are problems. Agriculture such as paddy and coconut plantation, as well fish culture, are widely conducted in the province. In order to solve the flooding problems, coastal dikes with sluice gates are being constructed to form a polder system (ring dikes) for protecting the agricultural areas against floods by the government of Viet Nam and World Bank. The height of coastal dike is set considering sea level rise.

Climate hazards addressed by the practice: Sea level rise and floods

DRR and CCA benefits: This practice will benefit the areas affected by sea level rise and floods by mitigating floods.

Figure 37. Polder dike including height for sea water level rise for protecting delta area of the Mekong River in Ben Tre Province, Viet Nam (GP-5.3c)
Source: JICA Project Team



Phase I tunnel (Right) and intake of power station (Left)

Phase II tunnel

Figure 38. Tulungagung Neyama Tunnel in the Brantas River Basin in East Java (GP-5.3d)
Source: JICA Project Team

Scalability potential: This practice has high scalability potential for the areas affected by sea level rise and floods.

- *Social and political acceptability:* This practice has acceptability from social and political points of view.
- *Economic viability and sustainability:* No information is available about its economic viability and sustainability.
- *Institutional and policy needs:* Enough budget for maintaining the dike is necessary.

Source/Contact: Ben Tre Provincial Government Office, Viet Nam.

GP-5.3d: Floodway tunnel (Neyama tunnel) in the Brantas river basin, Indonesia

Description of practice: Tulungagung Area was originally a flood-prone marshland with floodwater coming from the Brantas River and its tributaries. To solve the flooding problem, a tunnel floodway called "Neyama Tunnel" was constructed with design discharge of 1,000m3/s to discharge floodwater to the Indian Ocean which solved the flood problem and improved the agriculture. This project does not include CCA, but it can be one of the potential good practices due to the possibility of installing an additional retention pond in the upstream wide area along the inlet canal for not increasing flood peak discharge in case of climate change impacts.

Climate hazards addressed by the practice: Floods

DRR and CCA benefits: This practice has made significant benefits to the people in the area for ensuring safety of people, physical assets and agricultural areas against floods. Furthermore, this practice has contributed development of the area by mitigating flood problems in the area.

Scalability potential: This practice has scalability potential for the possibility of adding CCA elements.

- *Social and political acceptability:* This practice has acceptability from social and political points of view due to the fact that the area has been developed since implementation of this practice.
- *Economic viability and sustainability:* This practice has economic viability due to large benefit to the areas for agricultural and socio-economic development in the areas.
- *Institutional and policy needs:* Enough budget for maintaining and operating the facilities is necessary.

Source/Contact: Jasa Tilta I, Indonesia

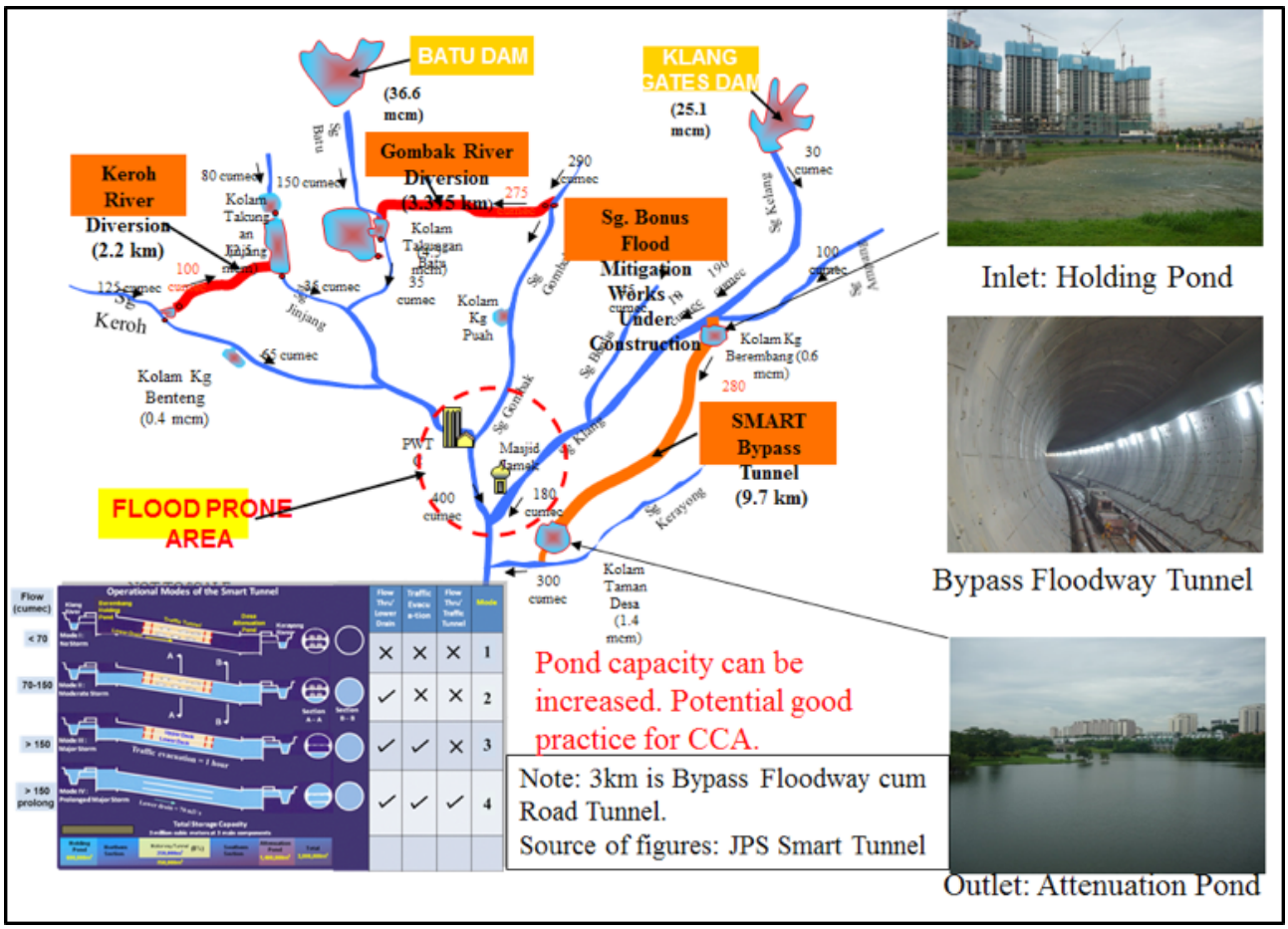


Figure 39. Smart Tunnel in Kelang River Basin, Kuala Lumpur, Malaysia (GP-5.3e)

Source: Smart Tunnel Management Office of JPS (DID) for schematic map, figures and photo of tunnel and JICA Project Team for photos of ponds

GP-5.3e: Smart tunnel and retention ponds, Kuala Lumpur, Malaysia

Description of the practice: Smart Tunnel is one of the flood control facilities of integrated flood risk management (FRM) system in Kelang River to protect Kuala Lumpur (especially the central area) from floods. JPS (DID) has the responsibility of managing the 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 Klang River to the centre of Kuala Lumpur. The design discharge of 290m3/s in the Klang River is divided into 280m3/s for the Smart Tunnel and 10m3/s for the downstream of the river. CCA elements are not included in this Project. However, retention capacities can be increased by enlarging the inlet and outlet retention ponds to some extent in case of additional climate change impacts. SMART Tunnel has been functioning well due to good management. This can be considered as a special example for mitigating floods in Kuala Lumpur, as an example of urban flood control facility.

Climate hazards addressed by the practice: Floods

DRR and CCA benefits: This practice has made significant benefits by mitigating floods in the central part of Kuala Lumpur.

Scalability potential: This practice has scalability potential for the possibility of adding CCA elements such as increasing capacity of retention ponds in the similar urban areas with flood problems. More suitable in flood prone and traffic congested areas.

- *Social and political acceptability:* This practice has acceptability from social and political points of view in very much developed urban areas such as metroplotan areas
- *Economic viability and sustainability:* This can be considered as a costly infrastructure. This practice has economic viability due to significant benefit to the areas. Sustainability is ensured with better operation and maintenance of the flood control facilities as well as utilization of bypass tunnel for transportation
- *Institutional and policy needs:* Enough budget and staff for maintaining and operating the facilities are necessary.

Source/Contact: Smart Tunnel Management Office of JPS (DID), .

Figure 40. A cyclone shelter in Ayeyarwady Delta in Myanmar (GP-5.3f)

Source: JICA Project Team

GP-5.3f: Cyclone shelters in Ayeyarwady Delta, Myanmar

Description of practice: Disasters such as Cyclone Nargis with storm surge occurred in the Ayeyarwady delta in Myanmar killing about 140,000 people in 2008. For evacuation, cyclone shelters have been constructed in the Delta Area. The cyclone shelters may not fully address climate change impacts, although these will also be effective under climate change impacts. These kinds of cyclone shelters are multi-functional buildings, since they are used as school buildings etc. during normal time.

Climate hazards addressed by the practice: Storm surge

DRR and CCA benefits: This practice has provided significant benefits to people living in the delta area with high risk of storm surge so that people evacuated to these shelters are safe during storm surge. During the normal time, the cyclone shelter can provide space for operating a school.

Scalability potential: This practice has scalability potential in similar risk areas of storm surge even with climate change.

- *Social and political acceptability:* This practice has acceptability from social and political points of view.
- *Economic viability and sustainability:* This practice has economic viability due to significant benefit to the affected communities. This practice has sustainability since this practice has been operated and maintained well and utilized as school during normal time.
- *Institutional and policy needs:* Enough budget for maintaining the facility is necessary. Community people are necessary to cooperate for maintaining the facility.

Source/Contact: Ayeyarwady Region, Myanmar

GP-5.3g: Riverbank protection using the Soda method, Lao PDR

Description of practice: This is a low-cost and sustainable riverbank protection technology from Japan introduced under a JICA project. Most of the riverbank protection works adopted by Lao PDR used Gabion Work, which are high in cost due to the use of gabion wire and difficulty in procuring materials (steel wire) and equipment. In Soda method, wooden branches are bundled as "rensai" (tie-beam of soda), and assembled as 3 layers of lattice structure with hurdle work on the top. The mattress is submerged by putting rubble stones on it to place on the river bottom to protect riverbed against scoring. Soda mattress acts well as foot protection work and creates harmonious riverine environment. Materials used are mainly broadleaf trees, which are readily available locally, hard and tough wood such as chestnut, oak, live oak, and sawtooth oak as well as flexible and sticky wood such as Japanese snow bell, Japanese rowan.

Figure 41. Riverbank protection using the Soda method, Lao PDR (GP-5.3g)

Source: JICA[5]

5 https://www.jica.go.jp/project/english/laos/003

Climate hazards addressed by the practice: Floods

DRR and CCA benefits: It complements implementation of both DRR and CCA benefits due to protection of riverbanks from erosion and future floods.

Scalability potential: The technology has a high scalability potential to areas wherever suitable materials are available

- *Social and political acceptability:* Since the method uses locally available materials, there is direct involvement of the local people in its construction and maintenance.
- *Economic viability and sustainability:* Its main attraction is low-cost and environmentally friendly. The Soda mattress is flexible and durable in water, suitable to sandy riverbed as foot protection and a good habitat for aquatic animals.
- *Institutional and policy needs:* Coordination between forestry agency and Department of Waterways, Ministry of Public Works and Transport is necessary

Source/Contact: 1) JICA. 2014. JICA Project on Riverbank Protection Works Phase II. Tokyo, Japan: Japan International Cooperation Agency. Available at https://www.jica.go.jp/project/english/laos/003/outline/index.html. 2) NARBO. 2009. IWRM Guidelines at River Basin Level – Part 2-2: The Guidelines for Flood Management. UNESCO, World Water and NARBO. Available at http://unesdoc.unesco.org/images/0018/001864/186420e.pdf.

GP-5.3h Hanging fertigation, Malaysia

Description of practice: In this technique, vegetables are grown in a bag with soil media that is hung to a pole so that the crops remain unaffected during the period of inundation. This technique is used in flood-prone areas to prevent crop damage and loss of fertility with floods.

Figure 42. Fertigation for gourds (GP-5.3h)
Source : MOA, Malaysia

DRR and CCA benefits: It complements both DRR and CCA as the technique is also water efficient as it employs fertigation by drips connected to each bag, making fertilization possible even during floods. The technique has been found advantageous to control pest infestation, extend harvesting period, better exposure to sunlight and higher yield.

Climate hazards addressed by the practice: Floods

Scalability potential: Effective in areas prone to inundation and could be easily adapted by individual farmer. MOA is considering it as a potential approach in flood prone areas.

- *Social and political acceptability:* The practice is highly acceptable due to income generation even during floods.
- *Economic viability and sustainability:* The approach is profitable and reduced risk of crop damage. Labour intensive (including need for uniformly tall labour), need higher cost and risk of structure collapsing are some of the disadvantages
- *Institutional and policy needs:* Government could provide suitable incentives in terms of financial subsidy and capacity building of farmers about the know-how and provision of materials (poles, drip irrigation, fertigation and crop types), to promote this practice both under DRR and CCA interventions.

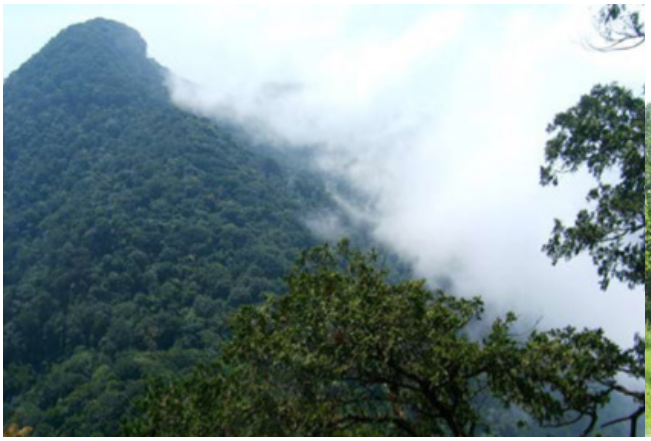
Source/Contact: Ministry of Agriculture (MOA), Malaysia.

GP-5.3i: Improved forest management in various ASEAN countries

Description of the practice: Forest Management is actively conducted in general in Myanmar, Thailand and Viet Nam. This can be said as a good practice for DRR and CCA as a non-structural measure against floods, landslides and water resources management for reducing the surface runoff, reducing sediment production from upper river basins and for storing water by natural storage function in forest areas.

Climate hazards addressed by the practice: Rainfall runoff, floods, landslide and drought

DRR and CCA benefits: This practice has provided significant benefits to the river basins with flood, landslide or drought problems by not increasing flood discharge and sediment production from the upper river basins and storing water in the mountainous areas and maintaining base flow in the rivers. As a non-structural



Ba Vi National Park, Viet Nam

Source: Viet Nam Administration of Forestry

Myanmar: Private Teak Plantation

Source: 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

Source: JICA Project Team

Figure 43. Diverse forest management practices in ASEAN countries (GP-5.3i)

measure, forest ecosystem has important role in regulating flows, controlling erosion and landslides and retarding rainfall flows and reducing runoff intensity.

Scalability potential: These practices are highly scalable to other river basins in the ASEAN region.

- *Social and political acceptability:* These practices are acceptable from social and political points of view and also from environmental point of view.
- *Economic viability and sustainability:* These practices are economically viable and sustainable for the reason of not increasing flood and landslide disaster risks and increasing water resources potential in the river basins. Effective if implemented through community participation. Mobilization of international financing such as REDD+ and use of other payment for ecosystem services schemes could also contribute sustainable forest management.

Source/Contact: Forestry Department (FD), Ministry of Resources and Environmental Conservation (MOREC), Myanmar; Royal Forest Department, Thailand; Viet Nam Forest Administration Office, Ministry of Agriculture and Rural Development (MARD).

GP-5.4a Drought information platform in Malaysia and Thailand

Description of practice: Malaysia and Thailand have established web-based platform for sharing drought information. Department of Irrigation and Drainage (DID), Malaysia has initiated drought monitoring program in 2001. The characteristics of InfoKemaru 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. InfoKemaru shares information on Standard Precipitation Index (SPI), dam water level and river flow to prepare monthly drought reports. Thailand Drought Monitoring Center reports

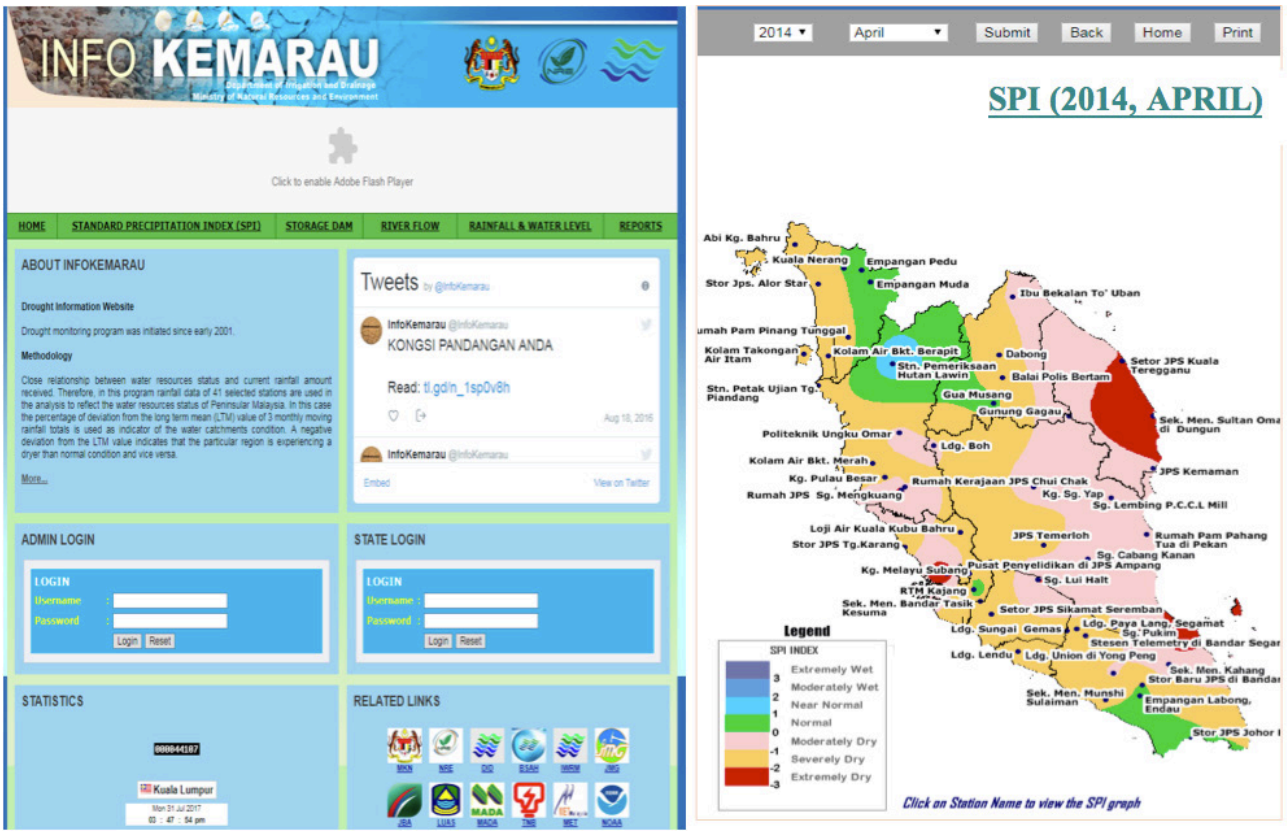


Figure 44. An example of web-based drought information platform in Thailand (GP-5.4a)
Source: DID Malaysia

various information relevant to drought. It shares information about distribution of rice grown areas, satellite based indices for vegetation (NDVI) and wetness (NDWI), and monthly reporting of drought affected low humidity areas.

Climate hazards addressed by the practice: Drought

DRR and CCA benefits: Information shared by these platforms could be used for both DRR and CCA related decision making.

Scalability potential: This kind of platform could be relevant mainly in drought prone areas

- *Social and political acceptability:* Could be very useful to farmers if information could be shared via mobile phones.
- *Economic viability and sustainability:* For economic viability, such platform could be mainly targeted at drought prone areas and a cost sharing mechanism could be developed with the provider of crop insurance services.
- *Institutional and policy needs:* Government funding and human resource capacity is vital.

Source/Contact: Department of Irrigation and Drainage (DID), Malaysia, Geo-Informatics & Space Technology Development Agency (Public Organization), Thailand.

GP-5.4b: Water user associations, Cambodia

Description of practice: Water user associations (WUAs) are the groups of farmers who come together to organize themselves in a systematic manner so that the financial, technical and physical resources are used efficiently to manage the limited water resources among the members of the association and to ensure equitable distribution of water even during the time of disaster such as drought. Promoting a form of participatory water management, the WUAs manage the tertiary irrigation infrastructure and schedule irrigations among the farmers depending on the crop needs. These water user associations were established with ADB support in 2011. Members pay 20000 riel per ha per crop to association.

Climate hazards addressed by the practice: Water user associations help manage both droughts and floods by operating canals in such a way that the water do not stagnate in the fields or do not lead to excessively deficit.

DRR and CCA benefits: WUAs have helped enhance the water use efficiency in water scare regions. Increased the area under irrigation by 50% at Krouch Saeuch alone through saving water in the upstream areas (1,000 ha irrigated) and

Figure 45. Office of a water user association in Cambodia (GP-5.4b)

Source: JICA Project Team

diverting it to the further deeper downstream areas (500 ha). As a result, yields increased by 1-2 tons/ha, living standards of farmers increased and they are able to cultivate three crops in a year.

Scalability potential: Water user associations are highly scalable and it is evident from many other ASEAN countries where such associations are thriving as in case of Malaysia, Indonesia, Viet Nam, Lao PDR and the Philippines.

- *Social and political acceptability:* The success and fast spreading of WAUs in Cambodia and elsewhere indicate that they are fairly well accepted both socially and politically but also depends on the active participation of the community and good governance on cost and benefit sharing.
- *Economic viability and sustainability:* These associations have thrived with no or limited failure. However, they need to be provided with the technical and financial management capacity.
- *Institutional and policy needs:* Institutional support for technical and financial management capacity as well as formalization of the WUA can help to improve the performance of WUAs and a policy support for their formulation and proper function

Source/Contact: Ministry of Agriculture, Forestry, and Fisheries, Cambodia.

GP-5.4c: Sprinkler irrigation in drought prone areas, Viet Nam

Description of practice: Sprinkler irrigation consist of piped-distribution of water to the point of delivery and application through an array of sprinklers, reducing the amount of water used while obtaining the same or more yield per unit

Figure 46. Sprinkler irrigation in the asparagus field (GP-5.4c)

Source: JICA Project Team

area. Traditionally, farmers grow vegetables using flood and furrow irrigation practices that are low in irrigation water use efficiency, leading to high water use and low productivity, which is detrimental to agriculture production in the drought-prone areas.

Climate hazards addressed by the practice: Drought

DRR and CCA benefits: Reduced water use (>60% compared to conventional methods), high crop productivity (>15% compared to traditional practice) and quality produce, reduced energy and fertilizer use (up to 30% reduction), better income, reduced crop loss, better integration with surface and sub-surface water sources, integration with the renewable energy use. Up to 60% of migrated farmers shifted to agriculture in the Tuan-Tu village after introduction of the sprinkler irrigation.

Scalability potential: Highly scalable to all drought prone areas with limited water supply including sandy soils where other forms of irrigation provide least efficiency. Sprinkler irrigation is rapidly expanding in several ASEAN countries.

- *Social and political acceptability:* Initial training is necessary for installation, operation and maintenance of irrigation systems. Highly acceptable, no known issues.
- *Economic viability and sustainability:* Initial subsidies are necessary for poor farmers and promoting local entrepreneurs can reduce the long-term costs. Profits sustain the higher adoption rate.
- *Institutional and policy needs:* subsidies targeting the poor farmers, training of extension agents on new irrigation and related agronomic practices.

Source/Contact: Implementation Unit for Capacity Development and ODA Water Resources Projects, Phan Rang, Ninh Thuận province, Viet Nam.

GP-5.4d: Recycled water for supplementary irrigation in water-scarce areas of Perlis, Malaysia

Description of practice: Recycling irrigation water constitutes circulating the drainage water from one part of the irrigation command area to irrigate additional cropped area by mixing it with fresh water so that the overall area under irrigation can be expanded without compromising the crop yields and soil health. Reuse the drainage water from the irrigated paddy fields of Muda Agriculture Development Agency (MADA) area for irrigating the paddy fields outside the MADA region, either mixing with the normal irrigation water from Timah-Tasoh or to use as such during the drought spells. The recycled water project has been in place since 2007.

Climate hazards addressed by the practice: Largely targets the droughts and related water scarcity

DRR and CCA benefits: The recycled water provided three full days of irrigation to more than 6000 ha in the April month of 2016 during the 2015-16 drought. As a result, farmers in this area were saved from crop loss while others outside this irrigated area were severely impacted by drought and lost their crop. Saving of crop during the drought had spill over impacts in terms of employment generation during the drought period sustaining the livelihoods of thousands of farm workers and farmers.

Scalability potential: Water recycling is scalable in areas where water can be diverted to mix with the fresh water and use in the downstream.

- *Social and political acceptability:* Initial acceptance could be a challenge due to fears of poor quality water impacting soils and possible disease and pest transmission.
- *Economic viability and sustainability:* Once fears of pest and disease infestations are addressed, the system is highly viable with its advantages clearly visible during the water scarce years.
- *Institutional and policy needs:* Capacity building of farmers for healthy management of fields, water and soil testing facilities for monitoring and policy support for infrastructure and coordination.

Source/Contact: Muda Agriculture Development Agency (MADA), Kedah, Malaysia.

GP-5.4e: Salinity intrusion monitoring, Viet Nam

Description of practice: 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. Eight monitoring stations were established to monitor the salinity levels. The results persuaded the Cai Rang district to construct Dat Set dam for salinity control.

Climate hazards addressed by the practice: Drought and related saline water intrusion in coastal areas

DRR and CCA benefits: The SMS alerts are helping water resource management authorities to operate the gates in time controlling the saline water intrusion. Stronger sea tide and saline intrusion are worsening the water scarcity problems in many of the coastal areas in Viet Nam and this system is helping ameliorate the problem. 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.

Scalability potential: There is a high potential to scale up this system to the entire Mekong region where salinity intrusion is worsening.

- *Social and political acceptability:* Highly acceptable
- *Economic viability and sustainability:* Initial

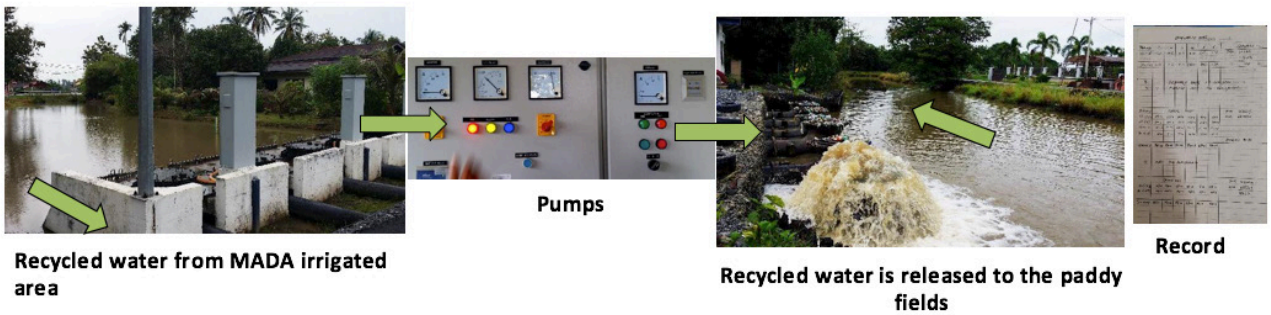


Figure 47. Infrastructure including pumps for operating the water recycling facility (GP-5.4d)
Source: JICA Project Team

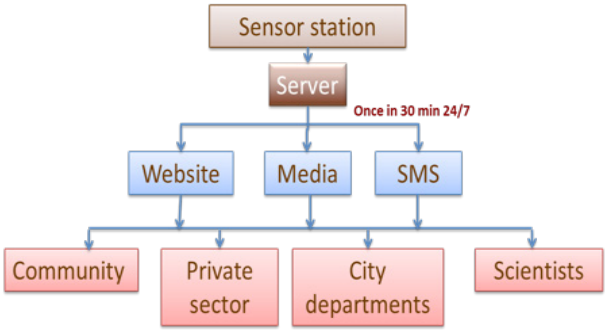


Figure 48. Model for transferring salinity data to various users (GP-5.4e)

Source: ISET, Viet Nam

costs are not exorbitant, require limited maintenance and is highly compatible with the existing physical infrastructure.

- *Institutional and policy needs:* Capacity building of existing staff in operating the system and converting the salinity level data into usable information for different stakeholders

Source/Contact: ISET, Viet Nam.

GP-5.4f: Water resources management in Singapore

Description of practice: 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 platform levels, crest protection and 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.

Climate hazards addressed by the practice: Flood and drought (water scarcity)

DRR and CCA benefits: highly relevant for DRR and CCA integration that involve city-wide coordinated resource management

Scalability potential: High potential but needs longer time

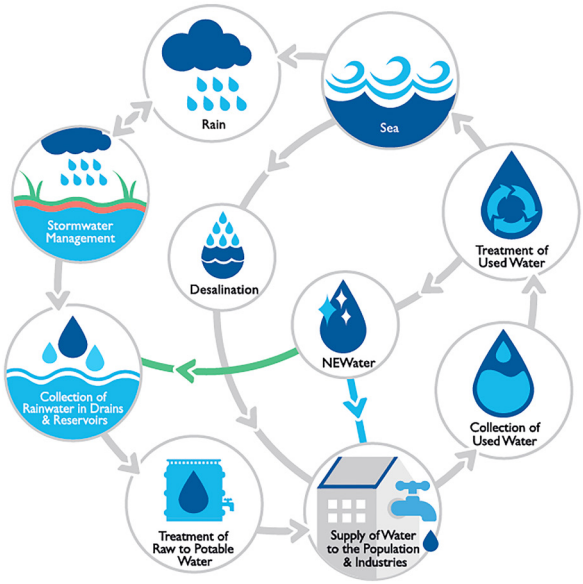


Figure 49. Philosophy of 'closing the water loop' in Singapore (GP-5.4f)

Source: PUB Singapore

- *Social and political acceptability:* Community awareness and participation is vital for social and political acceptability
- *Economic viability and sustainability:* Needs long-term investment and effective implementation is crucial for the sustainability
- *Institutional and policy needs:* Government support and integrated policies are necessary condition for such as approach to become successful

Source/Contact: Public Utilities Board (PUB), Singapore.

GP-5.4g: Conservation farming, Indonesia

Description of practice: Conservation farming refers to a range of methods of growing crops aiming at conservation of natural resources with minimal or no disturbance to soil and external inputs. FAO and Indonesia's Ministry of Agriculture are promoting conservation farming in East and West Nusa Tenggara that are highly drought prone regions in Indonesia. So far, the program is able to expand the conservation farming to 6,000 farmers in two years.

Climate hazards addressed by the practice: Mostly droughts

DRR and CCA benefits: Conservation farming provides needed buffer from short to medium dry spells in rainfall, improves and conserves the soil especially from the erosion in the undulated topographies as seen in Indonesia and provides

Figure 50. Conservation farming in the East Nusa Tenggara island, Indonesia (GP-5.4g)
Source: JICA Project Team

climate mitigation benefits due to soil carbon sequestration, reduced fertilizer consumption and need to pump groundwater. 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 sqm; interview with farmers). All these benefits tantamount to improved economic resilience, better nutrition (two crops in a year) and better soil conservation.

Scalability potential: Highly scalable depending on the nature of crops to which the method has been developed.

- *Social and political acceptability:* Initial acceptance is low due to cultural mindset among farmers but can take off rapidly with sufficient exposure to the practice
- *Economic viability and sustainability:* Highly viable due to reduced off-farm inputs and promotes sustainable use of natural resources including soil conservation.
- *Institutional and policy needs*: Capacity building of farmers is needed with initial on-farm trials to persuade farmers, developing suitable agro-techniques by local agricultural research stations is necessary with necessary financial and technical capacities.

Source/Contact: FAO, Indonesia.

GP-5.4h: Small water impounding for flood water use during dry season

Description of practice: The complex geography and climatological features of the ASEAN region means that the countries in the region face repeated cycles of floods and droughts and the ASEAN countries are able to convert this bane into boon by putting in place co-management measures. Farmers along the Mekong River floodplain rely on natural flood water inundation which is vital for growing crops in the dry season as long as such inundation is not in excess or below the normal. For instance, average 6m river water level is found ideal for inundation in fields in the case of Prey Veng Province of Cambodia. Recognizing these flood inundation areas for their water supply utility during the dry season risk mitigation, several countries and institutional stakeholders in the ASEAN region including Cambodia, Indonesia and the Philippines are promoting small water impounding projects.

Climate hazards addressed by the practice: Drought and floods

DRR and CCA benefits: Complementary use of excess flood waters during dry seasons will have win-win benefits for both flood and drought risk reduction. During flood season, the inundation areas act as buffers to store excess flood water thereby reducing the flood risks for agriculture fields and communities and help in recharging the groundwater reservoirs. Since the flood water is stored in abandoned and uncultivated fields, this water can be retained for use during the dry season since many areas in ASEAN countries suffer from severe dry-season water shortage even after a satisfactory wet season due to unfavorable soil and vegetation conditions. As a consequence, the dry season crop production could be substantially improved benefiting communities economically and micro-environmentally i.e. through cooling down the micro-climate in the vicinity of small water impounding areas benefiting the local vegetation.

Scalability potential: The concept of small water impounding areas are highly scalable to all the ASEAN region wherever land is available for impounding the flood season water. This concept has already been known to be extensively used in Indonesia and the Philippines.

- *Social and political acceptability:* The uptake of this practice by national government and development partners indicates that the practice has gained social and political acceptance in many countries.
- *Economic viability and sustainability:* The small water impounding projects often use natural depressions and those areas with minimal modification of topography and hence are not costly compared to conventional water storage tanks that need extensive earthmoving. These measures also require minimal maintenance and hence can serve the purpose for several years.
- *Institutional and policy needs:* Several countries in ASEAN region including Indonesia and the Philippines have national level

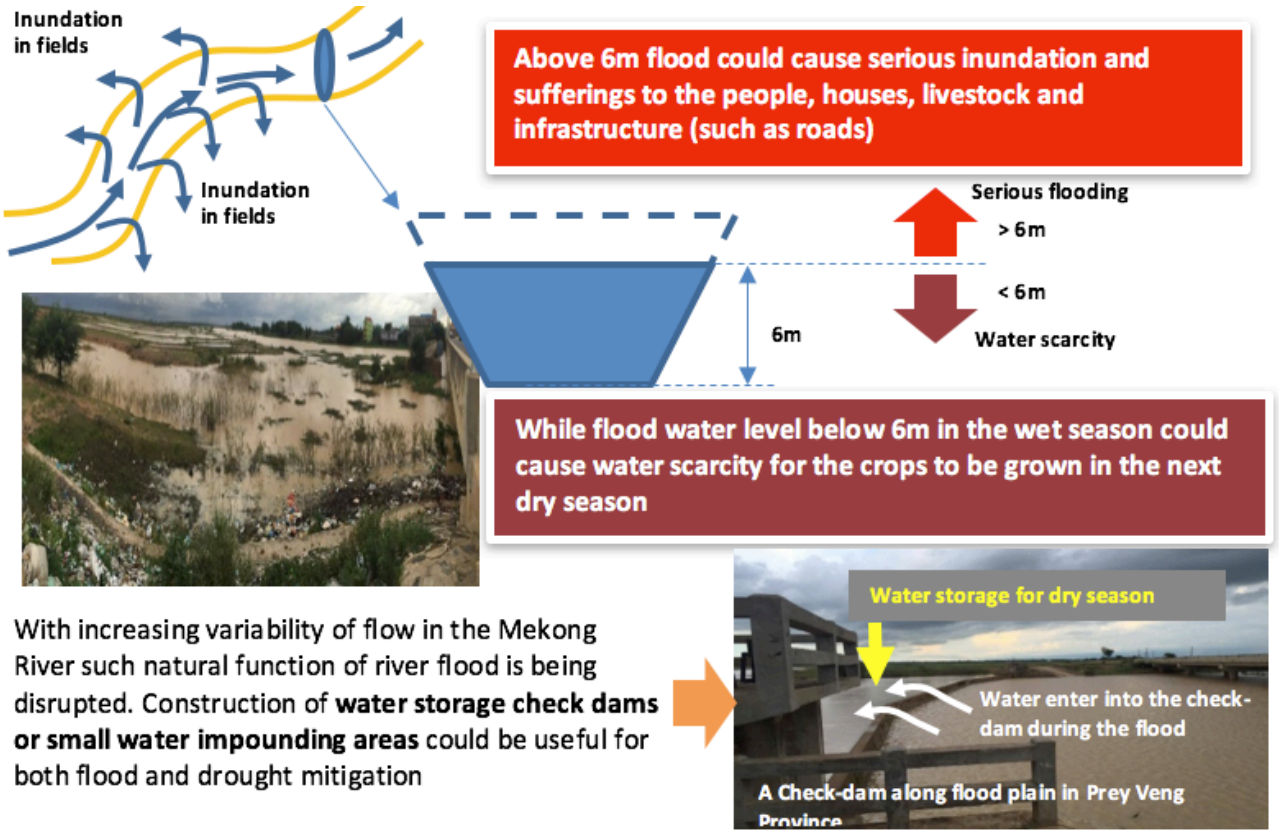


Figure 51. Small water impounding projects are on the rise in various ASEAN countries providing win-win benefits for flood and drought risk reduction (GP-5.4h)

Source: JICA Project Team

programs for promoting the implementation of small water impounding projects and hence the required policy conditions are met in these countries.

Source/Contact: Department of Agriculture, the Philippines

GP-5.4i: Groundwater irrigation for drought mitigation and climate smart agriculture in several ASEAN countries

Description of practice: ASEAN countries are increasingly facing drought due to occurrence of El Nino. Government in almost all countries have promoted use of groundwater for drought mitigation as well as to ward off temporary dry spells caused by change in rainfall pattern during the rainy season. One of the common approaches taken by countries is to install groundwater pumping stations at drought affected areas for irrigation or drinking water. In case of irrigation, the main intent is supplementary purpose during the time of temporal water deficits. Indonesia's Ministry of Public Works (PU) support farmers to irrigate fields during temporary water scarcity. The PU drilled the well and gave training to farmers on its operation and management. Well is 200 m deep, use diesel generator to run pump, yields 40 lit/sec and can irrigate 40-50 ha. 156 farmers formed community water user group to irrigate a total of 38 ha. The facility is not a main source of irrigation; used only when there is shortage of water for few days. Farmers collect Rp.25,000-50,000/2,500 m2 block to cover operation and maintenance cost. In Malaysia, there are over 280 tube-wells and 1700 mobile pumps in use for agricultural purpose in water scarce areas. Groundwater irrigation has been also promoted in by drought prone areas of Mindanao region in the Philippines, Prey Veng Province in Cambodia, and northeast part of Thailand.

Climate hazards addressed by the practice: Drought

DRR and CCA benefits: Groundwater acts as a natural buffer storage during the time of drought and thus could be a cost-effective and convenient option for both DRR and CCA due to ease for abstraction and its slow response to external climatic condition.

Scalability potential: Groundwater irrigation is highly scalable due to easy access and relatively lower investment for development. However, proper care should be taken to prevent over reliance of groundwater and limit the use explicitly for drought mitigation. .

- *Social and political acceptability:* Due to its ubiquitous and affordable access,

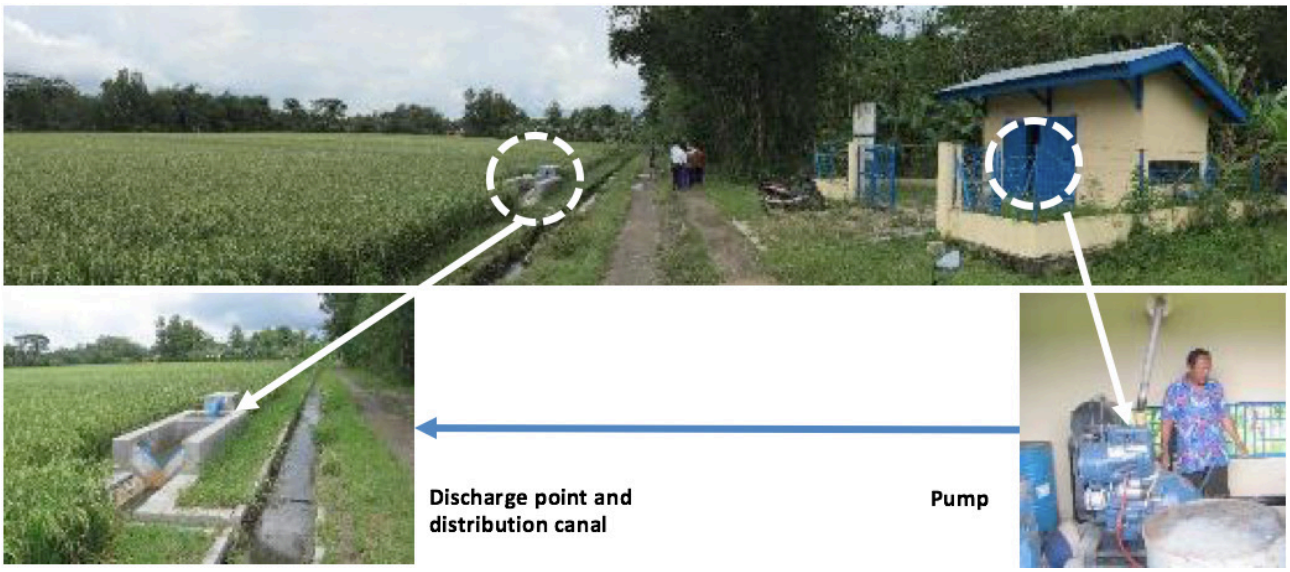


Figure 52. Groundwater bore wells for supplementary irrigation in rice field in Indonesia (GP-5.4i)
Source: JICA Project Team

groundwater is usually the primary choice during the time of droughts. .

- *Economic viability and sustainability:* Unless used for very large scale irrigation and abstraction did not exceed the sustainable yield, groundwater is a cost-effective and reliable option for supplementary irrigation and for drinking water supplies. Over abstraction of groundwater could threaten resource sustainability.
- *Institutional and policy needs:* Strong institutional, regulatory and policy measures are necessary condition for sustainable development of groundwater. In case of DRR and CCA, groundwater should be prioritized as a strategic resources and strong regulatory mechanism should be in place to control over uses.

Source/Contact: MOA and DID in Malaysia, DGR in Thailand, Ministry of Public Works in Indonesia, IWUMD, Myanmar, DWRM and Ministry of Rural Development in Cambodia, National Irrigation Authority (NIA), the Philippines.

6

CAPACITY BUILDING

Category	Sub-category	Definition
Sector-wise training (6)	Generic training (6.1)	DRR and CCA trainings for national and local government officials and other stakeholders are provided
	Sector-specific training (6.2)	Special training programs are implemented for specific purposes

GP-6.1: DRR and CCA training, Indonesia

Description of practice: BAPPENAS has developed a 2-week training course on integrating DRR and CCA in the local development plan for government officials, which was piloted and refined in cooperation with Bandung City. The training course is organized 2 times a year for around 40 participants each. There is another 2 week training course on environmental planning including development of local climate change action plans. The training programmes, direct or indirect, play important roles in the capacity development on DRR and/or CCA. The curriculum covers a range of subjects starting from the introduction to basics of disaster risk reduction and developmental planning and touches upon various stages of disaster risk reduction cycle and implications for climate change adaptation.

Scalability potential: The training programme can be scaled up so as to increase the number of staff engaged in the integration of DRR and CCA.

- *Social and political acceptability:* Since the capacity development in the field of the DRR and CCA integration plays an important role in the human resources development of the government, there exists a clear-cut social and political acceptability.
- *Economic viability and sustainability:* Since the integration of DRR and CCA will be implemented by trained personnel under government budgetary support, there are less risk factors on economic viability and sustainability.
- *Institutional and policy needs:* Specific institutional and policy needs required to implement the capacity development are properly met in the basic policy direction.

Source/Contact: GRIPS. 2016. Training of Trainer: Planning and Budgeting for BAPPENAS, Republic of Indonesia. Tokyo, Japan: National Graduate Institute for Policy Studies. Available at http://www.grips.ac.jp/en/news/20160810-4168/.

GP-6.2: Climate field schools, Indonesia

Description of practice: Climate field schools (CFS) refers to the farmer field schools that are designed to impart climate-related knowledge and skills to farmers and how to modify the cropping according to the weather and climate information. Indonesia is the first country to introduce climate field schools in Asia in collaboration with ADPC and the climate field school in Indramayu is the first climate field school in Asia. Since 2011, 25 provinces have been implementing three-month CFSs where BMKG staff train farmers every 10 days on how to apply weather and climate information during the planting and growing seasons. More than 6,000 trainers were trained.

Climate hazards addressed by the practice: climate field schools can be designed to address droughts, heat waves, floods, typhoons etc.

DRR and CCA benefits: Farmers are able to obtain stable crop yields despite the El Nino weather aberrations. In 2014 corn crop, the production in CFS was 6.48 ton/ha and the normal production in the district of Bali was 3-4 ton/ha which shows the impact of the CFS. Out of this yield benefit, the BMKG attributes about 50% to the provision of climate information. Due to CFS, farmers are increasingly recognizing the importance of observing weather and climate trends to design their cropping decisions.

Scalability potential: Highly scalable to a wide range of agro-climatic and cropping conditions.

- *Social and political acceptability:* Highly acceptable, initial orientation may be necessary to pursue farmers considering the time to be spent in attending the school.
- *Economic viability and sustainability:* Viability and sustainability depends on the constant and high quality weather and climate information and knowledge imparted on how to use it for cropping decisions. There is a need for additional finances to scale up CFS to reach out to more farmers, more types of crops. There is also a need for improving the weather predictions through improved weather forecast models and integrating El Nino and La Nino signals at the local level.
- *Institutional and policy needs:* Provide weather observatories, trained personnel are needed to teach farmers on climate and weather observations and their interactions with crops.

Source/Contact: Climate field school, Indramayu, Indonesia.

WAY FORWARD

The good practices for strengthening DRR and CCA integration listed in this publication are intended to be used as references, or resources, for cross-checking what has been implemented and what has not, and identifying applicable measures in each ASEAN Member State. It is expected that the Member States learn from each other directly or through the Working Group on Prevention and Mitigation (WG on P&M) by their facilitation.

During the national workshops held in Myanmar, Viet Nam and the Philippines in May-July 2017 under the CN20 Project, necessary approaches for strengthening DRR and CCA integration at national and local levels were discussed. The participants highlighted the necessity of such an institutional setup to facilitate the integration. The participants were from multiple agencies related to DRR and CCA, including national disaster management office and agencies in charge of hydro-meteorological data management, climate and disaster risk assessment, river management, water resources management, forestry management, landslide risk reduction, drought risk reduction and climate change policies. They also mentioned the importance of having an opportunity to exchange and share their views and coordinate their policies and activities for better synergies.

The ideas of regional collaborative activities and the supporting institutional system were further discussed at the Regional Forum held in Bangkok, Thailand on 5-6 September 2017 and consolidated into a Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration (hereinafter, Work Plan; the outline is shown in in the annexure). The Work Plan aims to reduce disaster risk and increase resilience by incorporating climate change impact assessment in the DRR decision-making process and promoting associated activities such as knowledge sharing, capacity building training and cross-sectoral collaboration. The main player of the Work Plan is the WG on P&M supported by the ASEAN Member State. Each Member State coordinated by the National Project Focal Point implements DRR and CCA activities and reports the progress annually to the WG on P&M. The WG on P&M then compiles it and shares it among the Member States. The WG on P&M also promotes capacity building activities through coordination with resource institutions in ASEAN and other development partners.

There are five collaborative activities for immediate implementation agreed in the Work Plan focusing on capacity building for planning and implementation, risk assessment and risk mapping, spatial planning, integration of relevant laws and regulations, financing, knowledge and data sharing, and monitoring and evaluation. As relevant good practices are listed up in this publication, it is expected that these resources are used effectively – for example, listed agencies and institutions proactively accept visitors for training from the other Member States or share relevant knowledge and information for training and regional use – for designing the collaborative activities.

ANNEXURE: Work Plan for Strengthening Institutional and Policy Framework on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Integration

Disasters in Southeast Asia

The number of disasters occurring in ASEAN Member States is increasing as shown in Figure 1. Among them, a significant portion of these disasters are water-related or rain-induced, including storms, floods, landslides and droughts. The situation is getting worse with more intensive and frequent rainfalls. ASEAN suffers damage in excess of USD4.4 billion each year on average as a consequence of natural hazards (AADMER 2016). During the period of 2004 to 2014, the region contributed to more than 50% of the total global disaster fatalities, or 354,000 of the 700,000 deaths in disasters worldwide (ASEAN Vision 2025 on Disaster Management). With this new normal, there is a need to anticipate and prepare for the unknown, such as unprecedented risks and unanticipated affected areas, magnified by climate change (AADMER Work Programme 2016-2020).

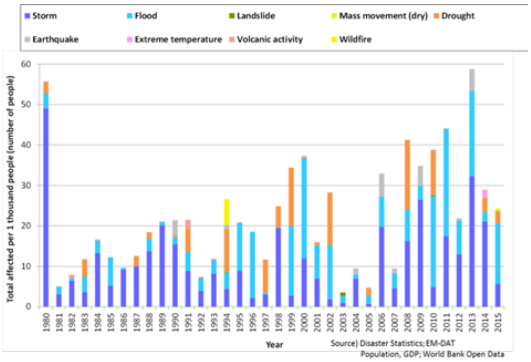


Figure 1 Number of disaster affected people in ASEAN

ASEAN's response

In response to these challenges, ASEAN has agreed on a number of decisions. The **ASEAN Committee on Disaster Management (ACDM)** established in 2003 developed the **ASEAN Agreement on Disaster Management and Emergency Response (AADMER)** in 2005 in association with the **Hyogo Framework for Action (HFA) 2005-2015**. The **ASEAN Coordination Centre for Humanitarian Assistance on disaster management (AHA Centre)** was established during the Phase 1 (2010-2012) of the **AADMER Work Programme 2010-2015** and 21 Flagship and Priority Projects were identified during the Phase 2 (2013-2015). Subsequently, the **AADMER Work Programme 2016-2020** was adopted corresponding to the **Sendai Framework for DRR 2015-2030**.

The **ASEAN Action Plan on Joint Response to Climate Change** was adopted in 2012 that stressed the importance on promoting regional climate information and data sharing in order to develop ASEAN CC impact scenarios at the regional, national and local levels. All Member States have also submitted Intended Nationally Determined Contributions (INDCs) to the **United Nations Framework Convention for Climate Change (UNFCCC)** Secretariat under the **Paris Agreement** in 2015 that outline each national efforts and needs for CCA.

The Heads of States of the ASEAN also adopted the **Declaration on Institutionalising the Resilience of ASEAN and its Communities and Peoples to Disasters and Climate Change** in April 2015 that stressed the importance of accelerating investments in disaster risk prevention and reduction and CCA focusing on key development sectors such as water management, ecosystems management, agriculture, education, infrastructure and construction and assigned the ACDM as the focal point for cross-sectoral cooperation at regional level.

In addition, all Member States also adopted the **17 Sustainable Development Goals (SDGs)** of the **2030 Agenda for Sustainable Development** at the United Nations Summit in September 2015 that promote to build resilient infrastructure in Goal 9; make cities and human settlement inclusive, safe, resilient and sustainable in Goal 11; and take urgent action to combat CC and its impacts in Goal 13.

Project for Strengthening Institutional and Policy Framework on DRR and CCA Integration

The Concept Note No. 20 (CN20) of **the AADMER Work Programme 2013-2015** focuses on Strengthening Institutional and Policy Framework on DRR and CCA Integration with following aims, 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; and
(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 DDR 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; and
(f) Support joint training, meetings, and other opportunities for increased interaction and cooperation.

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

The concept was succeeded in **the AADMER Work Programme 2016-2020** as Component 1. Strengthening institutional capacity and policy frameworks for effective implementation of DRR and CCA actions of the Priority Programme No. 3 ADVANCE: A Disaster Resilient and Climate Adaptive ASEAN Community. Targeted outputs of the Component 1 are:

- Documentation of good practices in strengthening institutional capacity and policy development on DRR and CCA in ASEAN;
- Capacity building programme on DRR and CCA, to strengthen institutional capacity and policy development; and
- Established ASEAN cross-sectoral collaboration on DRR and CCA.

CN20 Project

To support implementation of the CN20, the JICA Project Team conducted a baseline study to identify the status of DRR and CCA implementation and their integration in each ASEAN Member State with specific focus on water-related disasters, including flood, storm, landslide and drought, from September 2016 to February 2017.

Based on the findings, the Project Team organised three **National Workshops** in **Myanmar, Viet Nam and the Philippines** in May-July 2017 to identify necessary actions to improve implementation of DRR and CCA and their integration in each country as well as in ASEAN. Subsequently, a **Regional Forum** was held in Bangkok, Thailand, on 5-6 September 2017 to develop a **Work Plan for Strengthening Institutional and Policy Framework on DRR and CCA Integration** in ASEAN.

Work Plan for Strengthening Institutional and Policy Framework on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Integration

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 by 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 scope of the Work Plan is 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 2.

Reporting from each ASEAN Member State

The National Project Focal Point appointed by the ACDM National Focal Point reports the progress of DRR and CCA integration in line with the following items to the ACDM Working Group on Prevention and Mitigation (WG on P&M) annually.

1. Institutional and policy development
Policies, laws and regulations
- National socio-economic development plan
- DRR and CCA laws and regulations
- DRR and CCA related sectoral laws and regulations

Management system
- National and subnational DRR and CCA management systems

Financial arrangement
- Regular budgetary arrangements of line ministries for DRR and CCA
- Special funds for local and community-based DRR and CCA activities
- Payment for ecosystem services and insurance schemes

2. Risk assessment
Climate change impact assessment
- Observation and analysis of hydro-meteorological data
- Climate change projection
- Standard values of CC impact

Hazard and risk mapping
- Hazard and risk mapping of flood, storm surge, landslide and drought

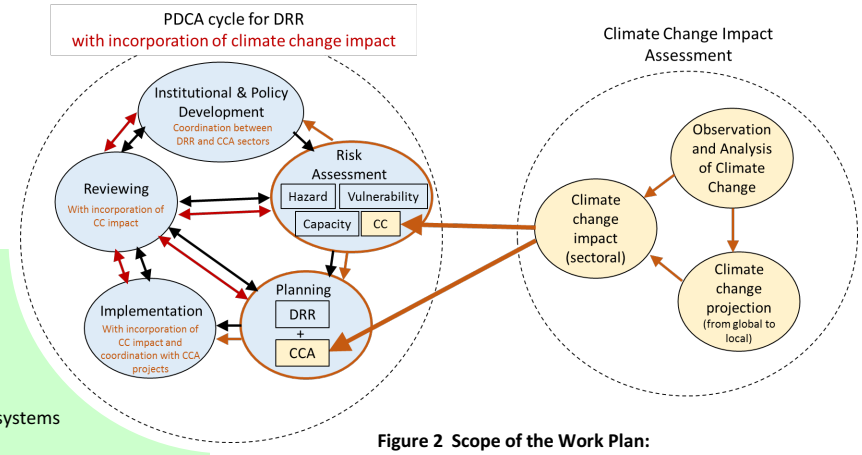


Figure 2 Scope of the Work Plan: Incorporation of climate change impact in a PDCA cycle for DRR

3. Planning and implementation
Disaster risk reduction
- DRR plans and implemented projects for flood, storm surge, landslide and drought

Standard guideline for disaster and climate risk assessment and planning

4. Reviewing (by the National Project Focal Point)
- Basic data are managed, updated periodically and shared
- DRR and CCA related plans and activities are reviewed periodically for close coordination and knowledge sharing among relevant agencies
- Capacity building needs are identified and corresponding training programs are arranged using domestic resources; other required external technical assistances are also identified and reported

Implementation structure

The ACDM WG on P&M is a manager of the Work Plan that is responsible for the knowledge management, coordination of the stakeholders and overall management of the Work Plan as shown in Figure 3. Each ASEAN Member State implements DRR and CCA activities and the National Project Focal Point reports the progress. The WG on P&M compiles the information and reports it to the ACDM Meeting annually.

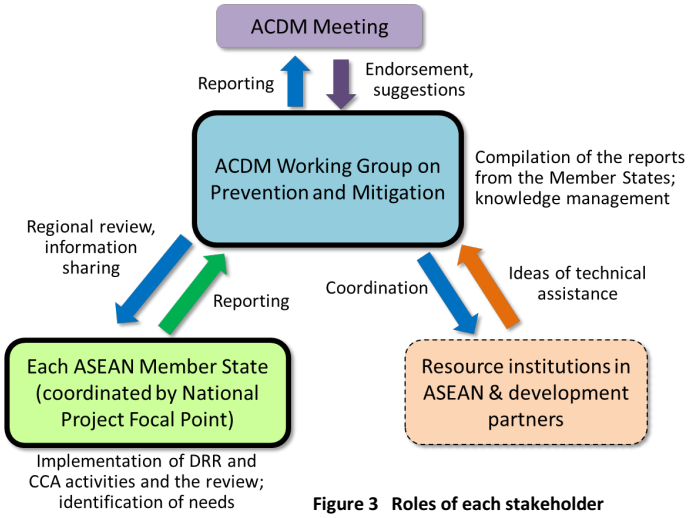


Figure 3 Roles of each stakeholder

Immediate collaborative activities

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 appropriate, 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.

Endorsement: The Work Plan was endorsed by the 31st ASEAN Committee on Disaster Management (ACDM) Meeting on 17 October 2017 in Luang Prabang, Lao PDR.

One Against Disaster and Climate Risks

A Repository of Good Practices for Strengthening DRR and CCA Integration in ASEAN

Published: November 2017

Concept Note 20 Project:
ASEAN Agreement on Disaster Management and Emergency Response (AADMER) Work Programme (2013-2015) Concept Note 20 and AADMER Work Programme 2016-2020 Priority Programme 3

Produced by JICA Project Team:

Institute for Global Environmental Strategies (IGES) Regional Centre
604 SG Tower 6th Floor, 161/1 Soi Mahadlek Luang 3. Rajdamri Road,
Patumwan,
Bangkok, 10330, Thailand
Tel: +66-2-651-8794
E-mail: regionalcentre@iges.or.jp

CTI Engineering International Co., Ltd.
Tachibana Annex Building
2-25-14 Kameido,Koto-ku
Tokyo 136-0071, Japan