



**National Committee for Sub-National Democratic Development Secretariat
(NCDD)**

**TA 8179: Mainstreaming Climate Resilience
into Development Planning, Package C:
Gender, Monitoring and Evaluation (M&E), and
Mainstreaming at the Sub-National Levels**

**Barriers and opportunities for
climate change adaptation and disaster risk reduction
at the district and commune levels in Cambodia**

Version 2c, February 2019



Updates

Version 0: Incomplete 1st draft for internal review (TA team and NCDDS) (October 2017)

Version 0a-0m: Various edits and improvements, reflecting guidance received. Foreword and acknowledgement inserted

Version 1: Consolidated draft (March 2018); leaflet prepared (April 2018)



Version 1b: Revised draft (July 2018):

- Structure of the document and many of its chapter headings changed, reflecting detailed guidance from ADB
- some abstracts added

Version 1e: Guidance from the TA team incorporated

- Some abstracts added
- New Section 5.2, Capacity-building, added; Chapter 5 re-structured
- Figure 12 updated

Version 2a-c (February 2019):

- New title (requested by ADB)
- Many changes throughout reflecting e-mail from Ms. Valerie, ADB:
 - (i) Previous Table 2 moved to new Appendix B
 - (ii) Section 4.1: Elaboration added about the NP-SNDD
 - (iii) Chapter 6 comprehensively re-structured
 - (iv) New Table 3 added
 - (v) Various other edits and elaborations
- New Figure 1 added
- New Appendix C.1 added

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Acronyms and abbreviations

ADB	: Asian Development Bank
ADPC	: Asian Disaster Preparedness Center (Bangkok)
ADRC	: Asian Disaster Reduction Center (Kobe)
CC	: Climate change
CCA	: Climate change adaptation
CCCA	: Cambodia Climate Change Alliance
CPEIR	: Climate public expenditure and institutional review
D&D	: Decentralisation and deconcentration
DMF	: Design and monitoring framework
DRR	: Disaster risk reduction
GEF	: Global Environment Facility
KP	: Knowledge product
LGCC	: Local Government and Climate Change (project of NCDD(S))
MCRDP	: Mainstreaming Climate Resilience in Development Planning (ADB TA 8179)
MLC	: Mekong-Lancang Cooperation
MoE	: Ministry of Environment
MoH	: Ministry of Health
MoI	: Ministry of Interior
MoP	: Ministry of Planning
MoWA	: Ministry of Women's Affairs
MRC(S)	: Mekong River Commission (Secretariat)
NAPA	: National Adaptation Programme of Action to Climate Change
NASA	: National Aeronautics and Space Administration (of the USA)
NCCC	: National Climate Change Committee (2006-2015)
NCDD(S)	: National Committee for Sub-National Democratic Development (Secretariat)
NCDM(S)	: National Committee for Disaster Management (Secretariat)
NCSD(S)	: National Council for Sustainable Development (Secretariat)
NGO	: Non-governmental organization
NOAA	: National Oceanic and Atmospheric Administration (of the USA)
NP-SNDD	: National Program for Sub-National Democratic Development
NRE	: Natural resources and the environment
PBCRG	: Performance-Based Climate Resilience Grant
PMSD	: Programme Management and Support Division (of the NCDD(S))
PPCR	: Pilot Program for Climate Resilience
RGC	: Royal Government of Cambodia
SNA	: Sub-national administration
SPCR	: Strategic Programme for Climate Resilience
UNCDF	: UN Capital Development Fund
SIDA	: The Swedish International Development Cooperation Agency
TA	: Technical assistance
VRA	: Vulnerability reduction assessment

Foreword

Climate change adaptation (CCA) and disaster risk reduction (DRR) are important perspectives in Cambodia's continued social and economic development. The present document provides a stock-taking with an assessment of remaining barriers and the related opportunities. Substantial progress has been achieved in recent years, but challenges remain.

Recognizing the significance of appropriate climate-related risk preparedness, the Royal Government of Cambodia has developed - and put into practice - clearly targeted policy responses and initiatives across all sectors and the entire society. Climate change policies, the concept of '*green growth and sustainable environment*', together with measured conservation and development of natural resources, are important elements of the existing National Strategic Development Plan (NSDP) 2014-18 and will remain so for the next NSDP.

At the sub-national level, NCDDS promotes mainstreaming of CCA and DRR by knowledge base development and capacity-building, action-oriented implementation modalities, and identification and financing of pilot and demonstration activities, collaborating closely with various ministries, development partners, NGOs, and the private sector. Also, a close collaboration is maintained with the National Committee for Disaster Management (NCDM), its secretariat, and its sub-national bodies.

The Programme Management and Support Division of NCDDS implements a number of externally financed projects that transfer earmarked funds for climate change adaptation to sub-national administrations.

As an active participant in Cambodia's Strategic Programme for Climate Resilience (SPCR), NCDDS appreciates the support provided under TA8179, Package C, and looks forward with confidence to a continued good collaboration.

H. E Ngan Chamroeun,
Under Secretary of State, Ministry of Interior and
Deputy Executive Director of NCDDS

Acknowledgement

The NCDDS TA team extends its sincere thanks to HE Mr. Ny Kimsan, Deputy Head of NCDDS and Director of its Programme Management Support Division, and Mr. Long Viseth, Deputy Director of PMSD/NCDDS and Project Coordinator of SPCR, for indispensable support and highly appreciated guidance throughout the TA implementation.

The team highly appreciates the collaboration with the executing agency (MoE), with the NCDDS executives and staff, and with the MoP and MoWA teams and counterparts.

Many SNA representatives and resource persons have shared their insight and added to the relevance of the present document during their active participation in the orientation and training sessions and the quarterly meeting held under the NCDDS Component of the TA.

Dr. Ancha Srinivasan, Principal Climate Change Specialist, ADB, and Ms. Valerie B. Pacardo, Consultant, ADB, have provided valuable coaching and specific guidance during the preparation process.

The team looks forward with confidence to a continued close collaboration towards successful completion of the TA.

TA 8179, Package C, at-a-glance

The '*Mainstreaming Climate Resilience into Development Planning*' (MCRDP) project is executed under the Strategic Programme for Climate Resilience (SPCR) by the Ministry of Environment (MoE) and the Cambodia Climate Change Alliance (CCCA) (an inter-agency network) with financing provided via ADB from the Strategic Climate Fund's Pilot Program for Climate Resilience (PPCR) and the Nordic Development Fund.

The objective of the MCRDP is to strengthen the capacity of Cambodian institutions and stakeholders to integrate climate concerns into development plans, programs and projects. The project has four outputs:

- (i) capacity to coordinate ppcr investments and mainstream climate change adaptation concerns into national and sub-national planning, budgeting, and development strengthened;
- (ii) feasibility studies for priority adaptation projects with a view to securing international funding conducted;
- (iii) civil society support mechanism to fund community-based adaptation activities established and the capacity of civil society organizations and non-government organizations to mainstream climate resilience into their operations strengthened; and
- (iv) climate change adaptation knowledge in various sectors generated and disseminated.

Package C of the MCRDP covers '*Gender, Monitoring and Evaluation, and Mainstreaming at Sub-national Levels*'. Consultancy services for Package C were initiated in August 2016 under a TA contract between ADB and UN-Habitat in association with Forum Syd and Save the Earth Cambodia. The scheduled duration is 3 years.

Package C has three implementation partners: MoP, MoWA and NCDDS, with a TA-cum-counterpart team hosted by each of these.

The present document has been prepared by the NCDDS team.

About this document

Context and rationale

This document is No. 5 in a series of 12 '*knowledge products*' (KPs) (guidelines and thematic reports) to be prepared under TA8179, Package C. An outline of the report was circulated for comments in October 2017, and consolidated, revised drafts were circulated in March and July 2018. The present draft, Version 2c, incorporates guidance received from ADB, institutional stakeholders and resource persons.

Aiming at a '*stand-alone*' document, the report includes some comprehensive extracts from knowledge products 1 and 4.

Objective of the study

The study aims to:

assess the progress of mainstreaming climate change adaptation (CCA) and disaster risk reduction (DRR), and to identify the barriers and opportunities for CCA and DRR at the district and commune levels.

In this connection, it must be noted that there are close interactions between CCA and DRR measures and development initiatives at the national and the sub-national levels. Successful achievements at one level will, in many cases, require progress at other levels of governance.

Methodology

The study is based on observations from previous related development initiatives, notably the recently completed Local Government and Climate Change (LGCC) project (2011-18) (see Appendix D.15), and the Ministry of Environment's Vulnerability Assessment and Adaptation Programme (VAAP) (2013-15).

Comprehensive guidance has been provided by NCDDDS and by representatives from the province, district and commune levels participating in the workshops under the NCDDDS Component of the TA.

The study duly recognises the close relationships between climate change adaptation and other important development priorities, as illustrated on the next below.

Applied definitions

In this study, '*adaptation*' is taken as adjustment to new circumstances - actual or expected. This can be in terms of behaviour, technology or structural intervention. '*Climate change adaptation*' (CCA) is measures - structural or non-structural - to reduce the adverse consequences of climate change. Examples include awareness-building and '*social marketing*'; introduction of more resilient production systems and infrastructure; appropriate land use ('*keeping people away from floods*'); flood protection schemes ('*keeping floods away from people*'); weather and flood forecasting services; improved water storage capacity; shoreline protection; saline intrusion control; crop insurance; supportive financing including microcredit; etc.

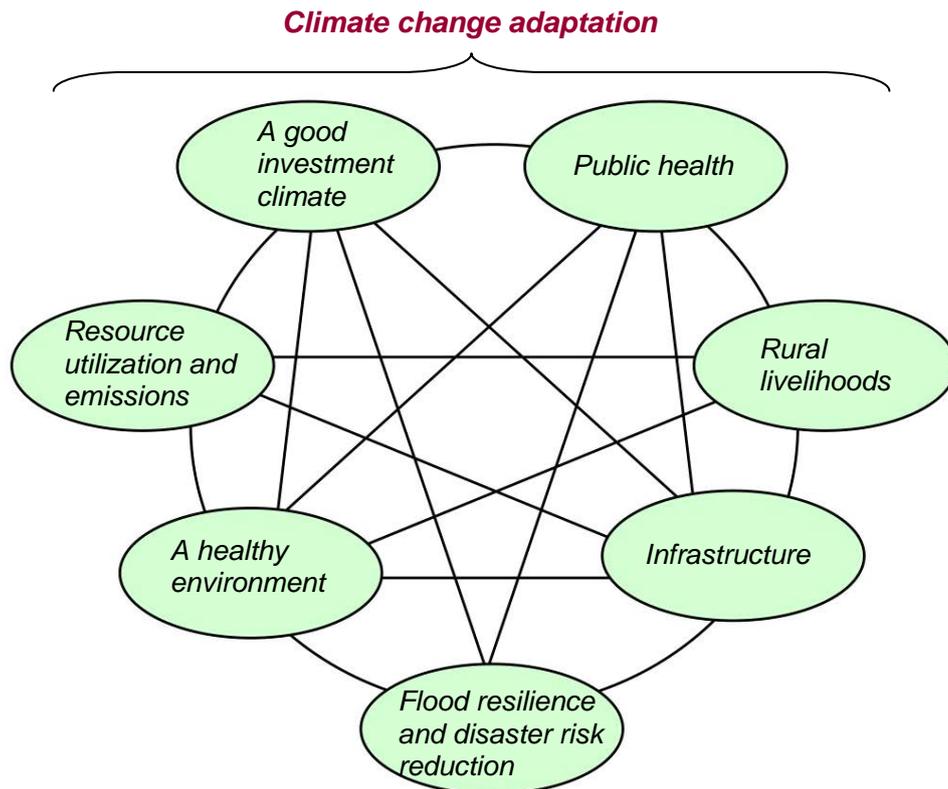
A '*disaster*' is a sudden event with significant adverse impacts - such as a flood, a land slide, or a severe drought. '*Disaster risk reduction*' (DRR) is measures - structural or non-structural - to reduce the adverse consequences of a disaster. '*Vulnerability*' is the extent of the (adverse) impacts of a given climate change exposure or a given disaster. The

vulnerability can be seasonal, and is always site-specific, depending on the population density, the land use, the value of buildings and infrastructure, the cultivation systems and other production systems, the preparedness, and the resilience.

'Resilience' is the ability to endure and/or to recover from a given exposure. A high resilience indicates a low vulnerability, and vice versa.

Context

Figure 1: The interactions and synergies of climate change adaptation



Public health includes safe water for households, maternal health, and control of water-related diseases

Rural livelihoods include improved income generation, improved and/or supplementary cultivation and livestock breeding, dry season cultivation, soil management, access to markets, extension services, and functional value chains unaffected by oligopolies

Infrastructure includes roads, waterways, and supplies of water and electricity

Flood resilience and disaster risk reduction include floods, landslides, drought, forest fires, and contingency planning and preparedness, interacting with land use planning

A healthy environment covers sustainable forestry, healthy headwater areas and active flood plains, wetlands, and aquatic habitats and ecosystems

Resource utilization and emissions include water and energy efficiencies, use of fertilizers and pesticides, and sewage and solid waste generation and disposal

A good investment climate covers predictable and transparent regulation of resource utilisation and emissions, orderly enforcement, EIA and CC screening implementation, and low CC-related risks

Population and administrative framework

Cambodia has an area of 181,035 km² and an estimated population of 16,481,000 people (by 1 January 2019) (49% male and 51% female), increasing by 1.6% per year. The net outward migration is around 4,000 persons per year. The median age is 24 years, and the life expectancy is 60 years for men and 65 years for women.¹

As per 2018, the national public administration is structured as follows:²

- 1 capital
- 26 cities
- 24 provinces
- 159 provincial districts
- 12 municipal districts
- 1,410 provincial communes
- 236 municipal communes
- 14,383 villages

Legislation

The legal framework includes the following:³

- The Cambodian Constitution (latest update 2010)
The Constitution does not refer to deconcentration and decentralization, but Article 145 states that the Kingdom shall be administratively divided into reach theany (royal capital city), khet (provinces), krong (municipalities), srok (districts), khan (arrondissements), khum (communes) and sangkat (quarters).
- The Law on Provincial and Municipal Budgets and Asset Management Regime (1998)
This law represents the basis for the present sub-national financial governance. It allows governors and deputy governors to manage budgets and assets on behalf of the central government.
- The Law on Commune and Sangkat Administrative Management (2001)
This law established the administrative management of all khum-sangkats in the Kingdom, reflecting the policy of decentralization. It stipulates that each commune shall have a council to manage their local affairs. Article 11 stipulates that the commune council is directly elected by the citizens for a five year mandate.
- The Organic Law on the Administrative Management of Capital, Provinces, Municipalities, Districts and Khans (2008)
Article 8 specifies that the capital, provinces, municipalities, districts and khans are legal entities to be governed in accordance with the principle of a unified

1 According to www.countrymeters.info, accessed in February 2019, quoting the UN Department of Economic and Social Affairs

2 According to Wikipedia, accessed in February 2019

3 According to Ung Nary and Top Davy (February 2014)

administration. Each sub-national level shall implement, promote and sustain democratic development through the policy of decentralization and deconcentration. Unlike the communes, Article 14 states that the councils of the capital, provinces, municipalities, districts and khans are indirectly elected.

Cambodia ratified the UNFCCC on 18 December 1995 and signed the Kyoto Protocol in 2002.

Executive summary

Until recently, Cambodia was rated among the countries in Southeast Asia that were most vulnerable to climate change. This was due to a low-level of preparedness, as much as to a particular exposure to the impacts of climate change (by Southeast Asian standards). Today, Cambodia's climate change resilience is steadily improving although the vulnerability is affected by urbanization, changing lifestyles, changes in land use, and the development of (vulnerable) infrastructure. Thus, there is an evident scope for further efforts.

With this background, the present document compiles some observations on climate-related barriers and opportunities, with a particular focus on the district and commune levels.

Barriers (or '*challenges*') include:

- an imperfect knowledge base affecting timely and well-informed decision-making and risk-responsive land use planning and land management;
- a remaining gap in the general public awareness of '*good practices*' for water and energy utilization, generation and disposal of sewage and solid waste, and disaster preparedness, interacting with community involvement during all stages of the adaptation process;
- a remaining scope for improved inter-sector and inter-agency streamlining and '*learning from each other*', horizontally (at a given administrative level) and vertically (between different administrative levels (with examples of tangible benefits provided under the ta8179, package c);
- continued substantial investment needs in infrastructure, such as irrigation schemes, storage capacity, flood-resilient roads, and (rural and urban) drainage capacity, with the benefits enhanced by well-informed operation, including multi-purpose operation of storage facilities; and
- continued attention to a healthy environment, including coastal and inland habitats and ecosystems, aquatic as well as terrestrial, and healthy headwater areas, given the multiple significant benefits to resource conservation, soil conservation, control of floods and siltation, and a variety of traditional resource-based rural livelihoods.

Most '*barriers*' are manageable and represent '*opportunities*' for improved climate change adaptation and resilience, and many of the opportunities provide substantial benefits at a moderate cost. It is consistently observed that climate change adaptation initiatives interact positively with public health, poverty alleviation, sustainable rural livelihoods, and a healthy environment.

Sub-national CC adaptation and disaster preparedness can be supported by measures, such as:

- an improved and broadly accessible hydrometeorological knowledge base, as well as operational weather forecasts (for crop cycle management) and flood forecasting services that reach out to remote areas exposed to flash floods;
- climate screening of investment projects applied on a routine basis, possibly incorporated in the environmental impacts assessments (EIAs), supported by concise guidelines and check lists;
- land use planning and management that reflect the risk of floods and landslides;
- improved urban cc resilience, supported by adequate stormwater drainage capacity and operation;
- improved extension services for farmers, assisting with the introduction of new (alternative or supplementary) cultivation technologies and livestock breeding, including energy- and water-efficient technologies, and control of pests, insect attacks and livestock diseases, supported by knowledge-sharing between the extension practitioners;
- improved disaster response during severe floods, including the army;
- improved drought contingency planning (including seed banks for rapid replacement of lost crops);
- district-level tree planting schemes to provide shelter against storms and also provide income generation opportunities at the same time (perhaps the traditional sugar palms, and/or some fruit trees supplied by drip irrigation, and/or high-value hardwood trees as a long-term investment);
- support to soil management (by composting and/or crop rotation, involving nitrogen-fixing legume species) (allowing for supplementary crops given that rice grows well on poor soils);
- various support to control of post-harvest losses (of rice, fruit and fish);
- continued expansion and streamlining of financing modalities, from major structural interventions to community-based micro-credit and crop insurance; and
- active involvement of the academic community.

There is a clear scope for continued and expanded liaison, knowledge-sharing and active collaboration, 'horizontally' (between sectors and administrative bodies at each level), as well as 'vertically', reaching all the way from the national government to the provinces, districts and communes down to the community and household levels. This includes continued support to coordination bodies such as the National Committee for Disaster Management (NCDM) and its sub-national bodies, the National Council for Sustainable Development (NCSD), and the Cambodia Climate Change Alliance (CCCA).

The applied terminology is explained in Annex A. Annex B presents case studies from China, India, The Philippines, Viet Nam and Thailand, illustrating the contributions to climate change adaptation from impact monitoring; land use management in general and of low-lying coastal areas in particular; early warning services; awareness-building; and active community participation. Annex C provides concise abstracts of some related documents.

1 Introduction

The design and monitoring framework (DMF) of TA8179 Package C includes the following outcome, output and activity:

- 1 Enhanced capacity to mainstream climate resilience at sub-national levels;
 - 1.1 Institutional and technical capacity of sub-national governments in mainstreaming climate resilience improved;
 - 1.1.7 Prepare guidelines/training manuals for mainstreaming climate resilience at sub-national levels;
 - 1.1.7.7 Knowledge product 5 (KP-5): Assessment of opportunities and barriers at the district and commune levels.

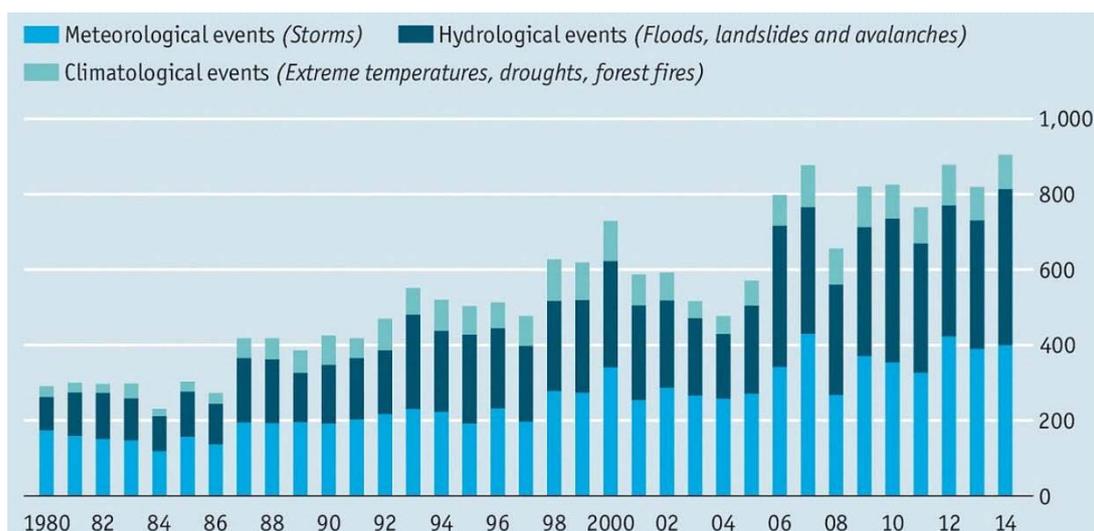
The present document has been prepared accordingly.

Other knowledge products under the NCDDS component of the TA are KP-1: 'Mainstreaming climate resilience in provincial, district, and commune development and investment plans' (October 2017); KP-4: 'Innovative financing schemes for mainstreaming climate resilience at provincial, district and commune levels' (November 2017); and KP-6: 'Best practices at sub-national level sub-national mainstreaming of climate risks' (not yet initiated). Related KPs have been or are being prepared under the MoP and MoWA components of the TA.

2 Climate change impacts and vulnerability of Cambodia

Globally, climate-related problems have escalated steadily over the recent decades, as clearly indicated in the figure below.

Figure 2: Disasters caused by weather and climate 1980-2014



Source: *The Economist*, 29 August 2017; data: Munich Re NatCatService, www.munichre.com

This adverse development is due to two factors exacerbating each other: One is increasing pressures related to global warming; and the other is increasing vulnerabilities, due to economic growth, population growth, urbanization, changing lifestyles, changes in land use, and development of (vulnerable) infrastructure.

In a much quoted study, Yusuf and Francisco (January 2009) note that '*... almost all the regions of Cambodia ... are among the most vulnerable regions in Southeast Asia*'. Notably, this high vulnerability is due to a low adaptive capacity as much as to a high exposure (by Southeast Asian standards).

3 The need for sub-national climate change adaptation and disaster risk reduction

Cambodia's Second National Communication to the UNFCCC (NCSD November 2015) notes that nearly half of the communes in Cambodia are categorized between vulnerable and extremely vulnerable to climate variations.

Humayun and Picard (June 2017) make a comparison between Cambodia and Bangladesh in terms of climate exposures and impacts. This study observed that while the exposures are much higher in Bangladesh, the relative impacts are significantly less coupled a decreasing trend in recent years, indicating that '*there is considerable potential for Cambodia to reduce its level of disaster risk ... through government and community action ...*'.

Cambodia was exposed to severe floods in 2000, 2001 and 2002. In September 2009, typhoon Ketsana moved across the Philippines and Viet Nam, and into northeastern Cambodia and Thailand, now downgraded to a tropical storm. With its extreme wind speeds, rainfall and flood waves, it caused loss of life and severe damage in a broad belt along its track, destroying properties, crops and infrastructure. Due to its extraordinary severity, the name '*Ketsana*' was skipped from the official roster of typhoon names. In Cambodia, the event prompted major rehabilitation activities with international support, along with initiatives towards improved disaster preparedness.

Despite the challenges of frequent natural disasters and developmental issues, the country has steadily improved, with economic and human development indicators showing upward movement. Advancement in these areas will help the country be more resilient and less vulnerable towards natural and man-made disasters. Currently, much of disaster management in Cambodia is focused at the community level on preparedness, disaster risk reduction and response preparation.⁴

Climate change barriers and opportunities are closely related to the present and upcoming pressures and impacts, as summarized below, keeping in mind that both are highly site-specific and can vary significantly over short distances, as well in the course of time.

CC-related pressures in today's Cambodia include

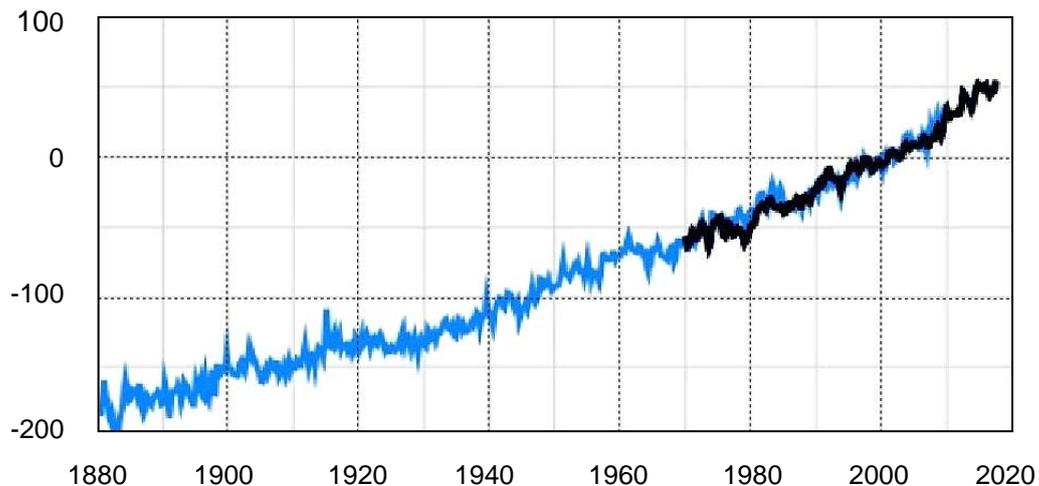
- erratic rainfall (causing floods and drought, with a range of serious consequential impacts);

4 Paragraph quoted from www.reliefweb.int

- sea level rise (1.7 mm per year since 1880 and 2.8 mm per year since 1970) (see figure below), interacting with land subsidence (which, presently, is of the same order of magnitude), also with a range of serious consequential impacts;
- global warming, affecting public health and the species balance of terrestrial and aquatic ecosystems; and
- sea water acidification, affecting the health of corals, which, in turn, can accelerate coastline erosion.

Figure 3: Global sea level rise since 1880

mm - change as compared with the average for 1993-2008



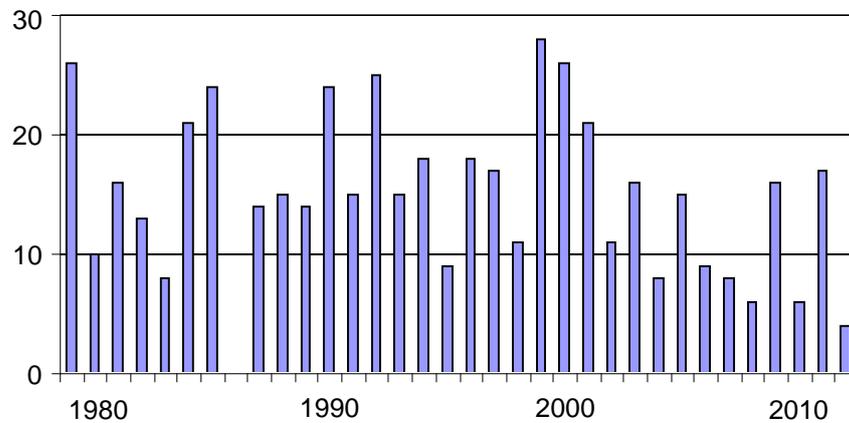
Source: Lindsey, Rebecca (September 2017)

The blue line shows seasonal (3-month) sea level estimates from Church and White (2011). The darker line is based on the University of Hawaii's Fast Delivery sea level data.

There is evidence that the frequency of local inland rain storms has increased. These storms can cause flash floods, landslides and urban floods. The occurrence of major tropical depressions (as well as typhoons) has not increased in recent years, see figures below.

Figure 4: Occurrence of wind speeds above 12 m/s off the coast of Cambodia

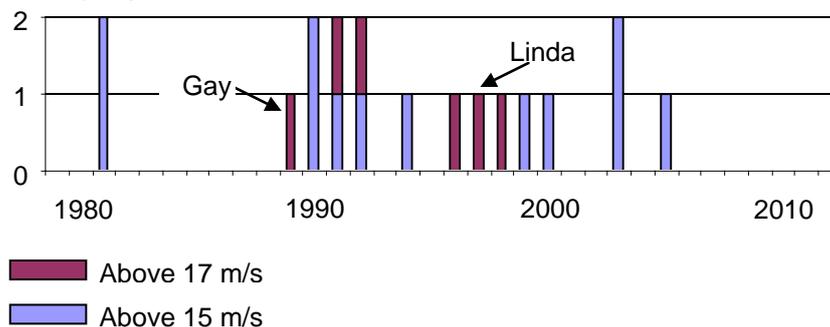
Events per year



Source: MoE (December 2013), data: NOAA,
time resolution: 1 hour, space resolution: 35 km (1979-2010), 23 km (2011-12)

Figure 5 Occurrence of wind speeds above 15 and 17 m/s off the coast of Cambodia

Events per year



Source: MoE (December 2013), data: NOAA,
time resolution: 1 hour, space resolution: 35 km (1979-2010), 23 km (2011-12)

Cambodia has a high incidence of forest fires. On February 3, 2018, NASA's Earth Observatory (LandSat 8) spotted 1,868 active fires in Cambodia (as compared with 185 in Lao PDR, 77 in Myanmar, 217 in Thailand and 114 in Viet Nam). Forest fires destroy the vegetation cover, so that large sediment loads are released during heavy rainfalls (particularly from locations with a steep slope), causing siltation in downstream reservoirs, and adding to the flood risk in downstream parts of the river system.

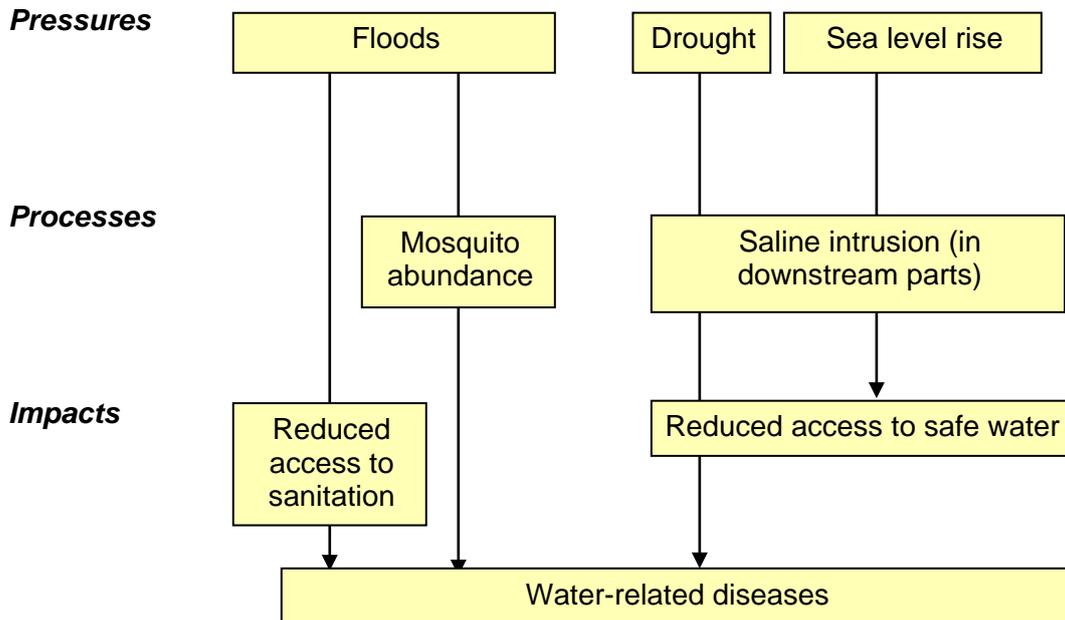
Figure 6: Forest fires observed from LandSat 8



Source: NASA; photo from Srepok Wildlife Sanctuary, February 3, 2018

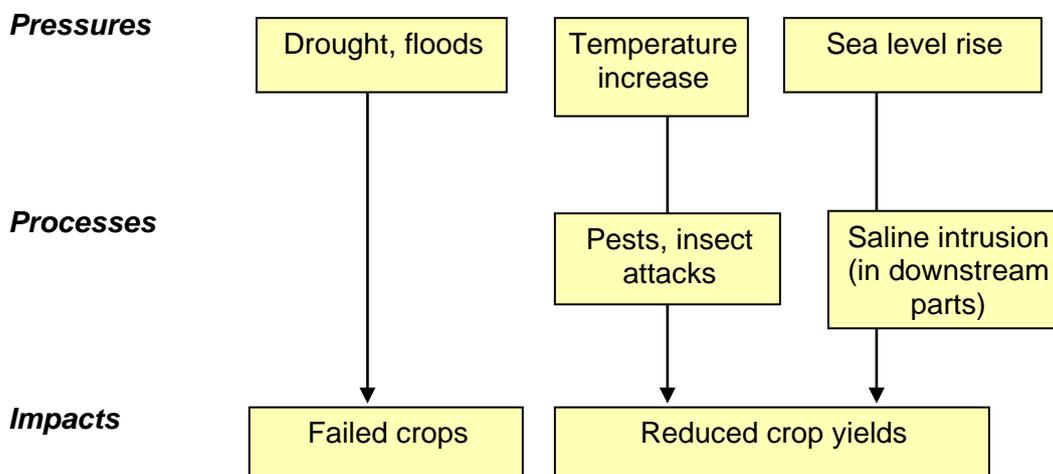
The various climate-related pressures affect public health, cultivation and other rural livelihoods, infrastructure, and terrestrial and aquatic habitats and ecosystems, as illustrated in the following figures. From case to case, the impacts can be exacerbated by pressures other than those related to climate change, such as waste generation and waste disposal (causing water, soil and air pollution), excessive groundwater withdrawal (causing land subsidence), deforestation (causing land degradation), land reclamation (adding to the flood risk), sand mining (causing bank erosion and siltation), and destructive fisheries practices (causing degradation of corals and mangroves).

Figure 7: Climate-related causes and effects affecting public health



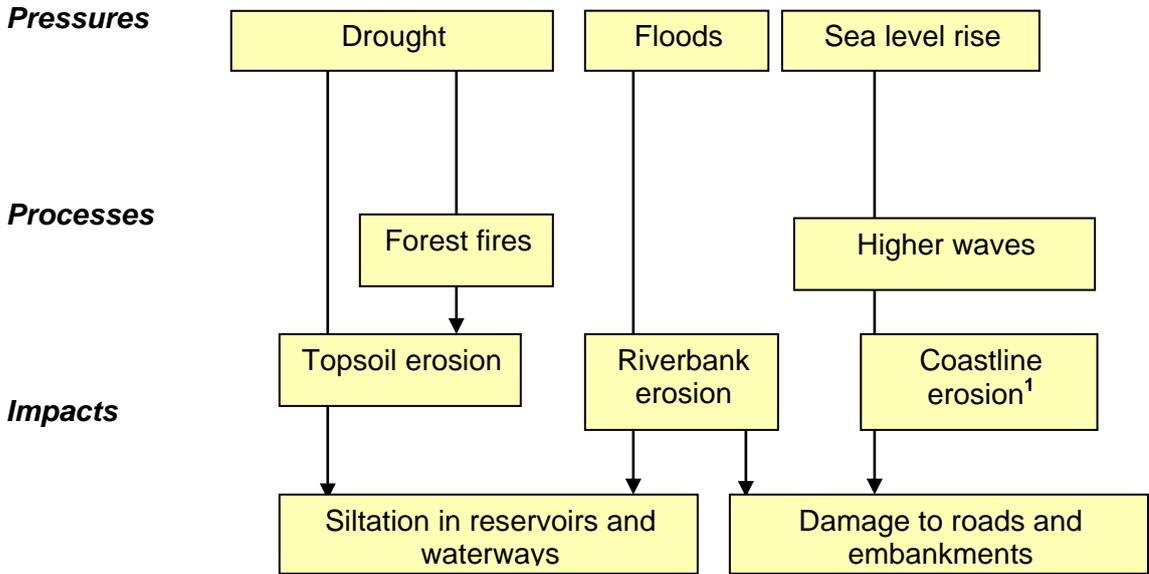
Note: Public health can also be affected by CC-related food shortage

Figure 8: Climate-related causes and effects affecting cultivation and other rural livelihoods



Note: CC will reduce the validity of 'traditional wisdom' about good cultivation practices achieved over centuries

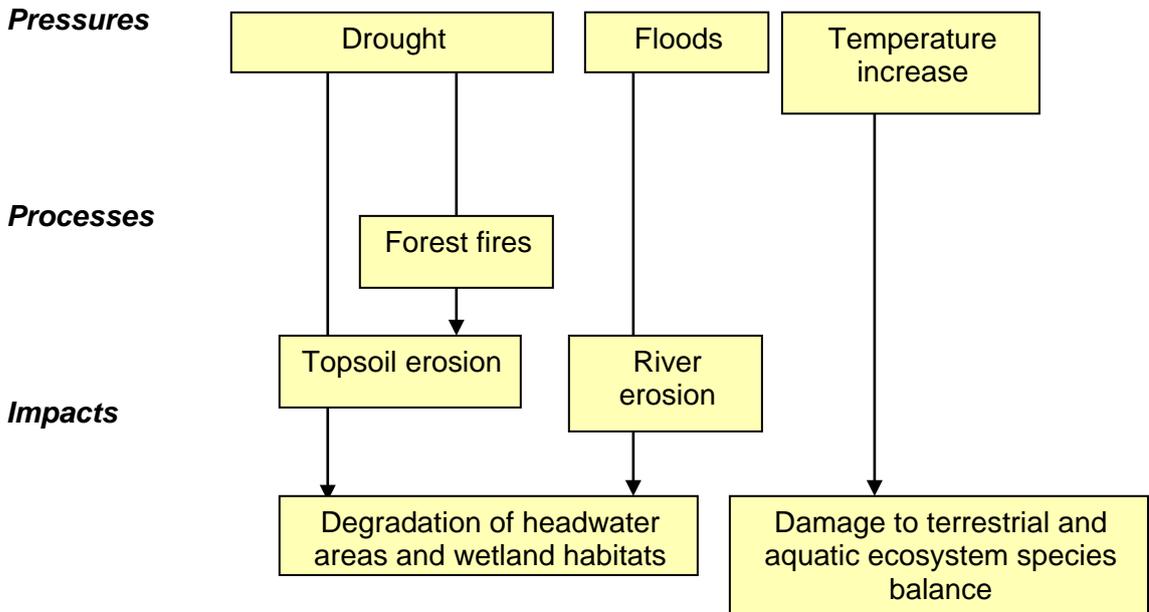
Figure 9: Climate-related causes and effects affecting infrastructure



¹ Exacerbated by protective coral reefs being affected by destructive fisheries, marine pollution and CC-related sea water acidification

Note: Floods can also affect access to schools, markets, work, and health clinics, and can cause damage to power grids and telecommunication networks

Figure 10: Climate-related causes and effects affecting habitats and ecosystems



4 Governance framework

4.1 Policy and planning

*The NP-SNDD 2010-19*⁵

The National Program for Sub-National Democratic Development (NP-SNDD) is the RGC's agenda for the ongoing comprehensive and in-depth governance reform process of the sub-national administrations, which will also impact on other national institutions. The formulation of the NP-SNDD reflects and confirms the RGC's political commitment to the vision, policies and strategies outlined in the D&D Strategic Framework and the government's commitment to implementing the Organic Laws on the Capital, Province, Municipality, District and Commune/Sangkat administrations.

The NP-SNDD has been formulated while the RGC is strengthening the roles and responsibilities of institutions at all levels towards achieving good governance, development and poverty reduction. To achieve these goals, great efforts by all national and sub-national levels are required, as well as effective cooperation between them. In this reform process, there is a need for equal opportunity for all citizens to participate in local development and to demand better and more comprehensive public services to meet citizen's needs, leading to poverty reduction and focusing on the most vulnerable groups, particularly the indigenous peoples, women and children.

In this respect, the RGC's goals for sub-national democratic development are to:

- Create a culture of local participatory democracy, accountable to the citizens;
- Improve public services and infrastructures;
- Bring about social and economic development;
- Contribute to poverty reduction.

Its five program areas are as follows:

- Sub-national institutional development;
- Development of strong human resource management systems;
- Transfer of functions and resources;
- Sub-national budget, financial and property systems;
- Support to institutions for the D&D reform process.



⁵ Extracted from the NCDD website, ncdd.gov.kh, accessed in February 2019

The guiding principles of the NP-SNDD include the integration of appropriate consideration of environmental issues, especially climate change, into SNA activities at all levels. Climate change is among one of three cross-cutting themes that are interwoven into the five program areas (the other two being gender mainstreaming and accountability).

The NP-SNDD notes that

'The National Committee for Sub-National Democratic Development (NCDD) was established to assist the Royal Government to implement the terms of the Organic Law and to formulate, oversee and coordinate implementation of a national D&D programme. The NCDD is now fully operational, and is working with all levels of government, including central and line ministries and councils at sub-national administration levels to achieve the common objective of establishing, promoting and sustaining democratic development.'

'The impact of climate change in Cambodia will be unprecedented and will require effective government leadership at all levels to respond to the increasing global threat to life, livelihoods and life-supporting systems. There is an urgent need to adopt low carbon development agendas, but at the same time to prepare for the new climate risks threatening Cambodia. The NP-SNDD provides key entry points required to create a national 'adaptation system' that will support society in the long-term, iterative process of adjusting as the climate changes'.

The D&D process has strong political support from the highest level. At the 41st Congress of the ruling Cambodian People's Party in December 2018, the Prime Minister emphasized that the process must be completed by 2020.⁶

The NSDP 2014-18

The current National Strategic Development Plan (NSDP) 2014-18 makes frequent reference to climate-related development needs. Section 4.88 of the Plan states that

'...the RGC is committed to full implementation of Cambodia Climate Change Strategic Plan 2014-2023, which includes the following provisions:

- *Put in place and implement national monitoring and evaluation systems for climate change projects.*
- *Create a knowledge management system for collection, analysis, and dissemination of data/knowledge, including knowledge of local communities on climate change.*
- *Improve a greenhouse gas inventory system: data collection, storage, analysis and modeling.*
- *Establish a national registration system for greenhouse gases reduction mechanisms, and foster implementation of appropriate mitigation activities (AMA) and greenhouse gas-reduction activities under different mechanisms within various priority sectors that provide multiple benefits.*
- *Mobilize funds and technical assistance for implementing the main activities outlined in the action plan and strategic plan to address sectoral climate change issues of the relevant ministries/institutions, including research activities, to support policy development.*

6 Quoted in Phnom Penh Post on 24 December 2018

- *Coordinate and enhance capacity and public awareness on climate change at national and local levels.*
- *Coordinate developing a national adaptation plan and develop implementation strategies for addressing medium- and long-term adaptation needs'.*

The NAPA (2009-15)

The first primary policy framework for climate change in Cambodia was the National Adaptation Programme of Action to Climate Change (NAPA) which was submitted in March 2007 to the UNFCCC (MoE, 2006). The aim was to develop a realistically achievable country-driven program of action and priority activities addressing the needs for adapting to the adverse impacts of climate change. The climate hazards addressed by Cambodia's NAPA are flood, drought, windstorm, high tide, salt water intrusion and malaria.

Table 1: High priority NAPA components

Infrastructure, cultivation	Million US
Rehabilitation of a multiple-use reservoir in Takeo Province	4
Rehabilitation of multiple-use dams in Takeo and Kg. Speu Provinces	2,5
Community and household water supply in coastal provinces	1
Development and rehabilitation of flood protection dikes	5
Rehabilitation of Upper Mekong and provincial waterways	30
Rehabilitation of multiple-use canals in Kampot Province	1,5
Vegetation planting for flood and windstorm protection	4
Strengthening of community disaster preparedness and response capacity	5
Construction of watergates and culverts	10
Safer water supply for rural communities	5
Development and improvement of small-scale aquaculture ponds	4
Promotion of integrated farming	2,5
Rehabilitation of coastal protection infrastructure	2
Development and improvement of community irrigation systems	45
Community-based mangrove rehabilitation and sustainable use of natural resources	1
Community-based soil conservation in Koh Kong Province	2
Health	Million USD
Production of biopesticides for malaria control	3
Development of healthcare centres and posts	0.75
Provision of safe water in malaria high-risk areas	0.1
Malaria education and mosquito habitat clearance campaigns	0.5 per year

Source: MoE (October 2006)

Listed by order of priority for each sector

Budgets are indicative estimates

The NAPA features 16 priority non-health projects and 4 health projects (see table above), with time horizons between 1 and 5 years, and budgets ranging from 0.1 to 45 million USD per project. The NAPA was not fully realized. Phase 1 was implemented from 2009 to 2013 with a budget of 3.1 million USD, and Phase 2 was implemented from 2013 to 2015 with a budget of 2.4 million USD.

4.2 The Council for Development of Cambodia (CDC)

Standard investment options across many sectors are available through the Council for Development of Cambodia (CDC). In addition to reviewing applications for investment incentives, the mission of the Council for the Development of Cambodia (CDC) is to promote and facilitate foreign and local investments. In order to accomplish this goal, it is charged with several functions:

- to provide information to potential investors;
- to review investment applications and grant incentives;
- to monitor investment projects after implementation;
- to provide after-care service to investors in their project's implementation;
- to provide a platform for the private sector to participate in policy dialogue with the government through its bi-annual Government-Private Sector Forum.

In principle, the CDC is the most important platform to foster climate resilient investment in Cambodia through the private sector.

4.3 The National Council for Sustainable Development

In 2006, the RGC established the National Climate Change Committee (NCCC), a cross-sectoral and multi-disciplinary body with the mandate to prepare, coordinate and monitor the implementation of policies, strategies, legal instruments, plans and programs related to climate change. The NCCC was supported by the Cambodia Climate Change Alliance (CCCA), a network of focal points in ministries involved in climate change (CC) adaptation and disaster risk resilience.

In May 2015, the NCCC's functions were taken over by the National Council for Sustainable Development (NCSD) with an extended membership. Today, the Council comprises high-level representatives of all the country's 25 ministries, as well as representatives from the Council for the Development of Cambodia (CDC), the NCDD, the National Committee for Disaster Management (NCDM), the Cambodian National Mekong Committee (CNMC), and others. Secretariat services are provided by the MoE.

The NCSD is involved in the coordination of climate change activities in Cambodia, including implementation of the Cambodian Climate Change Strategic Plan 2014-2023, the Sectoral Climate Change Action Plans, and the Climate Change Financing Framework.⁷ Its secretariat is also involved with Cambodia's participation under the 3 Rio conventions: The UN Framework Convention on Climate Change, the UN Convention on Biological Diversity, and the UN Convention on Combating Desertification (UNCCD).

⁷ www.camclimate.org

4.4 The NCDM and its sub-national bodies

The National Committee for Disaster Management (NCDM) was established in 1995, but with a weak mandate and a small budget. The organization was strengthened substantially by the June 2015 Disaster Management Law, which also introduced sub-national disaster management committees.

The Law on Disaster Management

(Promulgated in June 2015) (NS/RKM/0715/007)

- The objective of this law is to regulate disaster management in the Kingdom of Cambodia. Its provisions cover disaster risk reduction, disaster preparedness, emergency response, and post-disaster recovery.
- The National Committee for Disaster Management (NCDM) is established as the apex body to lead, administer and coordinate all disaster management activities.
- Hereby, the NCDM shall liaise with the various ministries via focal points in each ministry. Sub-national Committees for Disaster Management Committees are promulgated at the city, provincial, town, district and commune levels.

The NCDM is Cambodia's lead government authority for disaster management and response. The main responsibility of the NCDM is emergency preparedness and relief, and coordination with the various government ministries involved in disaster management and response. The NCDM collaborates with the international humanitarian community for cooperation and support. The Cambodian Red Cross (CRC) has been officially adopted by the NCDM as the primary partner to conduct relief operations. The Royal Cambodian Armed Forces (RCAF) also plays a significant role in disaster response and relief and has trained with foreign militaries, including the U.S. military, on improving coordination and response.⁸

The NCDM works closely with NCDMS and is the apex body for a structure of province-, district- and commune-level disaster management committees (PCDMs, DCDMs and CCDMs), presently in a state of consolidation. These sub-national committees have a particular insight and experience about location-specific risks and exposures.

4.5 Regional and international collaboration

Mekong River Commission (1995)

The Mekong River Commission (MRC) was established in 1995 by Cambodia, Lao PDR, Thailand and Viet Nam, replacing the previous Mekong Committee (*'Committee for Coordination on the Lower Mekong Basin'*) from 1957. Whereas the Mekong Committee was oriented towards development of hydropower and infrastructure, MRC has adopted a much broader (and multi-sector) governance perspective, including basin-level hydrometeorological monitoring and data-sharing, operational flood forecasting, and climate change adaptation. (Examples of MRC's climate-related publications are included under ***References and literature*** at the end of this report).

Cambodia's interaction with MRC is facilitated by the Cambodia National Mekong Committee (CNMC).

The UNFCCC (1995)

Cambodia ratified the United Nations Framework Convention on Climate Change (UNFCCC) on December 18, 1995 and acceded to the Kyoto Protocol on July 2, 2002. The country's Initial National Communication was submitted by MoE to the UNFCCC in October 2002, and the Second National Communication was submitted in November 2015 (NCSO, 2015).

Control of the causes of climate change is an international challenge that reaches far beyond Cambodia. Nevertheless, some measures are also clearly beneficial at the national level because they serve other good purposes in addition to climate mitigation:

- saving fuel in general and electricity in particular;
- improved over-all efficiencies of cultivation and industrial production systems
- recycling of chemical waste, including from refrigerators and air conditioners; and
- tree planting, reforestation, and sustainable commercial forestry.

Poverty reduces climate resilience; and improved climate resilience will support poverty reduction. A positive interaction can be achieved by:

- access to sustainable livelihoods, including resource-based livelihoods;
- resource conservation: water, energy, habitats and ecosystems (inland, coastal and marine);
- risk reduction and contingency planning (floods, drought, etc.); and
- broad education and awareness-building.

Efficient production systems - in agriculture as well as industries - will improve their competitiveness as well as their climate resilience. This comprises the water and fuel efficiency - ton output per m³ of water or kWh or unit of fuel - as well as the economic efficiency - value generated per m³ of water or kWh or unit of fuel.

Efficiency improvement of cultivation systems serves several good purposes. It will improve the income of the farmers in an increasingly competitive environment while producing more food with less water and maintaining food prices that are affordable to everyone.

Efficiency improvements of the industries and transport systems will reduce their unit costs and generate less sewage and solid waste while improving the air quality.

The Mekong-Lancang Cooperation (2015)

The Mekong-Lancang Cooperation (MLC) was entered in 2015 between China, the MRC member countries and Myanmar. On 10 January 2018, the countries signed the Mekong-Lancang Cooperation (MLC), a 5-year framework agreement on the collaboration for the

governance of the Mekong Basin. The agreement supports peace, stability, connectivity, development and non-interference.⁹

Cambodia's interaction with the MLC is facilitated by the National Secretariat of Cambodia for Lancang-Mekong Cooperation, established in October 2017.

5 Progress of mainstreaming climate resilience at sub-national development planning and budgeting in Cambodia

5.1 Policy and planning

Milestone initiatives include the National Adaptation Programme of Action to Climate Change (NAPA) (2009-15); and the Cambodia Climate Change Strategic Plan 2014-2023 (November 2013), with a related Climate Change Action Plan 2016-2018 and a suite of sectoral action plans. Various specific CCA and DRR initiatives have been (and are being) implemented by the Cambodia Climate Change Alliance (CCCA), the Mekong River Commission (MRC), the National Climate Change Committee, the National Council for Sustainable Development (NCSD), the NCDDS, various civil service organizations (CSOs), and others with technical and financial support from ADB, the Global Environment Fund, the Japan Fund for Poverty Reduction, UNDP, UNEP, The World Bank, and other development partners and bilateral donors.

5.2 Capacity-building

Adequate institutional capacity is a decisive precondition for successful sub-national CCA and DRR. In this connection, '*capacity*' is determined by (i) a strong legal mandate; (ii) user-friendly tools (manuals, guidelines); (iii) skills (to use the tools); (iv) a comprehensive knowledge base (in support of timely and well-informed decisions); and (v) financial resources (to implement the related development initiatives).

A substantial progress has been achieved in recent years, as summarized below.

Mandate

The 2008 Law on Administrative Management of the Capital, Provinces, Municipalities, Districts and Khans (the Organic Law) provided the basis for the National Programme for Sub-national Democratic Development (NP-SNDD), a 10-year programme for decentralization and deconcentration. Accordingly, the NCDD was established by Royal Decree in December the same year with a mandate to implement the Law and the decentralization and deconcentration policy.

The National Committee for Disaster Management (NCDM) was established in 1995, and was strengthened substantially by the June 2015 Disaster Management Law, which also introduced sub-national disaster management committees.

Tools

An impressive amount of manuals, guidelines and reference documents have been produced, as exemplified in Appendix B.

⁹ In February 2019, Cambodia received financial support of 7 million USD from LMC for implementation of 19 development projects

Human skills development

The Local Government and Climate Change (LGCC) project was implemented by NCDDDS from 2011 to 2018 with financial support (4.5 million USD) from the UN Capital Development Fund (UNCDF) and the Swedish International Development Cooperation Agency (SIDA). The project has provided comprehensive training, interaction with awareness-building initiatives, development of practical procedures and guidelines, targeted financing, encouragement of collaboration between district/municipal and commune/sangkat councils and administrations, and implementation of pilot and demonstration projects.

The present TA 8179, Package C, is implemented from 2017 to 2019, with one of its components hosted by NCDDDS. Activities include a sequence of training workshops, structured into 4 thematic training modules: (a) CC in Cambodia; (b) vulnerability analysis and risk screening as part of the planning and budget process; (c) climate resilience in design and implementation of projects; and (d) monitoring and evaluation of adaptation capacity.

Knowledge base

Cambodia ratified the United Nations Framework Convention on Climate Change (UNFCCC) on December 18, 1995 and acceded to the Kyoto Protocol on July 2, 2002. The country's Initial National Communication was submitted by then MoE to the UNFCCC in October 2002, and the Second National Communication was submitted by NCS in November 2015. These documents provide an overview of Cambodia's evolving agenda for CCA and DRR, supported by detailed information.

MoE (May 2017a, page 4) notes that

... over the years, Mekong River Commission (MRC) has contributed significantly to the NRE governance capacity by its member countries. MRC's Climate Change and Adaptation Initiative was launched in August 2009 as a regional collaborative initiative to support the member countries in adapting to the impacts and new challenges of climate change. The Initiative focuses on: (i) climate change impact and vulnerability assessment, adaptation planning and implementation in priority locations within the LMB; (ii) building knowledge and capacity at different levels (institutional, technical and managerial capacity); (iii) a regional adaptation strategy supporting national frameworks; and (iv) regional partnership and collaboration. The Initiative promotes networking and knowledge-sharing among government agencies, academic institutions, NGOs and development partners, and supports awareness-building, documentation, capacity-building and good practices related to climate resilience and adaptation planning.

Information needs

Knowledge-based CCA and DRR require accessible knowledge about:

- demography and livelihoods, including trends;
- hydro-meteorology, including normal and extreme rainfall (combining satellite data with a limited number of well-located ground stations);
- zoning, land use, vegetation cover, including trends;
- outbreaks of water-borne or water-related diseases;
- health of habitats and ecosystems/biodiversity, including coastal and marine

areas, and including trends;

- 'red spots' and 'green spots' (or 'assets')¹⁰;
- adverse events: floods, drought, forest fires, landslides, pollution spills, pest attacks, etc., including trends;
- climate change exposures and vulnerabilities, including trends and projections.

Modified after MoE (May 2017a)

Still, a visible scope remains for expanding the knowledge base. This may involve regular stocktaking building on primary data collected for the purpose; networking and dissemination of success stories from the numerous pilot and demonstration activities; and strengthened extension services in support of timely and appropriate response to adverse events as well as emerging challenges and opportunities.

5.3 Financing

Financing of specific development initiatives

CC adaptation and disaster preparedness require financing, from the national and sub-national levels all the way to the community and household levels, for investments, operation and maintenance, rehabilitation, and crop insurance.

NCDDS (November 2017)¹¹ observes that:

‘...besides the ordinary flows of public funding, Cambodia has substantial experience with donor-funded approaches that contribute to climate finance through a large number of programmes, projects and micro-projects. The Cambodian Climate Change Alliance Trust Fund, local projects through PPCR/SPCR/Plan International, GEF’s Small Grant Programme (SGP) and many interactions within the concept of north-south, south-south climate change technology transfer are daily and gradually contributing to enhance expertise and practical knowledge in the country.

The Royal Government of Cambodia is in the process of establishing a Sub-National Investment Facility (SNIF) which will transfer finance for investments to sub-national administrations, with the initial focus being on the District level. The Sub-Decree establishing the SNIF was approved in 2015 and the facility is to become active in 2017, with initial financing from an ADB loan as well as from RGC. SNIF Secretariat is housed in MEF but NCDD-S is represented on the Board of the SNIF.

MoE, as Cambodia’s National Designated Agency for the Green Climate Fund, has nominated NCDD-S as a National Implementing Entity (NIE) under GCF’s Enhanced Direct Access pilot. Successful accreditation will allow NCDD-S to access

10 An asset is a valuable feature. Some assets are NRE-related, for example a hydropower potential, a wetland, a fisheries area, a waterfall, or a river front of a town. Such assets cannot be moved. Their value - whether economic, social, or cultural - can be immediate or potential. See Muanpong Juntopas (February 2010)

11 NCDDS (November 2017): Innovative financing schemes for mainstreaming climate resilience at provincial, district and commune levels. Knowledge product KP-4 prepared under TA8179, Package C. The present section has partly been extracted from this document

substantial finance for scaling up sub-national climate change adaptation. However, the process of achieving accreditation is not straightforward and may still require a period of one year or more, as well as additional resources for implementation of the Readiness Action Plan.'

Examples of CC-related financing schemes are listed in the table below. Those schemes are most helpful in building national and local technical capacities for climate resilience measures and undertakings. A weak technical knowledge for design and implementation of actual climate resilience investments has been identified as a main bottleneck contributing to slow project execution.

Table 2: CC-oriented financing schemes (completed, ongoing and planned)

ASPIRE	2017 and onwards, 52 mio. USD
(the Agriculture Services Programme for Innovation, Resilience and Extension)	
The programme aims at testing climate-resilient innovations for Cambodian smallholder farmers, with 3 objectives: (i) Sustainably increase agricultural productivities and incomes; (ii) adapt and build resilience to climate change; and (iii) reduce or remove greenhouse gas emission where possible.	
The CCCA Trust Fund, Phase 1	2010-14, 11 mio. USD
(also referred to as the Cambodia Climate Change Financing Framework, CCFF)	
The fund aimed to support capacity development and institutional strengthening to address climate change, ensure climate change integration into policy, strategy, plans and programmes, and promote climate change knowledge and awareness in Cambodia.	
The CCCA Trust Fund, Phase 2	2014-19, 13 mio. USD
The facility aims to strengthen the governance of climate change; to support implementation of the Cambodia Climate Change Strategic Plan; and to develop human skills, tools and knowledge management in support of CC resilience.	
The DAP	2016-18, budget under advisement
(the Direct Aid Program) (implemented by AusAid)	
The DAP is a flexible small grants program, supporting poverty reduction and sustainable development by individuals, community groups and NGOs.	
The CCBAP	2010-15, 4.5 mio. USD
(the Cambodia Community Based Adaptation Programme)	
Activities included rehabilitation of canals, reservoirs, community ponds and household ponds; construction of wells; support to water harvesting; savings groups; and seed banks. Also, 7 pilot projects on CC mainstreaming into sub-national planning were implemented with support from NCDDDS.	

S-RET	2017-21, 5 mio. USD
(Scaling up of Renewable Energy Technologies in Rural Cambodia)	
The programme aims at promoting renewable energy technologies in the agricultural sector.	
GCF Scale-up	2018-22, budget under advisement
(the Green Climate Fund, Enhanced Direct Access Component)	
Depending on funds available, GCF financing might support 50-60 districts, based on the Climate Vulnerability Index developed by MoE using the Commune Database (CDB).	
The SNIF	Planned
(the Sub-national Investment Facility)	
The SNIF will serve three levels of sub-national administrations: (i) provinces; (ii) districts and municipalities; and (iii) communes and sangkats.	

Source: NCDDES (November 2017); please refer to this document for details about each scheme

Central to capacity building at province, district and commune levels is the timely availability of adequate costing, budgets and funding. Although global climate finance offers ways to provide substantial sums for investments, severe obstacles must be overcome before a Sub-National Authority (SNA) becomes a benefactor. Simply depositing climate finance into the national accounts of the country is not enough to ensure that those funds reach the most vulnerable populations. Established mechanisms are needed to channel financial resources down to the local level. Looking into schemes established in Cambodia, they do provide a gateway for vulnerable communities to gain increased access to climate adaptation finance.

An analysis of the Cambodian experience is very much in line with international discussion and debate and existing literature on local climate finance. In the global discourse there is general agreement on four pillars that do contribute to the success of local (financial, financial/technical) schemes:

- 1 An enabling institutional environment for climate finance:
The autonomy and authority that sub-national governments have to respond to climate change will, to a large extent, be determined by a country's approaches to political, administrative and fiscal decentralization.
- 2 Improved delivery of climate finance:
While providing transfers specifically targeted for climate change projects may be a useful short-term strategy to raise the profile of climate change at a local government level, mainstreaming climate change concerns into ongoing expenditures in relevant areas (i.e. rural development programs, water and sanitation, and agriculture) may bring greater long-term benefits.
- 3 More effective and equitable planning and budgeting for climate initiatives:
Responses to climate change at the local level will involve different stakeholders: local government, line departments, and CSOs. Similarly, there is a role for national

institutions and academia to provide policy guidance. Ensuring the participation of communities in the planning process can make them more responsive to the needs of those communities and is a core aspect of political decentralization. Transparent financial planning and budgeting and comprehensive budgets will have a key role to play in enabling participation.

4 Monitoring and evaluating the local impact of climate finance:

The establishment of a good monitoring and evaluation framework and creating a process where the information is shared with the public can be an effective way of holding local governments to account in the use of public resources and the results that they have contributed to.

Taken together, these four pillars serve as an overarching framework that can be used to inform a suitable approach to ensure that finance is channeled and used effectively to address climate change at the local level.

NCDDS observations and recommendations

NCDDS (November 2017) lists the following lessons learned from the analysis of financial barriers and opportunities to sub-national CC adaptation and disaster resilience:

Management structure: All existing projects have complex management structures on national level, reaching across different ministries and government authorities with similar mandates. This makes coordination and communication time-consuming and may constrain mainstreaming action by NCDD-S on sub-national level.

Length of application process and timely response: It appears that the cycle from planning / budgeting to implementation is taking a long time (from 12 to 30 months) with project proposals and documents being sent back and forward several times. In cases of quick response needs, or required modifications and changes in the design this may hamper effectiveness.

Size of funding, effectiveness and impact: The amounts of funds channeled through the existing schemes seem to be rather modest (from 15,000 to 50,000 USD) per investment or activity. This may not be sufficient to assure transformational change as required to match development objectives, achieve climate resilience goals, protect individual and common assets, and to substantially foster international agreements.

Institutional and technical capacity building: Despite being slow as a financial instrument alone, the existing schemes do significantly contribute to capacity building of staff on sub-national levels. A new balance may have to be found where the important goal of capacity building is meeting the wish for a faster delivery on the ground.

Suitability for large-scale CCA/ DRR investment: The function between amounts flowing through a system, the frequency of use, quality of technical delivery and implementation on-the-ground, and time needed for the whole process is decisive for making a judgment on the suitability of a system for large-scale investments, or replication and duplication of pilot projects. In this regard, investments for more long-term oriented DRR/CCA may use a different modality than investments for more short-term oriented DRR/CCA.

Availability of technical expertise for appropriate design and implementation: Across all schemes the availability of technical expertise to identify, plan, budget, implement specific investments that better assure climate resilience appears to be limited. The development of the technical human resources (engineers, agriculturists, water

managers, appropriate technicians, builders, conservationists, etc.) may be developed through the educational and vocational sector. Existing expertise, knowledge and experience created through diversification schemes as under the CCCA trust fund, and the SPCR/Plan International (package 2) fund for community-based adaptation activities are enormously important (also the GEF's Small Grants Projects). They should be seen as having a seed function for bringing technical expertise on district and commune levels, and the demonstrated models may turn out to be very valuable for reasonably fast expansion and replication.

Capacity of sub-national administrations: District level officials and councilors, and Commune councilors, have basic but adequate ability to identify climate-related challenges and to propose and implement simple, appropriate responses. However, understanding of the nature of global climate change and the expected long-term consequences is quite limited. In turn, this limited understanding places limits on the types of challenge that are prioritized in planning and the climate change adaptation responses that are financed.

Weaknesses in planning include lack of access to and / or ability to make use of climate data and science-based climate change scenarios, and a tendency to focus exclusively on reduction of drought and flood vulnerabilities to the exclusion of other dimensions of climate change.

Use of plans in the allocation of resources has proved more problematic with planning participants (consisting of the District Technical Facilitation Committee, with representatives from the District Administration, District technical offices and Commune Councils) finding it difficult to systematically apply prioritization criteria from the District Climate Resilience Strategy to the allocation of resources.

The Performance-Based Climate Resilience Grant (PBCRG) and transfer of funds through the national and sub-national budgets: The system for transfer of funds from NCDD-S into the sub-national budgets has proven to be slow. The District budget is prepared in the third quarter of the preceding year and is consolidated into the National Budget. Commune budgets are prepared in November-December of the preceding year. Because the process involves sub-dividing the PBCRG amount between District and Commune budgets, it has not yet proved possible to complete this process before the SNA budgets are finalized. This in turn has required a budget amendment to reflect the PBCRG funds. Amendment of the Commune budget can be approved by the Provincial Governor and can be done relatively easily for a small number of communes, but would become problematic if the process were scaled up. Amendment of the district budget requires the signature of the Minister of MEF and can be very time-consuming, leading to implementation delays. The original concept of the PBCRG was that the whole amount would be transferred to the district budget, which would then make sub-grants or co-finance with the communes. However, there are practical difficulties with this approach, including that district and commune operate under different procurement and financial management rules.

Commune councils and district administrations: The budget execution and financial management regimes of the district administrations have proven challenging in some respects. The commune councils work under a well-established and well-understood system that facilitates implementation of small infrastructure projects through contractors who are hired using a simple competitive bidding system. Other types of activity, for example service contracts, can be more problematic but there are established precedents. The district budget execution system is relatively new and is more complex, requiring an additional level of approval of expenditures

through the provincial departments of finance. Procurement rules for service providers, and arrangements for financing services delivered by technical offices of line ministries at district level, are less clear and this has led to delays in implementation of some LGCC activities.

General-purpose vs conditional grants: NSDP summarizes the key objectives of the NP-SNDD which include the establishment of new fiscal transfer mechanisms for SNAs. Financing at district and commune level is almost entirely through a system of general purpose (i.e. non-earmarked) grants. NCDD-S and MEF are preparing a general framework for conditional grants – i.e. transfers to SNA earmarked for specific purposes.

The pathway to improve the efficiency and effectiveness of sub-national climate change adaptation financing, as well as to create conditions for sustainability, is to bring it within this '*conditional grants*' framework.

Generation of own revenues by SNAs: Also in NSDP the intention is stated to increase the own-source revenues that are directly collected by, or earmarked for, SNAs. Own-source revenues currently form only a very small part of SNA budget revenues. Although this matter has been under consideration for some time, it is not considered likely that significant progress is to be made in advance of the national election in 2018.

The technical quality of small-scale infrastructure investment: The quality of small-scale infrastructure investments has generally been acceptable but there is room for improvement. Not all investments have been equally relevant to climate change adaptation. Capacity for scheme-level design, for example of irrigation systems, is weak. Quality of construction works is generally acceptable in context, though not of the highest quality. Arrangements for operation and maintenance of infrastructure are an acknowledged weakness. The quality of service delivery activities (for example, extension training in resilient agriculture techniques) has been limited by the capacity of the District technical officials to deliver these services as well as by the budget execution problems referred to above – non-infrastructure activities make up a fairly small proportion of the portfolio of PBCRG expenditures and are best considered as pilots exploring implementation modalities, rather than as fully effective adaptation actions in their own right.

On this basis, NCDD-S (November 2017) makes the following recommendations on financing modalities:

RECOMMENDATION #1, 'SCALE': The scale of planned sub-national interventions should be significantly expanded, anticipating substantial global climate finance available, and to generate a measurable impact on the socio-economic development of provinces, districts, and communes towards a 'green economy'.

RECOMMENDATION #2, 'FIN-TECH SCHEMES': Rather than designing a scheme along narrow financial criteria alone, the intended CC resilience benefits need to come to the forefront during implementation, and relevant technical capacity should be developed along with the administrative capacity.

RECOMMENDATION #3, 'CONCERTED LOCAL ACTION': The transmission belt from the national to the sub-national levels needs to generate a larger portfolio of interventions, a wider local distribution of climate-related action, better appreciation of the climate relevance of investments, and improved acknowledgement of the

short- and long-term opportunities opening up for local populations and for sub-national development.

Microcredit and crop insurance

Microcredit (and, to some extent, crop insurance) are provided by dedicated institutional operators (like ACLEDA) and by community-based saving groups. (In Thailand, such savings groups operate with private sector sponsorships, see Annex B.3). Where microcredit facilities are established, they can provide a functional platform for expedient disbursement of extraordinary credit or compensation after a disaster.

ACLEDA Bank Plc.

The Association of Cambodian Local Economic Development Agencies (ACLEDA) was established as an NGO in 1992 by UNDP to provide microcredit for small-scale development initiatives with the short term objective 'to have a great and immediate impact on the ground'. With comprehensive donor support, it expanded its activities to all over Cambodia. In 2003, it was licensed as a commercial bank, and has since then expanded its activities to Lao PDR and Myanmar.

Sources: Madden, Raymond and others (2015); Wikipedia

Community-based microcredit



Mrs. Thorng Rath is the accountant for a savings group in Sameakki Commune, Preah Sihanouk Province - one of 25 such groups established under the MoE's Vulnerability Assessment and Adaptation Programme (2012-16), with a seed capital of some 1,500 USD per group. There are 28 members, who contribute 10,000 riel (2.5 USD) per month and receive a 0.8 %/month interest. Provided that funds are available, members can borrow for example 200,000 riel (50 USD) at a 1% per month interest fee. The accounts are continuously monitored by the group members.

Loans are used for investments in livestock, small household businesses, and medical treatment of sick household members. The demand for loans highly exceeds the available funds.

Source: MoE (June 2016)

In 2015, the Cambodian Agriculture Cooperative Insurance Company (CACIC), an initiative established by the Cambodia Center for Study and Development in Agriculture (CEDAC), announced the start of an agricultural micro-insurance service to help rice farmers better respond to climate change. The initiative is presently being implemented by CEDAC in five target provinces including Takeo, Kampong Chhnang, and Kampong Speu. In the last two years, about 150 farmers have signed up with CACIC/CEDAC, registering more than 140 hectares of rice plantation.¹²

Similar activities are supported by the Co-operative Organization Cambodian (CAC), aiming to set-up and support financial co-operatives to help Cambodia's rural poor. In addition to helping establish new co-ops, CAC provides training to co-op leaders, monitors co-op operations and promotes networking and sharing between the co-ops so that they can learn and support each other.

¹² The remainder of this section extracted from NCDDDS (November 2017)

Some cooperatives promote the benefits of using financial co-ops to villagers, especially children. This includes encouraging villagers to open savings accounts and teaching them basic money management skills.

Because of its highly diversified micro-finance sector, and rich society of small-and medium sized enterprises (SMEs), Cambodia is in an excellent position to set examples for private sector engagement that could be adopted in other parts of the world.

5.4 Awareness-building and social marketing

Cambodia's climate change and disaster risk preparedness and resilience are steadily improving at all levels of society, supported by various awareness-building initiatives, and facilitated by a wide network coverage for mobile telephones and televisions, using TV spots, Facebook entries, and other dissemination vehicles. The efforts interact with awareness-building about public health, including safe water and sanitation, and malaria and dengue control.

Continued efforts are warranted, reaching out to the most remote parts of the country, including communities exposed to flash floods and landslides.

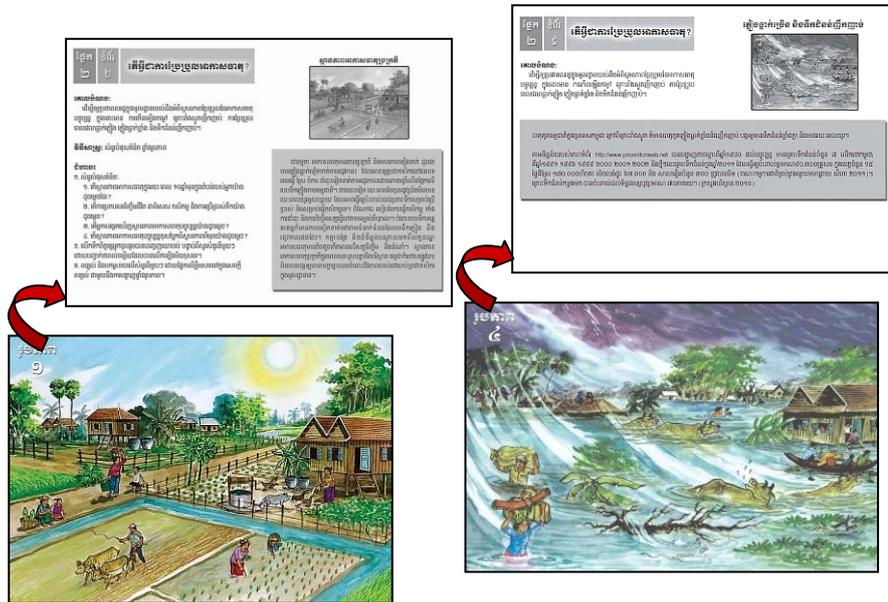
Experience from elsewhere in Asia indicates that involvement of the primary schools can be helpful in this connection. The schoolchildren are open-minded and interested and will readily share their newly acquired wisdom with their fellow household members (perhaps assisted by small thematic handouts about 'good practices'). An example from a primary school drawing contest is shown below, and a 'flipchart' for high-impact introductory-level briefings is shown on the following page.

Figure 11: A child's comprehension of a healthy coastal environment



Source: Entry for a drawing contest organized under MoE's 'Environmental Management in the Coastal Zone' project, Phase 2 (1994-97)

Figure 12: A flipchart promoting climate change resilience at the community level



This flipchart was used in Cambodia's coastal provinces for community-level awareness-building about climate-related disaster risks and adaptation, as well as good practices for resource utilization and waste disposal. The front side of each display (in colour, facing the audience) shows thematic pictures, while the rear side (in greyscale, facing the teacher) shows comments and technical notes. This material is also well suited for primary and secondary schools with some adaptation for context.

The flip chart was prepared and piloted by Save Cambodia's Wildlife (SCW).

Source: MoE (June 2016)

6 Barriers and opportunities for enhancing sub-national adaptation actions

Cambodia's climate change adaptation and disaster risk reduction sectors have seen substantial progress since the Ketsana incident mentioned above. Nevertheless, some barriers (and related opportunities) remain for improved preparedness and resilience.

CCA and DRR take place in a rapidly evolving context of steady economic growth, urbanization, and changes to land use, which sometimes increases the exposures and vulnerabilities. The dynamic social, economic and environmental interactions offer entry points and new attractive opportunities, building on the synergies between CCA, DRR, public health, sustainable livelihoods, and a healthy environment in support of overall social and economic development.

Un Seyma (February 2018) observes that a total of 15 ministries have developed their own Climate Change Action Plans, and these comprise 171 climate actions projects. Most of these projects relate to adaptation work (93%) and only 7% focus on mitigation. The MoE, MAFF and MoWRAM have, together, proposed 62 adaptation and mitigation projects, but only 12 of these (or 19%) were in operation by 2016. These three ministries face similar challenges in implementing their climate change projects: Financial constraints; limited human capacity; a lack of reliable and comprehensive data sets and research; and a lack of technology transfer and awareness.

An overview of barriers and opportunities is shown in the table below, with elaborations provided in the following sections.

Table 3: Barriers and opportunities for sub-national CC adaptation

Category	Barriers	Opportunities
1 Policy and institutional aspects	Scope for improved inter-agency coordination of CCA initiatives Inadequate land use planning and management	Strong political support for the D&D process Scope for improved, site-specific disaster preparedness and contingency planning Scope for improved CCA in urban areas
2 Information and knowledge base	High time-and-space variability of rainfall and stream flow Sea level and land subsidence are not systematically monitored	Detailed, high-resolution satellite data readily available New hydro-meteorological data portals in an advanced state of implementation Manuals, guidelines and reference documents are readily available (see Appendix B).

Category	Barriers	Opportunities
3 Capacity and skills	A remaining need exists for sub-national consolidation of CCA and DRR mainstreaming EIA and climate screening modalities exist but are not consolidated	Recent comprehensive training programs have been conducted for sub-national practitioners A clear scope for improved extension services, based on sharing of existing (but fragmented) expertise
4 Financial/economic constraints	Current commune- and district-level budgets can cover urgent infrastructural maintenance only – there is no room for pro-active development	Substantially increased budget allocations have been announced Various targeted CCA financing options are available Scope for cost recovery Scope for private sector collaboration
5 Technology	Tools and modalities for identification, scoping and design optimization exist but are not well consolidated	Several related development initiatives are in progress
6 Social aspects	Good public awareness of climate-related pressures and concerns, but limited awareness of adaptation options	Scope for expanded community-based cultivation, forestry and irrigation scheme operation, including knowledge-sharing and dissemination of 'success stories' Scope for expanded access to microcredit and crop insurance Scope for strengthened interaction with the academic community and the NGOs/ CSOs

6.1 Policy and institutional aspects

The multi-disciplinary character of CCA and DRR indicates a clear scope for inter-sector and inter-agency collaboration at the national as well as the sub-national levels. In order to fully activate the intended benefits, irrigation specialists and operators must liaise with cultivation specialists and operators, and must further collaborate with bodies that are involved in rural transport infrastructure and flood protection.

The promulgation of the 2008 Organic Law led to the formulation of the National Programme for Sub-national Democratic Development (NP-SNDD), which defined a 10-

year programme for decentralization and deconcentration (D&D), assuming a significant line ministry collaboration.

Other initiatives have been implemented in support of coordinated governance, such as the Cambodia Climate Change Alliance (CCCA) and the National Council for Sustainable Development (NCSD) (see Chapter 4 above), operating under the shared umbrella of the National Strategic Development Plan (NSDP). At the province level, the governor maintains inter-agency coordination. The commune-level 5-year development planning and rolling investment programmes are inter-disciplinary in their character, facilitated by annual '*district integration workshops*' in each district, with coaching by the provincial departments.

A scope remains for extension and consolidation of the inter-sector and inter-agency collaboration at all levels and reaching from policy and strategy formulation to identification and scoping of individual development initiatives.

Land use planning and management

Land use planning and management can reduce the vulnerability to CC and disasters in urban as well as rural areas by incorporating knowledge about exposures and risks. Modalities and regulation are in place, but a scope remains for more comprehensive coverage and improved implementation.

The efforts can be substantially supported by an improved knowledge base, as discussed in Section 5.1 above.

MoE's UNEP-supported '*Vulnerability and Adaptation Programme for the Coastal Zone of Cambodia*' (VAAP) (2009-16) has piloted the integration of CCA and DRR in the land use planning for the coastal provincial towns of Koh Kong, Sihanoukville, Kampot and Kep.

Urban climate change resilience

Ongoing steady urbanization increases the vulnerability to floods from place to place exacerbated by more intense rainfalls, inadequate stormwater drainage capacity, siltation of rivers and streams, sea level rise, saline intrusion, land subsidence, and reclamation activities around urban centres. The potential impacts can be substantial, including damage to buildings and infrastructure and the interruption of daily life.

Since 1999, the stormwater drains of Phnom Penh have been continuously expanded and upgraded, with support from the government of Japan. Urban floods are still frequent, however. This is partly due to the city's rapid expansion and reclamation of wetlands around the city, but it also plays a role that people continue to throw their garbage in the stormwater drains, reducing their conveyance capacity.

Related opportunities include land use planning (see Section 5.5 above); improved stormwater drainage capacity, supported by appropriate facilities and responsive operation (as applied in Bangkok and in the Vietnamese Delta); and public awareness of keeping the drains functional (which would demand limited cost inputs).

Contingency planning

Contingency planning is an important element of CC resilience and disaster preparedness, providing for timely and appropriate response once an adverse event is imminent or has occurred. Such planning can be helpful in relation to floods (including flash floods), landslides, drought, and outbreaks of pests and diseases.

The exposures and vulnerabilities are highly location-specific, and the contingency planning must be targeted to the local conditions. The NCDM and its sub-national bodies are in a particular position to facilitate and implement the planning (which, in many cases, will span across sectors and agencies).

The army has resources and capacity to assist when efforts are impeded by damaged infrastructure or defunct communication.

The contingency planning can be supported by public awareness of how to prepare for or respond to an adverse event.

6.2 Information and knowledge base

Much of Cambodia's recent, impressive infrastructural development has taken place on a basis of less than perfect knowledge because either data did not exist or were not easily accessible. Many irrigation schemes have been built (and are now operated) without access to data about the local '*normal*' or '*reliable*' rainfall.

A good basis for feasibility studies and design will increase the cost-benefit ratio of infrastructural developments, reduce the risks, and, notably, add to a good investment climate - an objective in its own right.

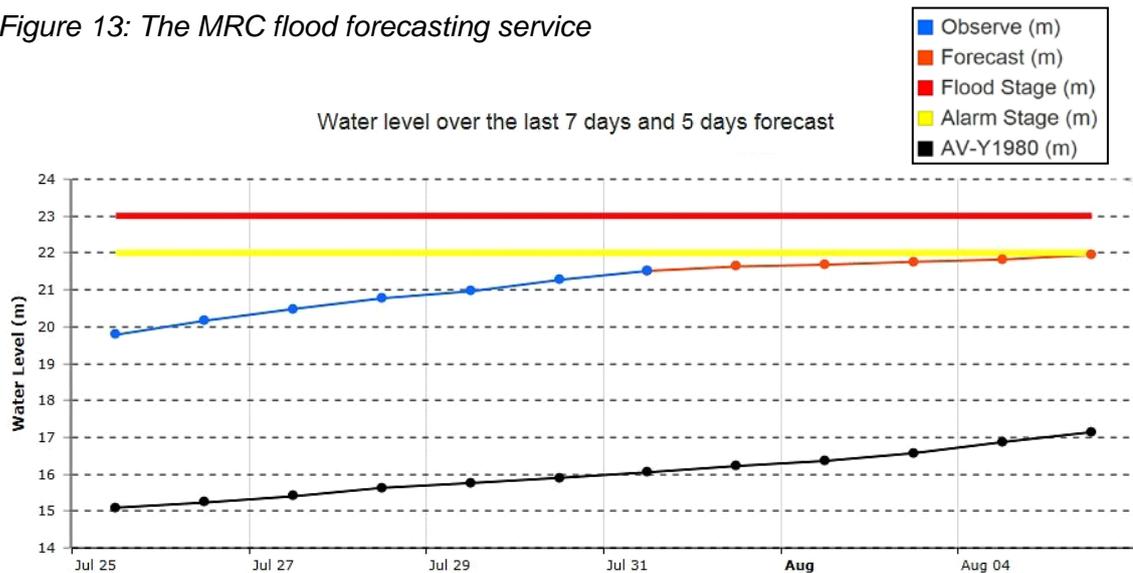
Timely and well-informed decision-making requires the availability (and accessibility) of an adequate knowledge base (along with access to decision-support tools and modalities). This is needed for policy formulation, action planning, land use management, and identification and scoping of specific development initiatives, feasibility and impact assessments and design optimization, as well as operation of reservoirs, irrigation schemes and drainage facilities.

A sequence of recent studies¹³ consistently indicates a clear scope for improving the knowledge-base for CCA and DRR. Hydrometeorological data exist, including some long-term records, but are sparse and largely fragmented, which is less than desirable given the significant variability of for example rainfall and evaporation over short periods of time and over short distances. Rainfall is mostly monitored on the floodplains (including Pochentong Airport and many provincial capitals) whereas most of the rain falls in the mountainous areas that can be exposed to flash floods and landslides.

The Mekong River Commissions basin-wide monitoring has been discontinued in recent years, but the MRC Regional Flood Forecasting and Mitigation Centre (in Phnom Penh) still provides operational 7-day flood forecasts for locations along the Mekong, including 8 in Cambodia, see figure below.

13 Chhun Sokunth (February 2014); MoE (January 2015), (October 2015) and (May 2017b); MRC (October 2014); and Yem Dararath and Tue Kell Nielsen (September 2006)

Figure 13: The MRC flood forecasting service



Example: Forecast for the Mekong at Kratie
 Screenshot from www.mrcmekong.org (31 July 2018)

At the current time, rainfall and wind are monitored by American and Japanese satellites, with an impressive time and space resolution and data being available for free. Only, the data need to be compiled systematically, conceptualized, and made accessible for the various uses. In this connection, it is noted that several new hydro-meteorological data portals are in advanced states of implementation.¹⁴

The remote sensing data can be calibrated by ground-truthing from a reasonable number of self-recording gauges in the mountains, yet this is much more expensive. However, a combination of the two would be powerful.

The same is the case for the inland vegetation cover (and the indications of rehabilitation where needed, in support of reduced land erosion and siltation, and the related opportunities for sustainable forestry livelihoods and income generation).

Sea level and land subsidence are not systematically monitored, so this information must be derived from Thailand and Viet Nam.

14 By GEF (with MoE) and by NCDM (with Mol), respectively

Land subsidence

Land subsidence can be caused by groundwater extraction and by tectonic processes, interacting with sea level rise (but sometimes at a higher rate) and increased storm surges related to climate change.

Subsidence caused by tectonic movements is unavoidable while subsidence caused by groundwater extraction or drainage (as it occurs for example in the Prey Nob polders) is generated by human activities and is irreversible.

There is some evidence that the Sunda plate (on which Cambodia is located) started to subside by perhaps around 4 mm per year after the Indian Ocean earthquake and tsunami on 26 December 2004 (and following a period where the plate was rising by around 3 mm per year). Flood-prone Bangkok is presently sinking by around 1cm per year, on top of much higher rates in the past (up to 12cm per year in the early 1980s). Parts of the coastal city of Jakarta (Indonesia's capital) have sunk by several meters over the last 35 years, and parts of Ho Chi Minh City are sinking by 8cm per year.

Source: MoE (May 2017b)

Another information gap is the health of the coral reefs that, along with the mangroves, provide protection against coast erosion, but which are threatened by the ongoing sea water acidification and exacerbated by destructive fisheries. The corals are also valuable assets for the tourism industry.

Useful knowledge

- Hydro-meteorology, including normal, '*reliable*' (4 out of 5 years) and extreme rainfall;
- Zoning, land use, vegetation cover, including trends;
- Health of habitats and ecosystems/biodiversity, including wetlands, inundated forests, coastal and marine areas (mangroves and corals), and including trends;
- '*Red spots*' and '*green spots*' (or '*assets*');
- Adverse events: Floods, drought, forest fires, landslides, pollution spills, pest attacks, outbreak of water-borne or water-related diseases, including trends;
- Climate change exposures and vulnerabilities, including trends and projections.

Source: MoE (May 2017b)

6.3 Capacity and skills

In 2017, the MoE conducted an assessment of capacity needs and options with a particular view to the three Rio Conventions. The following priorities were established¹⁵:

	Relevance
	H = high, M = medium, L = low
Economic valuation	M
Impact assessment	H
Numerical modeling	M/L
GIS analysis	M/H
Scenario analysis	M
Systematic registration of incidents and initiatives	H
Supplementary data collection	H
Stock-taking reporting	H
'Capacity-mining' (activating existing capacities)	M/H
Communication and dissemination	H
Success stories	H
Policy briefs	H
Networking	H

The analysis provided the following observations on particular capacity needs:

Skills: 3 examples of 'high' gaps, 3 examples of 'medium/high' gaps

Tools: No examples of 'high' gaps, 13 examples of 'medium/high' gaps

Knowledge base: 3 examples of 'high' gaps, 16 examples of 'medium/high' gaps

Giving the steadily evolving context for CCA and DDR in Cambodia, the needs of sub-national capacity and skills are evolving accordingly. This includes for example:

- modalities for inter-agency liaison, aiming at identification and activation of the various inter-sector synergies, particularly at the national and the province level;
- modalities for CCA and DRR mainstreaming into the planning process and budgets; and
- EIA and climate screening practices.

Recent comprehensive training programs have been conducted at the province, district, commune and community levels under the MoE's Coastal Zone Management Programme (1999-2007), the National Capacity Development Project (2002-05), ADB TA 6470

¹⁵ MoE (May 2017b)

'Managing Water in Asia's River Basins' (2008-2014), the Local Government and Climate Change project of NCDD (2011-18), the Pilot Program for Climate Resilience (PPCR), Component 2 (2012-13), and the ongoing TA 8179, Package C (since 2016) (which has conducted 6 training-of-trainers sessions and 20 roll-out sessions for 1,214 sub-national practitioners by early 2019).

There is a clear scope for improved extension services, supported by sharing the existing (but fragmented) expertise across the country. A series of consultation workshops were conducted in November and December 2016 by Cambodia Water Partnership under the Water, Climate and Development Programme (WACDEP).¹⁷ They strongly indicated several immediate and substantial benefits of strengthened extension services provided to water user communities, cultivation communities and forestry communities. This would support sustainable and climate-resilient rural livelihoods across water management (water harvesting, etc.); understanding of environmental implications, water pollution and sanitation; agriculture (soil management, cultivation, livestock breeding, use of compost and fertilizers, pest and disease control, reduced post-harvest losses, etc.); and sustainable forestry.

The extension services can be upgraded by training of the involved province and district level practitioners, and supported by networking and study tours building on the expertise that already resides within some (but not all) sub-national administrations in Cambodia. (This is sometimes referred to as '*capacity-mining*').

6.4 Financial/economic constraints

At the current time, the budget for CCA in Cambodia has been insufficient. Even though the total amount of public spending earmarked for climate change projects increased steadily from 92 million USD (or 0.9% of GDP) in 2009 to 212 million USD (or 1.3% of GDP) in 2014, the financial resources have limited the planned adaptation and mitigation initiatives. The financing gap affecting the implementation of all CCAP projects was estimated at 93% in 2016. The MoE had a narrower financing gap than the others, at around 25% as compared with gaps of almost 100% for MAFF and MoWRAM.¹⁸

Today's commune- and district-level budgets (of around 35,000 USD per year on the average) can cover urgent infrastructural maintenance only - there is no scope for proactive development unless specific financing can be obtained under the various development programs.

Various targeted CCA financing options are available; however, the needs exceed the availability.¹⁹

Substantial budget allocations have been announced for the years to come. In February 2019, the Minister of Interior announced that the commune development budgets will more than double to around 73,000 USD in 2020, with subsequent gradual increases up to 110,000 USD by 2023. He explained that these upgrades had already been approved by the Prime Minister and by the MEF.²⁰

17 According to CamboWP (January 2017)

18 According to Un Seyma (February 2018)

19 Innovative financing schemes for mainstreaming climate resilience at provincial, district and commune levels are discussed in (NCDD, November 2017, revised July 2018)

20 According to Phnom Penh Post, 14 February 2019

Much of Cambodia's ongoing development is generated by the private sector - in many cases without much involvement from the state. The private sector has its own (profit-oriented) development agenda, sometimes (but not always) with a shorter time horizon, and its own particular sources of financing.

There are many examples of overlaps of interest between the state and the private sector, for example related to reducing the investment risk:

- protection against disasters (or good knowledge about the risks);
- access to, and sustainable use of various resources (land, water, energy, ...);
- orderly waste disposal; and
- transparent and predictable environmental regulations and land use regulations.

From case to case, the private sector can sponsor various CC adaptation initiatives, as is seen in Cambodia, Thailand and elsewhere.

6.5 Technology

Tools and modalities for identification, scoping and design optimization of climate-related development initiatives are readily available. Upgrades - mainly at the national level - have been pursued under (for example) MRC's Flood Management Programme and Information and Knowledge Management Programme, and ADB's TA7610-CAM. Several related development initiatives are in progress, including the recently initiated Mekong Integrated Water Resources Programme (MIWRMP) Phase 3, which covers the province and sub-basin levels in northeast Cambodia.

One consistent observation from Cambodia and elsewhere in Asia is that successful technology transfer requires a time horizon of around 10 years, including a consolidation period with access to coaching and backstopping.²¹ Technology may, from case to case, be implemented within a government body, a semi-autonomous '*centre of excellence*', a private firm, or a university institute.

6.6 Social aspects

Following years of climate-related events, Cambodia has developed a good general public awareness of climate-related pressures and concerns (such as floods, drought, landslides and forest fires), but the awareness of adaptation options remains limited.

This is important because some CC adaptation initiatives are better achieved by public awareness than by formal regulation, as exemplified below:

- Good practices for sewage and solid waste generation and disposal, from households as well as manufacturers and industries. In Phnom Penh and other urban areas, waste recycling (of paper and plastic, but, surprisingly, not glass) is widely practiced, providing livelihoods for small-scale operators (who collect the waste items) and intermediaries (who compile and deliver the waste).
- Good practices for water and energy consumption (by households as well as manufacturers and industries), saving scarce resources, reducing the pollution, and saving money at the same time. Small-scale farmers can generate attractive supplementary incomes in the dry season by appropriate use of tiny amounts of water, perhaps obtained by water harvesting (or from groundwater wells), and

²¹ See for example Nielsen, Tue Kell (1998)

supplied for cultivation of vegetables, fruit, straw mushrooms (or even flowers) by hand or by simple drip irrigation (using plastic bottles).

- Good practices for use of fertilizers and pesticides for cultivation. Given that the rainfall and soil conditions vary significantly over short distances, farmers must apply these new technologies with substantial caution: What works well in one place can be useless (or even harmful) in another location, perhaps even nearby. Wrong use of fertilizers and pesticides is a waste of money, and can reduce the crop yield and cause unnecessary pollution.
- Good practices for control of post-harvest losses, which can add to the farmers' revenues.

Community participation

Experience from recent development programs (such as the LGCC, the CARP and the VARP) indicate a clear scope for expanded community-based cultivation, forestry and irrigation scheme operation, including knowledge-sharing and dissemination of 'success stories', adding to disaster resilience, income generation, sustainable resource utilization, and a healthy environment.

Also, a scope remains for expanded access to (community-based) microcredit and crop insurance.

Interaction with the academic community

Collaboration with the academic community can be a win-win strategy with researchers and students getting involved in real-life challenges and getting access to data and information while the government bodies will benefit from an improved, country-specific understanding of processes and cause-effect relationships.

The academic community is involved in international outreach and liaison, and is well positioned to spot and relay information about new opportunities and new technologies.

NGO/ CSO participation

NGOs/CSOs are important partners in scoping and implementation of CC-related development initiatives, contributing skills and experience, and (often) financial support. In Cambodia, these organizations have undertaken valuable awareness-building, and implement pilot and demonstration projects operating at the community and household levels. Their networks can facilitate dissemination and replication at the national as well as the international levels.

7 Activating the opportunities

7.1 Preparedness and adaptation needs and opportunities

The basis for effective and significant CC adaptation and disaster preparedness is the interdependencies between these objectives: sustainable (rural and urban) livelihoods and income generation, and a healthy environment.

Opportunities span across governance modalities, institutional capacity-building (skills and knowledge base), structural interventions, gender mainstreaming, extension services, community mobilization, awareness-building, and piloting and demonstration of '*good practices*'. Examples of no-regrets (or '*multiple benefits*' solutions include (but are not limited to):

- improved agricultural efficiency and income generation;
- added value of water utilization in general;
- reduction of existing flood exposure and vulnerability (including improved water retention in headwater areas);
- improved drought resilience (including increased storage capacity, and seed banks);
- improved urban drainage capacity and operation;
- improved groundwater management; and
- education and awareness-building.

From 2008 to 2014, ADB's RETA6470, '*Managing water in Asia's river basins*', promoted basin-level, multi-sector development roadmaps in various countries, including Cambodia (with CNMC as implementation partner). The roadmaps were action-oriented and implementation-friendly, and provided an overview of inter-sector and inter-agency interfaces and synergies. Some interventions were classified as '*green lane*' (or '*fast-track*') opportunities, characterized by being obviously useful, uncontroversial with few risks, and without uncertain assumptions about institutional, legislative or regulatory dependencies. Other interventions were classified as '*high-impact developments*', characterized by substantial benefits, but with a longer time horizon, and (in many cases) substantial budgets.

It was noted that a mixed portfolio of '*green lane*' and '*high impact*' proposals could assure momentum and visibility, which, in turn, could attract support from decision-makers, stakeholders and beneficiaries while improving the prospects for financing.

State-of-the-environment reporting

State-of-the-environment reports can apply a problem-oriented '*pressure-state-response*' approach or a more opportunity-oriented SWOT (strengths-weaknesses-opportunities-threats) approach. They are prepared for different purposes (that can be combined):

- general monitoring of states, pressures and trends; and related concerns;
- identification of development opportunities and development promotion;
- related policy guidance.

The following reports have been published:

- The '*State of Environment Report*', covering the entire country, was prepared by MoE in 2004, with chapters on human settlements; agriculture; land use; water; fisheries; forest resources; and biodiversity. A partial update, an 'Environment Outlook', was issued in 2009.
- '*State of the Coastal Environment and Socio-Economy*' reports', covering the coastal provinces was prepared by the MoE in 2002, 2005 and 2013. The most recent version covered biodiversity/coastal habitats; education; fishery resources; forestry resources; health; land use; living standards; population; solid waste; toxic contamination; urban environmental quality; water pollution/eutrophication; water resources; and climate change.
- An '*Environment Profile*' for Cambodia was published by the EU in 2012, covering the state of the environment: Trends, pressures and driving forces; CC implications; institutions, policies and legislation; integration of environment and CC in policy; and development cooperation in the environment sector.

- MRC published its '*State of the Basin*' reports in 2003 and 2010. They cover the Lower Mekong Basin, and hereby (basically) the inland provinces of Cambodia, or 86% of the country's area. The 2010 edition covers setting and context; people and livelihoods; the environment; economic status and trends; and development in the Lower Mekong Basin. MRC has also published a large number of related thematic reports.

7.2 Services and regulation

Services and supportive regulation can contribute to improved CC resilience and disaster preparedness directly as well as indirectly (via support to public health, livelihoods and income generation, and waste management).

This includes *extension services* that can be responsive as well as pro-active. In this regard, a scope is present for mobilizing the expertise and experience that exist at the sub-national levels across the country, but this is sometimes confined to specific provinces and districts, and not always readily available to other provinces and districts to gain from. The services can be improved, at a moderate cost, by support to knowledge-sharing and networking between the extension services, and by study tours and exchange visits activating the opportunity for '*learn from each other*'. Also, targeted (and certified) vocational training of extension practitioners will be helpful.

The demand for services includes technical and managerial coaching and backstopping provided to the farmers' water user communities (FWUCs), the cultivation communities, and the forestry communities.

A Cambodia Climate Change Institute?

Successful thematic technological service institutes (or '*centres of excellence*') exist in, for example, Bangladesh, India, Sri Lanka and Viet Nam. They can be government owned, but enjoy a high degree of autonomy operating on a semi-commercial basis with revenues retained within the institute (rather than paid into the government budget). Costs can be covered by performance contracts with the government and/or by payments for delivery of specialist services.

They make advanced expertise available to the government (and to others who need it), responding promptly to the needs while liaising with the professional and academic communities in the host country and internationally.

Staffing can include some core staff, associates, interns, and staff seconded by the government, universities, or the private sector.

Several such institutes exist in Cambodia, but they do not cover climate change resilience and disaster preparedness.

There is a need for a trustworthy *quality certification* of agricultural products (including organic products, which command a higher price on the domestic market, and which would strengthen the prospects for export). Access to certification of sustainably produced hardwood timber would increase the market value dramatically opening access to new export markets, contribute to public revenues, and provide incentives to maintain a healthy forest cover - in turn contributing to CC resilience and disaster risk reduction.

Branding of products can add to the revenues generated, as demonstrated by Cambodia's Kampot pepper - with high awareness of the internationally protected and positive 'name' recognition. Thailand's hom mali rice and India's basmati rice enjoy an even higher international 'name' recognition with attractive prices on the export markets where high-end restaurants proudly indicate the rice variety on their menus. It is less well-known that much of Cambodia's rice is of an equally high standard: The World Rice Conference rated a Cambodian fragrant rice variety as '*Best in the World*' in 2012 and 2014, and no. 3 (among 21 entries) in 2017. In January 2018, the Cambodia Rice Federation launched '*Malys Angkor*' as the brand name for four Cambodian fragrant rice varieties with a view to international promotion.

7.3 The low-hanging fruit: Some attractive opportunities

Some of the opportunities are suited for immediate implementation and with moderate cost implications. This is the case for many awareness-building initiatives, soil management, good practices for waste recycling and waste disposal, and quality certification of agricultural products and timber.

Other examples are provided below.

Climate screening of investment projects

A simple screening can be made of planned development initiatives at an early stage of the project cycle. The screening would consider whether there are climate-related concerns and opportunities (possibly inter-sector and/or cumulative) that might warrant an assessment.

At the sub-national level, the screening may be conducted by the provincial Departments of Environment, or by the Technical Support Units of the Provincial Administrations.

In due time, the screening should be extended to cover private sector investments.

Human resources development

Long-term, strategic capacity-building can be achieved by natural resource and environment (NRE)-related MSc and BSc courses, possibly including decision-support-oriented disciplines, such as statistics, GIS analysis, economic analysis and resource valuation. A certain inter-disciplinary orientation is helpful in an NRE context, where specialists in different subjects need to collaborate. This is the case both for research and education. Flood risk management, climate change resilience and sustainable resource-based livelihoods must all be developed and supported in a multi-sector and inter-disciplinary perspective, with engineers, biologists, economists and sociologists adding value to each other's work. The students cannot master all these disciplines but may learn to know the inter-dependencies and understand the potential synergies.

Access can be facilitated by scholarships (perhaps partly via private sponsorship of students and/or faculty staff), and by access facilitation and entry-level coaching of otherwise talented students that are geographically or socially remotely placed for advanced education. A targeted (1-year) entry program could be considered for promising students from remote areas with a weak educational starting point. A few university graduates from an otherwise isolated remote rural community could have unexpectedly positive effects in the long term.

Online courses, including formal education at MSc or PhD levels, are popular. Among the advantages are that they can be completed in parallel with a professional career. Today,

such courses are readily available from abroad, but some national universities might consider (and perhaps collaborate) in providing online education with NRE governance from a national perspective. Participation could be supported by implementation in small groups or networks allowing the students to learn from (and motivate) each other.

Accredited diploma courses can be more flexible than the formal degrees, and can provide a tool for mid-career skills development. Such courses can be offered by an accredited university that can provide professional coaching and supervision, possibly collaborating with a government bodies with an interest in the subject. The courses can conveniently be completed by small teams of students - perhaps 3 to 5 - who would share the work and motivate each other. The courses can be completed on a part-time basis and with a flexible duration, allowing the participants to implement their daily work activities in parallel.

Vocational training can facilitate a shift to new and improved livelihoods, such as reservoir fisheries, forest conservation, handicrafts, and livestock breeding, not to speak of the ever-escalating tourism sector. Also, such training can support vocational health, as well as good practices for efficient resource utilization and waste generation and disposal - appropriate use of pesticides being only one example. If so desired, the training can be formalized by accredited apprenticeships, based on government-approved contracts between a certified employer and the apprentice. As a result, the apprentice achieves improved career prospects; the employer achieves access to skilled labor; and society as a whole benefits from higher professional standards within construction, manufacturing, cultivation, and services.

The potential benefits of vocational training include skills development for locally based (district- or province-level) extension workers, who in many cases operate on the frontline of climate change adaptation, disaster risk preparedness, and sustainable resource-based livelihoods. The various challenges and development opportunities vary within the country, sometimes over rather short distances, and a balance is required between general good practices and a site-specific focus.

'Success stories' and policy briefs

Many CC adaptation and disaster preparedness and response initiatives have been (and are being) implemented across Cambodia, and often with impressive benefits. Sharing of *'success stories'* can facilitate replication and expand the benefits at a moderate cost. This can be done via the news media, and/or Facebook posts, and/or the Internet (via the camclimate.org website, the NCDM website, and others). Dissemination can be supported by private sponsorships (as it is presently done for awareness campaigns for safe water and sanitation, and control of water-related diseases).

Concise *policy briefs* can be prepared when some good opportunity has been identified to bring the matter to the attention of decision-makers.

Tree planting

Sugar palms and climate change resilience



In 1901, Cambodia's King Norodom encouraged all farmers to plant a few sugar palms on their land to provide a dry season livelihood that is complementary to the traditional rainfed paddy cultivation. Apart from sugar and fruits, the trees provide leaves for thatch, as well as timber and firewood.

Mrs. Ming Chheng, 43, a farmer from Angsnoul in Kampong Speu, lives in a house with a roof made from sugar palm leaves. After rice harvesting, sugar palm is the main crop produced on her farm. *'From December to April, I produce approximately 1,800 kg of sugar from the juice of 20 trees. I can earn nearly 2 million riel to feed my family of 15,'* she says.

Today, many of the sugar palms are gone, leaving homes and paddy fields more vulnerable to storms.

Source: Web of Cambodia, www.web-cambodia.com

8 Discussion

Pressures and adaptation opportunities

Cambodia's continued healthy social and economic development is exposed to several pressures - climate-related as well as others.

Some of the pressures - pollution, land reclamation, settlements in flood-prone areas, deforestation, sand mining, excessive groundwater withdrawals - are *'manageable'* at the national or sub-national levels of administration, at least to some extent. Others - global warming, sea level rise, sea water acidification - require coordinated international action.

As exemplified in the previous chapter, several attractive options exist for improved CC resilience and disaster preparedness. Just as the pressures can exacerbate each other, the various adaptation opportunities can add value to each other, and most opportunities have benefits that reach beyond the CC agenda, providing substantial *'win-win'* or *'no regret'* benefits.

Different parts of Cambodia can experience quite different *'normal'* (or *'reliable'*) rainfall rates and have quite different soil types. They also differ in terms of exposure to seasonal floods and flash floods. In some places, the groundwater is contaminated by arsenic, and access to markets also vary contributing to various risks and vulnerabilities. For such

reasons, lessons learned in one place - including both positive and negative experiences - must be considered with due caution. What has worked well in one place and at one time may fail in another place and at another time - and what has failed in one place and at one time may work well in another place and at another time. For example, a new national road may open opportunities to areas that were previously isolated bringing with it various opportunities and challenges.

Water resources

Apart from flood exposure and saline intrusion in coastal areas, a major CC impact is access to safe and '*reliable*' water for households, cultivation and other production systems. This can be mitigated, within limits, by storage capacity and irrigation infrastructure.

Rainwater harvesting is an option for rural households, and the benefits can be enhanced if combined with other kinds of support to the agricultural sector, such as technological guidance provided by capable local extension services, and access to markets and post-processing facilities.

Replication of achievements can be supported by working with the 'water user communities' and 'cultivation communities' that operate in many places across Cambodia. (Some of these communities work well while others are in need of coaching).

Also, development initiatives at the community-level will benefit from interaction with, and preferably active participation by, the sub-national (commune, district and province) administrations that can learn from the process and assist with dissemination and replication. The dissemination of '*success stories*' can be helpful in this connection.

'Hard' and 'soft' adaptation measures

'*Hard*' (or structural) and '*soft*' (or non-structural) adaptation measures can add substantial value to each other. Hard measures include dykes, embankments, shore and bank protection structures, reservoirs, and irrigation and drainage facilities. Soft measures include good resource utilization practices (including efficient production systems), environmental regulation, and land use (and flood risk) management, supported by broad awareness-building (or '*social marketing*', see Annex B.2), and by pilot and demonstration projects.

For example, new irrigation facilities will create larger benefits if the farmers learn how to adjust their cultivation practices. The lifetime of a reservoir depends highly on orderly land use in its drainage basin (preventing soil erosion and siltation). Expansion of urban drainage will become more effective when the local communities are aware of the benefits and will avoid blocking the drains.

Other initiatives

There is a scope for trustworthy certification of organic products, which would increase the value generated. Also, the market value of hardwood timber can be significantly improved by a trustworthy certification process, which would also provide incentives for rehabilitation of the forest cover in degraded areas.

9 Conclusion and way forward

Visible barriers remain to comprehensive sub-national CC adaptation and disaster preparedness. However, these barriers are not insurmountable obstacles, but rather '*challenges*' to be duly considered in connection with development planning in general.

At the same time, there are many attractive adaptation opportunities with substantial social, economic and environmental benefits, and (in some cases) achievable at quite moderate costs. Sub-national CC adaptation and disaster preparedness can be supported by measures, such as:

- an improved and broadly accessible hydrometeorological knowledge base, as well as operational weather forecasts (for crop cycle management) and flood forecasting services that reach out to remote areas exposed to flash floods;
- climate screening of investment projects applied on a routine basis, possibly incorporated in the environmental impacts assessments (EIAs) supported by concise guidelines and check lists;
- land use planning and management that reflect the risk of floods and landslides;
- improved urban CC resilience, supported by adequate **stormwater** drainage capacity and operation;
- improved extension services for farmers, assisting with the introduction of new (alternative or supplementary) cultivation technologies and livestock breeding, including energy- and water-efficient technologies, and control of pests, insect attacks and livestock diseases supported by knowledge-sharing between the extension practitioners;
- improved disaster response during severe floods, including the response from the armed forces;
- improved drought contingency planning (including seed banks for rapid replacement of lost crops);
- district-level tree planting schemes to shelter against storms while generation income at the same time (perhaps the traditional sugar palms, and/or some fruit trees supplied by drip irrigation, and/or high-value hardwood trees as a long-term investment);
- support to soil management (by composting and/or crop rotation, involving nitrogen-fixing legume species) (allowing for supplementary crops, given that rice grows well on poor soils);
- various support to control of post-harvest losses (of rice, fruit and fish);
- continued expansion and streamlining of financing modalities, encompassing from major structural interventions to community-based micro-credit and crop insurance; and
- active involvement of the academic community.

There is a clear scope for continued and expanded liaison, knowledge-sharing and active collaboration '*horizontally*' between sectors and administrative bodies at each level as well as '*vertically*', reaching all the way from the national government to the provinces, districts and communes, and down to the community and household levels. This includes continued support for coordination bodies, such as the National Committee for Disaster

Management (NCDM) and its sub-national bodies, the National Council for Sustainable Development (NCSD), and the Cambodia Climate Change Alliance (CCCA).

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Appendix A: Terminology

Adaptation: Adjustment to new circumstances - actual or expected. This can be in terms of behavior, technology or structural intervention. Examples include introduction of better suited production systems and infrastructure. See *climate change adaptation*.

Adaptation deficit: The case of being underprepared for (present and/or future) climate conditions. This can be related to a less than optimal allocation of limited resources, resulting in for example inadequate urban drainage infrastructure or water storage capacity.

Climate change (CC): Medium- or long-term changes in the general weather - such as temperature and rainfall - over time scales of decades. Climate changes have always occurred. The present trend is related to CO₂ emissions to the atmosphere, causing global warming, erratic rainfall (causing floods and drought), sea level rise, and sea water acidification (affecting coral habitats).

Climate change adaptation (CCA): Measures - structural or non-structural - to reduce the adverse consequences of climate change. Examples include appropriate land use ('*keeping people away from floods*'), improved water storage capacity, flood protection schemes ('*keeping floods away from people*'), weather and flood forecasting services, etc.

Climate change mitigation: Measures that address the causes of global warming, by reducing greenhouse gas emissions and the greenhouse gas levels in the atmosphere. Examples include improved energy efficiencies, reduced energy consumption, tree planting/ reforestation, etc.

Disaster: A sudden event with significant adverse impacts - such as a flood, a land slide, or a severe drought. *Disaster risk reduction* is measures - structural or non-structural - to reduce the adverse consequences of a disaster. A particularly severe disaster is called a *catastrophe*.

Exposure: Being subject to some pressure (for example climate change). In Cambodia, the exposure can vary significantly over short distances

Impact: The same as effects, or consequences, of a given exposure. The impact can be positive or negative. A high (negative) impact will occur in case of a high exposure and a high vulnerability (or a low resilience).

Flood preparedness: Due awareness of the flood risk, and knowledge and ability of appropriate response. The flood preparedness can be supported by measures such as awareness campaigns, education, and flood forecasting services, as well as flood proofing measures.

Land subsidence: A general gradual sinking of the land, caused by downward tectonic movement and/or excessive groundwater withdrawal. Cambodia is located on the *Sunda plate*, along with southern Viet Nam, South Thailand and most of Malaysia. This plate is presently sinking by some mm per year, or the same order of magnitude as the ongoing sea level rise. From decade to decade, vertical tectonic movements can change between uplifts and subsidence. Subsidence caused by groundwater withdrawal is irreversible.

No-regrets solution (or '*multiple benefits solution*') (for climate change adaptation): A solution that is valuable even if the climate doesn't change in the way that is presently expected; a solution that not only supports climate resilience and/or disaster risk reduction but other good purposes as well.

Preparedness: Being ready for a particular exposure (such as a flood or a drought).

Resilience: The ability to endure and/or to recover from a given exposure. A high resilience indicates a low vulnerability, and the other way around.

Sea level rise: Global warming causes a sea level rise, due to the water column expanding with higher temperatures, and melting of ice in Arctic areas, combined with local conditions.

Scenario (used for planning in a context of uncertainty): A possible (conceivable) future combination of circumstances. For example, a scenario can reflect '*business as usual*' (= no adaptation) plus a certain exposure to climate change.

SWOT analysis (of strengths, weaknesses, opportunities and threats) can support an opportunity-oriented (or '*pro-active*') development planning, as compared with '*problem-oriented*' or '*responsive*' planning. (The two perspectives can be combined).

Vulnerability: The extent of the (adverse) impacts of a given climate change exposure or a given disaster. The vulnerability can be seasonal, and is always site-specific, depending on the population density, the land use, the value of buildings and infrastructure, the cultivation systems and other production systems, the preparedness, and the resilience.

Weather: The conditions of the atmosphere at a given location and a given time: Temperature, precipitation, cloud cover, fog, sunlight, air pressure and wind. Compare with *climate*.

Appendix B: Examples of documents related to sub-national CCA and DRR

<i>Publisher</i>	<i>Title</i>	<i>Project/programme</i>
NCDDS (July 2018)	Innovative financing schemes for mainstreaming climate resilience at provincial, district and commune levels	TA8179, Package C
RGC/NCDD (October 2017)	Commune/sangkat fund project implementation manual	
NCDDS (September 2017)	Mainstreaming climate resilience in provincial, district, and commune development and investment plans	TA8179, Package C
CamboWP (January 2017)	Water security framework and policy briefs	The GWP Water, Climate and Development Programme (WACDEP)
NCDD (April 2017)	Integrating socially inclusive CC adaptation into the commune development planning and the commune 3-years rolling investment programme process	
Mol and MoP (March 2017a)	Guideline on the preparation of commune/sangkat development plans	
Mol and MoP (March 2017b)	Guideline on the preparation of commune/sangkat investment programmes	
Mol and MoP (March 2017c)	Guideline on the preparation of district development plans	
Mol and MoP (March 2017d)	Guideline on the preparation of district investment programmes	
NCDD (September 2016)	Implementation and procurement handbook for construction/ rehabilitation of the district disaster risk reduction and climate change adaptation small scale infrastructure projects	The Community-Based Disaster Risk Reduction Project (CDRR), Component C
GSNCSD (July 2016)	Promoting private sector contribution to the climate change response in Cambodia	
UNDP Cambodia (December 2014)	Practitioner's handbook: Implementing the Vulnerability Reduction Assessment	
MRC (October 2014)	Climate change analysis in the Lower Mekong Basin	MRC Working Paper No. 52
ADB (May 2014)	Kingdom of Cambodia: Strengthening coordination for management of disasters	Capacity Development Technical Assistance Project No. 46230

<i>Publisher</i>	<i>Title</i>	<i>Project/programme</i>
MoE (January 2014)	Effective mechanisms for climate change mainstreaming in sub-national planning	The CCCA Vulnerability Assessment and Adaptation Programme
MoE (2013)	Guidance on mainstreaming climate resilience and disaster risk reduction into sub-national development and investment planning	PPCR, Component 2
MoE (2013)	Climate screening toolkit	PPCR, Component 2
MRC (June 2010)	Impacts of climate change and development on Mekong flow regimes	MRC Technical Paper No. 29
MRC (September 2009)	Adaptation to climate change in the countries of the Lower Mekong Basin: Regional synthesis report	MRC Technical Paper No. 24

Appendix C: Examples of adaptation initiatives elsewhere in Asia

C.1 China: 1 million *'river chiefs'*

Background and context

Surveys by the Pew Research Centre, a think-tank, found that 37% of respondents in 2016 saw water pollution as a “very big problem”, up from 28% in 2008. Those polled expressed less anxiety about smog and the rising cost of living.

Ministries responsible for bodies of water have unclear and sometimes overlapping responsibilities. It has been said that ‘nine dragons rule the waters’ – a reference to the tangle of diffuse and unclear responsibilities for managing different aspects of China’s environment and policies.

Pressures and vulnerabilities

In 2007, Lake Tai, one of the largest lakes in central China, experienced a dangerous bloom of blue algae that threatened the drinking water of more than five million Chinese in Wuxi, one of the country’s most prosperous areas.

In 2018, a government report said that surface water in nearly a third of river sections surveyed was too risky to touch, let alone drink. Water in nearly 15% of them was rated too dirty even for industrial use. Lakes are worse. The report says that out of 54 large ones surveyed, 29 contained water deemed unsafe for human contact.

Adaptation initiatives

A *'river chief'* is responsible for protecting the waterway, scooping out garbage (or hiring others to do so) and keeping an eye out for pollution-causing activities on its banks. The *'river chief'* system began more than a decade ago in the eastern province of Jiangsu. In 2016 the central government decreed that every lake and river, or segment thereof in the case of larger ones, must have someone tasked with keeping them free of visible pollutants.

By the end of June 2018, every river had at least one local official designated as its supervisor. 402 of the river chiefs are provincial level officials and 59 of them are heads of their provinces. All but two of the provincial regions have also appointed 760,000 river chiefs at the village level.

Those with complaints about foul water can easily find out whom to call: Notice boards have been erected by almost every river and lake with the name and mobile-phone number of a chief.

Figure C.1: Cleaning the Bahe River (in Beijing). Photo: The Economist



Professor Habich-Sobiegalla of the Institute for Chinese Studies at the Free University of Berlin says that the River Chief policy is an ‘ingenious’ method of using party hierarchy as a lever to improve coordination between various government organs. ‘Before the River Chief policy it was very difficult to get officials of the same rank to cooperate on pollution and water-resource management issues, but by making one person responsible that person now has authority over the departments below him on issues related to the management of the river... now there is a mechanism to make these people or departments cooperate more fully. This is the main advantage of the River Chief system - it can solve this gridlock up to the provincial level.’

The impact will become clearer in 2019, when the government is expected to release data from the first nationwide water-quality survey since rivers got their chiefs. But anecdotal evidence is promising. A man fishing in the Bahe River recounts how the water was opaque green and fetid just two years ago. Today it is clear and odourless. He credits the river-chief system.

Relevance to Cambodia

The concept is perhaps not suited for direct replication, but a clear and visible, community-based entry point for monitoring and reporting of pollution could support awareness-building and appropriate response. River pollution in Cambodia (as in many other places) can be caused by major emissions and by direct disposal of sewage and solid waste. In some cases, visible improvements can be achieved with a minor effort.

Figure C.2: Polluted river in Phnom Penh (February 2019). Photo: Phnom Penh Post



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C.2 India: Community-based flood risk management in Assam

Background and context

Assam, located in northeast India, has an area of 78,400 km² and a population of 31.2 million, of which 14% is urban and 86% live in rural areas (2011). The share of the urban population is steadily increasing.

Soils can be fertile and well suited for cultivation (except where covered by sand drift). In general, however, the rural livelihoods are significantly affected by the pressures imposed by flooding and bank erosion. In the remote, rural parts of the floodplain, livelihoods include cultivation (rice, vegetables, fruit trees, and other crops); livestock production (cattle, sheep, goats, pigs, geese and ducks); daily wage labor on estates and plantations, or in urban areas; some fisheries; services; small grocery shops; and spinning and weaving. There are large tea estates, and some households cultivate tea with the leaves being sold to the estates for processing. There is no aquaculture.

Water in the rural areas is available from rain, rivers, and groundwater. Households are supplied from small waterworks (using groundwater), and/or from household wells. Also, there is some extent of rainwater harvesting. Water for livestock and irrigated cultivation is

pumped from various tanks and small reservoirs, of which there are many; or, sometimes, from the ground. Drought is a minor concern, although an occasional late onset of the monsoon can cause difficulties.

All villages have primary and mid-level schools (covering grade 1-5 and 6-8, respectively) (with kids starting at the age of 5). Schools are converted to relief centers when the need arises (as a result, the teaching is interrupted for up to 20-30 days).

Pressures and vulnerabilities

With 40% of its area being flood-prone, Assam is among the states of India that are most exposed to floods.

Figure C.3: Urban floods in Guwahati



Photo: Rediff, <http://www.rediff.com>, 22 September 2014

From place to place, there are different kinds of floods (that can interact):

- seasonal Brahmaputra mainstream floods generated by monsoon rainfall and snow melt in the Himalayas. such floods can be predicted with good accuracy and fair notice
- floods on the Brahmaputra tributaries generated by local rainfall, which is mainly (but not entirely) seasonal. These can be predicted, but sometimes with a short notice
- flash floods and landslides in or around hilly or mountainous areas, generated by local rainfall. These are difficult to predict
- urban floods. floods in Guwahati (the capital of Assam) occur occasionally, generated by local rainfall even when the Brahmaputra is well below bank level (see photo above).

Global climate change is expected to increase the flood risk and flood exposure.

Parts of Assam are flooded for up to 6 months per year. Ordinary floods disrupt daily life, impeding access to schools, workplaces, markets and clinics while severe floods require evacuation, disrupt power supplies, and cause loss of livestock and other property. Another major concern is erosion of the river banks and floodplains, causing loss of land, buildings and infrastructure. Also, in some places, comprehensive sand drift, driven by the

floodwaters and the wind, can destroy agricultural lands and cover roads and buildings. Livelihoods in remote rural areas are affected by small land holdings; difficult access to markets; and a low-level of education.

Traditional occupations are generally not particularly sustainable. The crops can endure heavy rain but not extended submersion. High-quality seeds exist, but are expensive and not readily available, so farmers tend to prefer their own seeds. There are seed banks to meet the need if the 1st crop is destroyed by floods.

Figure C.4: Showing the typical annual flood height



Roads are built on levees and some (but far from all) homes (and schools and clinics) are built on small mounds, with the excavation pits conveniently being used for water storage. 'Safe' elevated areas have been established in some places, sometimes supplied with emergency latrines but are often in need of basic facilities, such as shelter, water and sanitation while some are intended for livestock only. In some cases people live on such sites for years.

Another major concern is erosion of the river banks and floodplains causing loss of land, buildings and infrastructure. Also, in some places, comprehensive sand drift, driven by the floodwaters and the wind, can destroy agricultural lands and cover roads and buildings. Strong erosion can force the households to re-locate, imposing a pressure on nearby areas. A major earthquake on 15 August 1950 caused comprehensive loss of life and property in Tibet and Assam and released large amounts of sediments into the Brahmaputra that changed the course of the river. The Dibrugarh pilot area was affected by strong erosion and loss of land and property, which has continued until today. Dibrugarh Town was erased by bank erosion and had to be re-built in its present location. 12 years ago, the distance from Pukhurijan Village to the river was 25 km, as compared with 3 km today. Bogoritolia Village is located on the bank of the mainstream, but 40 years ago it took a day's walk to reach the river.

Adaptation initiatives

The following activities have been completed or are in progress:

- mobilization and training of village facilitators;
- village-level participatory rural appraisals (PRAs), flood risk mapping, and responsive micro-planning;
- establishment (or re-activation) of village disaster management committees (VDMCs), and related capacity-building;
- development of early warning services (EWS);
- EWS implementation with awareness of timely and appropriate response options.

Communities in the Brahmaputra floodplains have lived with floods for generations. Still, there is a scope for strengthening the operational preparedness, for example through implementation of site-specific early warnings, maintenance of escape routes, and access to evacuation facilities (such as boats) and 'safe' elevated areas with shelter, safe water and sanitation. Also, efficient vertical and horizontal knowledge-sharing is useful.

Relevance to Cambodia

Community-based development initiatives can add substantial value to investments in structural flood proofing and bank erosion control contributing to disaster preparedness and resilience. Also, such initiatives can serve important purposes in their own right, providing support to sustainable livelihoods and income generation.

Disaster preparedness, livelihoods development and infrastructural development can add value to each other: Poor livelihoods indicate a higher vulnerability while sustainable and efficient production systems (and livelihoods) are more resilient.

Smooth and efficient information flows must be maintained and combined with awareness of timely and appropriate response options - for example, regarding whether or not to evacuate.

Knowledge about the flood exposure is needed not only for the resilience of communities, but also for land use planning, development of cultivation systems, and the design of buildings and infrastructure.

Good practices at the household and community level

Preparing for a flood

- Pay close attention to flood warnings;
- Keep in touch with your local disaster management committee (DMC) about any concerns and uncertainties, or if you have any suggestions;
- Maintain functional and clearly marked escape roads/pathways (visible also when inundated);
- Maintain functional storm water drains, dykes and water control structures;
- Keep a stock of emergency supplies: drinking water, torchlight, batteries;
- Keep valuables and documents safely stored;
- Store grains and seeds in a safe place.

Precautions during a flood

- Follow guidance from the local DMC;
- Evacuate sick or disabled household members and pregnant women as early as possible;
- Avoid (or be careful when) crossing rivers, streams and inundated areas;
- Keep clear of electric power installations and facilities;
- Keep children under close supervision;
- Evacuate livestock, in accordance with local good practices.

Mitigation after a flood

- Report damages to the local DMC, including infrastructure and escape roads/pathways;
- Report observations and suggestions to the local DMC.

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C.3 The Philippines: Social marketing in Central Cebu

Background and context

The central part of Cebu Island has three small river basins: Kotkot, Mananga and Combado-Lusaran. The Central Cebu Protected Landscape comprises the mountainous headwater areas of these three rivers, which provide raw water for Cebu City, with its approximately 923,000 people (2015), which is located downstream.

Livelihoods include

- farming (rice, corn, root crops, mangoes, vegetables, high value crops);
- poultry and livestock raising (piggeries and dairy cattle);
- charcoal production, firewood gathering;
- sand and gravel extraction;
- employment in government and private companies in Cebu City and other cities and municipalities;
- construction work;
- rattan furniture making;
- employment in private manufacturing companies; and
- fishing.

The area has been protected in stages since 1911, as listed in the table below.

Table C.1: History of landscape protection

Buhasan Watershed (part of Mananga Watershed	1911
Central Cebu National Park	1937
Sudlon National Park	1936
Mananga Watershed	1989
Kotkot-Lusaran Watershed	1992
Central Cebu Protected Landscape	2003

Figure C.7: Landscape in Central Cebu



Some people engage in illegal activities, such as felling trees for firewood or charcoal. Sand and gravel extraction in prohibited areas also continues to flourish. These activities cannot be controlled unless the people are provided with alternative livelihoods.

Pressures and vulnerabilities

About $\frac{2}{3}$ of households live below the poverty line, and access to safe water, sanitation and electricity is inadequate.

Sand mining and some slash-and burn cultivation are degrading the unique forest ecosystems. The downstream part of the area is polluted by disorderly solid waste disposal; and the pollution problem is aggravated by excessive sand and gravel extraction, and encroachment of informal settlements. Other problems include:

- (i) severe erosion;
- (ii) excessive extraction of groundwater, causing the groundwater body to be contaminated by intruding saline sea water;
- (iii) degraded slopes due to deforestation activities,
- (iv) dried-up rivers, and
- (v) water rights disputes between local water users and Cebu City.

Adaptation initiatives

Various regulation exists that prohibits detrimental activities, such as:

- animals that destroy plants;
- sand and gravel extraction;
- electro-fishing;
- throwing garbage in the river;
- building of commercial structures near the river; and
- cutting trees for charcoal.

Enforcement of the regulation is imperfect, however.

Adaptation needs and opportunities include the following:

- basic socio-economic development, including increased rural incomes;
- improved land use practices; technological upgrading within agriculture and forestry;
- development of safe water supplies (on a background of unreliable raw water availability); and sanitation, solid waste disposal and electricity supplies;
- maintenance and expansion of storage capacity, small-scale and large-scale, including a dam on the Mananga River.
- development of roads.
- gradual development of tourism.

Social marketing is applied as a supplementary adaptation measure. Social marketing is the use of traditional commercial marketing for social development. Based on education and awareness-building, social marketing takes on the further steps to change the attitudes and improve the behavior of the target group for their own benefit, as well as for the benefit of society as a whole.

Examples of social marketing applications

- disinfection of otherwise risky drinking water;
- appropriate solid waste disposal;
- water utilization and energy consumption by households;
- disaster preparedness: floods, drought;
- water utilization for irrigation;
- appropriate use of fertilizers and pesticides;
- water utilization and energy consumption by industries.

In Central Cebu, social marketing plans have been prepared with the following objectives:

- better coordination among local administrative bodies (barangays/ municipalities);
- public support for implementation of regulation;
- orderly solid waste disposal;
- acceptance of alternative, sustainable livelihoods.

Relevance to Cambodia

Social marketing can be an inexpensive and highly efficient supplement to costly structural developments (such as water supply, sanitation, or flood protection). Sometimes, social marketing is an attractive option in its own right to achieve some development where formal regulation can be less practical or have unintended side effects (such as the appropriate use of pesticides in agriculture).

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C.4 Thailand: Resource-based livelihoods in the Songkhla Lake Basin

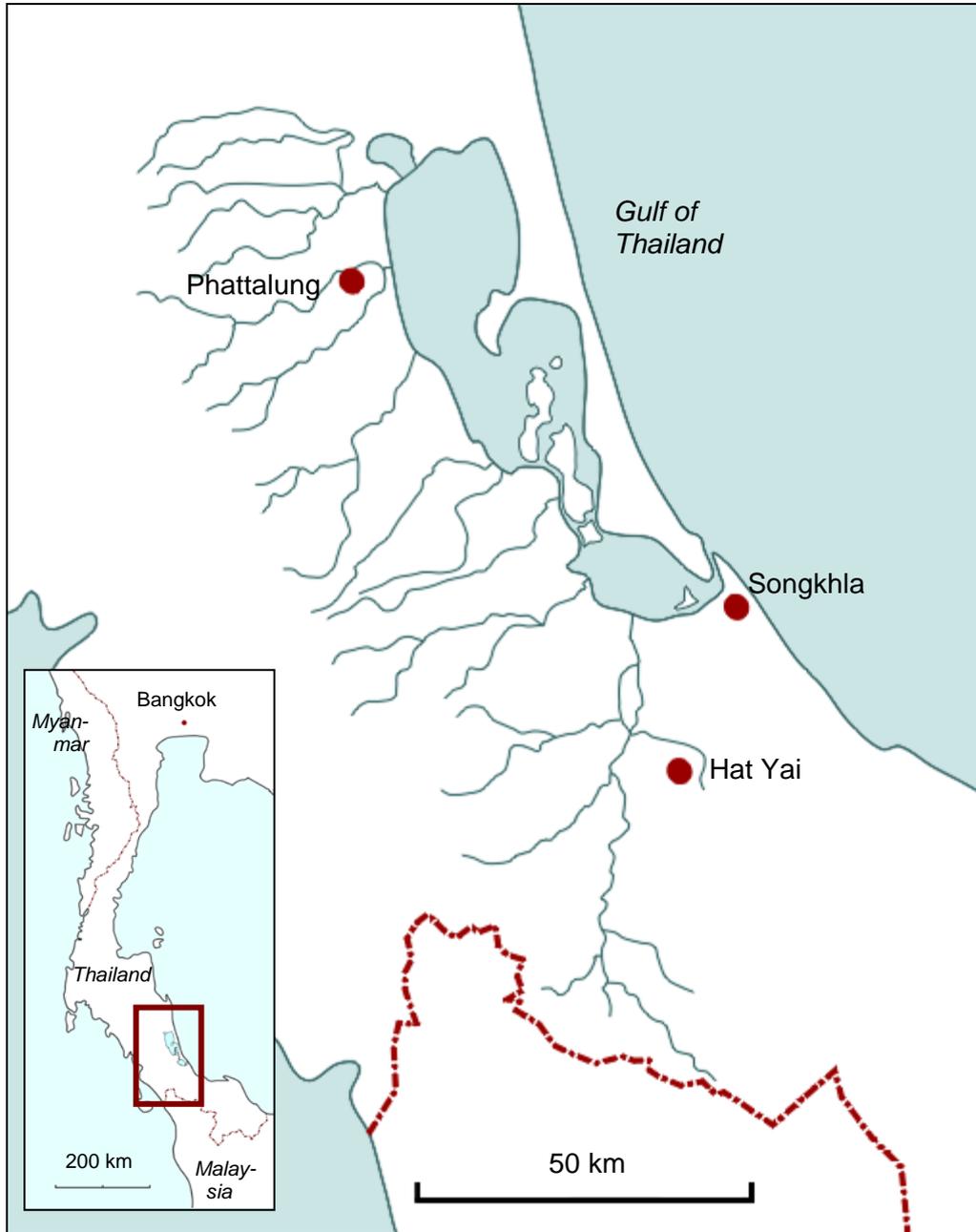
Background and context

Songkhla Lake is the largest natural lake in Thailand. Its drainage basin has a long history of basin-level development planning dating back to 1985, and, since 2005, with extensive community participation. The basin has rich but sensitive aquatic and terrestrial ecosystems and a broad range of resource-dependent livelihoods.

The lake and its lake basin are located between the sea and a mountain range. The rainfall is around 1,800 - 2,100 mm/year with a pronounced seasonal variation. The mixing of freshwater runoff and saline water from the sea causes the salinity of the lake to vary spatially and temporally. The water depth of the lake system is around 1.4m, varying between some 1.2m in the dry season and some 2.2m in the wet season.

Off-stream water uses are dominated by irrigation (81%) as well as domestic and industrial uses (9 and 10%, respectively). In-stream water uses include a rich fisheries and aquaculture in the lake, as well as preservation of the various unique habitats and the related tourism and recreation. It is estimated that a pod of 20 to 30 dolphins is currently living in the Songkhla Lake. Bird's nest harvesting is a particular resource-based livelihood, which has flourished in the area for more than 400 years. High quality bird's nests fetch around 75 to 90,000 baht (USD 2,500 – 3,000) per kg.

Figure C.8: Songkhla Lake



Basin population (2010): 1.6 million

Basin area: 8,495 km²

Lake area: 1,040 km²

Source: Orasa Kongthong and Chatchai Ratanachai (May 2012)

Pressures and vulnerabilities

Challenges in the Songkhla Lake Basin include (Sutiwipakorn and Ratanachai, 2005):

- 1) Forest & mangroves: Steady decline of upstream forest and mangrove. The upstream forest area has decreased from over 40% to about 12.5%(Year 2004 statistics) of the basin area during the past two decades. Only about 15,000 ha. of mangrove and wetland, or 1.7% of the basin area is left.
- 2) Sedimentation: Soil erosion & sedimentation in waterways and lake and erosion along the coast. Studies show that the sedimentation rate in Songkhla Lake is around 5.0 – 6.9mm per year. At this alarming rate, without any remedial action, the lake will be filled in 300 to 400 years.
- 3) Developmental conflicts: Inappropriate and unplanned land use; conflicts between shrimp farming and paddy cultivation; and impacts of roads and other physical development on drainage and wetlands habitats.
- 4) Water extraction: Fresh surface water over-pumping (causing saline intrusion); and groundwater overuse. Annual groundwater surveillance data indicate that the extent of areas where groundwater levels are below sea level has expanded from 2,700 ha. in 1992 to 10,300 ha. in 2002. In some areas, groundwater is more than 10m below the sea.
- 5) Increasing flood exposure: Hat Yai, the major business city of southern Thailand, was devastated by floods in 1988, 2000 and 2011. Smaller cities and rural areas were also flooded to varying degrees. Causes have been blamed, among other things, on bad city planning and inefficient water management.
- 6) Fisheries: Fisheries exceeding capacity; fish migration is blocked; resources are over-used and in urgent need of restoration. There are currently over 2,000 bag nets and over 30,000 sitting cages in Songkhla Lake. One cannot trace a 10m radius circle in the lower part of Songkhla Lake without encountering fishing gear.
- 7) Pollution: Solid waste and sewage disposal, and water pollution, including domestic wastewater; industrial wastewater; and wastewater from pig farms and shrimp farms.

Figure C.9: A view from the lake (Ban Thale Noi)



Adaptation initiatives

Amidst the above challenges, there are some potentials and important development opportunities, as follows:

- continued development of resource-based livelihoods, in terms of quality and generated value as much as in terms of quantity;
- good governance supported by civil society and local wisdom;
- demand side management of water utilization;
- capacity building and awareness-building for local governments and society as a whole;
- eco-tourism development, spearheaded by entrepreneurs.

The Lake Basin has an active and entrepreneurial civil society, which is, to varying degrees, active in temporary groups promoting specific initiatives, or which can be organized as permanent bodies.

Tambon Ta-Hin has 1,100 households, 4,000 people, and 235 registered fishing boats. The community council is an autonomous body established by the people and endorsed by the Ministry of Labour and Social Welfare. Together with two adjacent tambons, the council advocates successfully against illegal fisheries. A no-fishing zone has been established (and is observed). Social sanctions are imposed against illegal fisheries. Fish stocks are replenished on a periodical basis from government hatcheries. Divergences of interests between farmers and fishers are sorted out in an orderly way.

The Tambon Ko Mak fishery community has successfully introduced fish conservation zones on a voluntary basis. Such good practices work well and are now emulated elsewhere and by the authorities.

Figure C.10: The Thale Noi elevated causeway



Relevance to Cambodia

A joint study, *'Learning from the lakes'*, was conducted in 2012 by Cambodia National Mekong Committee and Thailand National Mekong Committee, with comparisons and lessons learned from the governance of the Great Lake of Tonle Sap and the Songkhla Lake Basin, respectively.

It was observed that both basins have extraordinary environments and a broad range of resource-dependent livelihoods. Within each of them, complex sets of dependencies exist between the welfare of the population and the environmental quality. These dependencies must be wisely managed and seen as opportunities as much as constraints.

Between them, the two basins provide an ideal '*laboratory*' for governance modalities, concerns and development opportunities. With their similarities and differences, they can serve as references for each other, thereby broadening the perspective for responsive development planning and adaptation initiatives.

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C.5 Viet Nam: '*Living with the Floods*'

Background and context

The Vietnamese part of the Mekong (or Cuu Long) Delta has an area of 40,600km² and a population of 17.4 million people. The largest city is Can Tho (with 1.2 million people).

80% of the population is engaged in rice cultivation. Yields exceed 5 t/ha/crop, with 2 to 3 crops per year. This equals 1,400kg of rice per person per year. Other production systems are livestock, cash crops and fruit trees. The ongoing salinization of the surface waters has indicated a gradual shift towards brackish water aquaculture, including shrimp cultivation.

Figure C.11: Life on the river



Pressures and vulnerabilities

Most of the Delta is elevated by only 2 to 4m above sea level. Present and projected climate threats include

- seasonal floods during peak flow in the Mekong, interacting with rainfall and high tide in the sea;
- droughts; and
- saline intrusion into the mouth of the Mekong.

Saline intrusion occurs every year to an extent that depends on the actual dry season Mekong flow, and is gradually increasing due to sea level rise and land subsidence. The current subsidence rate is 1 to 3 cm per year, much higher than the rate of the global sea level rise. The subsidence is caused by tectonic subsidence and excessive groundwater withdrawal.

The saline intrusion makes the water unsuited for public supplies and irrigation.

The morphology of the Delta, including its coastline stability, depends on the steady supply of sediments from the Mekong Basin, which may possibly be intersected by dams.

A rising sea level and a subsiding land level will increase the near shore wave heights and the erosive capacity of the waves, which, exacerbated by a reduced sediment discharge from the Mekong, will cause coastal erosion.

Adaptation initiatives

In the 1990s, the area experienced an inward migration of people moving from adjacent but less fertile areas. Many newcomers settled in flood-prone areas (where land was readily available), so damages caused by floods escalated even if the floods did not. Therefore, in 1996, the Vietnamese government launched its '*Living with the Floods*' program, which comprised structural flood protection initiatives '*keeping floods away from people*' and land use restrictions '*keeping people away from floods*'. (Also, the program promoted good practices, such as teaching children how to swim from a young age).

Two levels of structural protection are applied: Full (or all-year) protection, and '*August protection*', allowing the 2nd rice crop to be harvested before the field is inundated. The full protection is mostly used for residential areas; it is more expensive, can cause land degradation inside the area, bank erosion outside the area, and increased flood risk upstream of the area.

Many houses are built on poles.

Non-structural measures include the following:

- a shift to short-term rice varieties, so that the summer-autumn crop can be harvested before the floods. Thereby, two rice crops can be cultivated per year, with a crop of vegetables in between;
- improving the post-harvest technology;
- planting trees along roads and dikes;
- teaching the children to swim;
- operating health care boats;

- timely evacuation of people and livestock.

Flood-related livelihoods include capture fisheries on the river and on the paddy fields; collecting snails; fish breeding in cages; and cultivating aquatic vegetables.

Viet Nam has a strong tradition for hydro-meteorological monitoring conducted over decades. Supplemented with research and analyses at universities and service institutes, this has provided a good understanding of cause-effect relationships and management options.

- Viet Nam has achieved an impressive experience and capacity related to control of saline intrusion - a major threat in the Delta area. This includes accurate operation of gates to let the outflow of flood water pass while preventing inflow of saline sea water (see photo below). The highly complex operation is facilitated by decision-support tools developed by local technological service institutes: the Southern Institute of Water Resources Research and the Southern Institute of Water Resources Planning (both in HCMC).
- Viet Nam has a dedicated water resources university (Thuyloi University based in Hanoi), offering 25 undergraduate programs, 20 MSc programs and 11 PhD programs, effectively contributing to national excellence in water resources management.

Figure C.12: A multi-purpose flow regulator, controlling inflows and outflows



- Research is in progress at the Cuu Long Delta Rice Research Institute (in Can Tho) to develop and test salt-tolerant rice species.
- Also, research and development is in progress within aquaculture in general and shrimp cultivation in particular, and supportive extension services are available.

Relevance to Cambodia

Conditions in the Vietnamese part of the Mekong Delta resemble those in the low-lying parts of the coastal zone of Cambodia. Both areas have fragile, mangrove-protected

coastlines; and both areas contribute significantly to the countries' food production. Furthermore, the areas are exposed to similar sea level rise and tectonic land subsidence, causing saline intrusion (affecting water supplies and irrigation) and coastal erosion (with loss of land, and damage to coastal embankments and roads). (Cambodia's coastal area is outside the Mekong Basin, however).

Both the exposures and the responsive adaptation initiatives are in a somewhat more advanced stage in Viet Nam.

Experience from the Cuu Long Delta shows that appropriate land use planning can substantially reduce the vulnerability to floods.

Can Tho University is centrally located in the Delta and has built a substantial expertise related to climate change implications and resilience. In 2014, the CCCA organized a successful study tour to the university (and to Soc Trang Province) to learn from the experience, with participation by representatives from Cambodia's coastal provinces and communes, communities, and individual water users in the coastal provinces.

A scope is seen for expanded liaison, for coordinated impact monitoring, and for knowledge-sharing about cause-effect relationships, adaptation planning and mitigation measures.

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Appendix D: Abstracts

All documents are available with the TA Team, and most are available from the Internet.

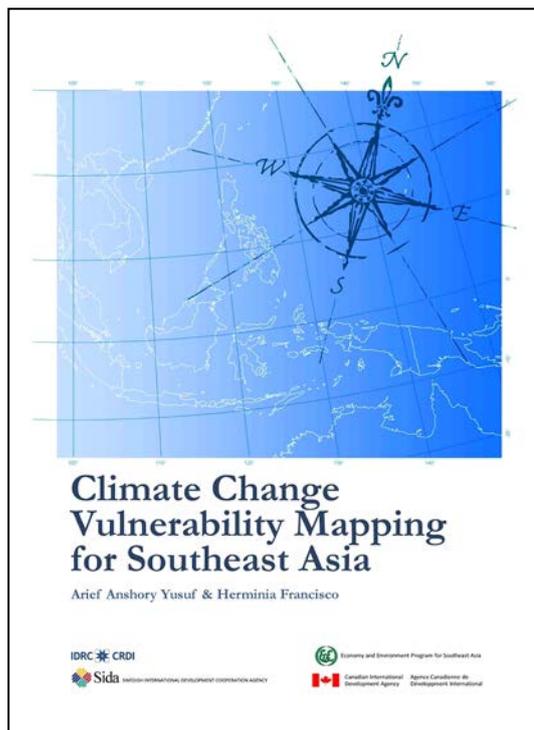
They are listed chronologically, reflecting the evolving agenda for sub-national CCA and DRR.

Disclaimer: The abstracts have been compiled for the purpose of the present document and have not been vetted by the authors.

Index

- D.1 CC vulnerability mapping for SE Asia
- D.2 The commune/sangkat fund project implementation manual
- D.3 Adaptation to CC in the Lower Mekong Basin
- D.4 CC in the Lower Mekong Basin: Synthesis report
- D.5 Water-related assets
- D.6 Impacts of CC and development on Mekong Flow Regimes
- D.7 Social marketing
- D.8 The CPEIR review
- D.9 Community vulnerability and risks from CC
- D.10 Disaster management - country report
- D.11 CC analysis in the Lower Mekong Basin
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- D.13 City climate action planning
- D.14 NCDD implementation and procurement handbook for DRR and CCA
- D.15 Local government and climate change- draft annual report 2016
- D.16 Socially inclusive CCA in the commune development planning
- D.17 The law on disaster management in Cambodia
- D.18 Financing national adaptation plan processes

D.1 CC vulnerability mapping for SE Asia



Yusuf, Arief Anshory and Herminia A. Francisco (January 2009): Climate change vulnerability mapping for Southeast Asia. Prepared under the Economy and Environment Program for Southeast Asia (EEPSEA) (32 pages)

This publication provides information on the sub-national areas (regions/districts/provinces) most vulnerable to climate change impacts in Southeast Asia. The assessment was carried out by overlaying climate hazard maps, sensitivity maps, and adaptive capacity maps following the vulnerability assessment framework of the United Nations' Intergovernmental Panel on Climate Change (IPCC).

The study considers that the CC vulnerability is determined by (1) the exposure; (2) the sensitivity; and (3) the adaptive capacity. The adaptive capacity, in turn, depends on socio-economic factors (poverty, education, etc.), technology (power supply, irrigation), and infrastructure (transport and communication).

The study used data on the spatial distribution of various climate-related hazards in 530 sub-national areas of Indonesia, Thailand, Vietnam, Lao PDR, Cambodia, Malaysia, and the Philippines. Based on this mapping assessment, all the regions of the Philippines; the Mekong River Delta in Vietnam; almost all the regions of Cambodia; North and East Lao PDR; the Bangkok region of Thailand; and West Sumatra, South Sumatra, West Java, and East Java of Indonesia are among the most vulnerable regions in Southeast Asia.

At the time of the study, it was found that Cambodia's high vulnerability was related to a low adaptive capacity, as much as to a high exposure.

D.2 The commune/sangkat fund project implementation manual



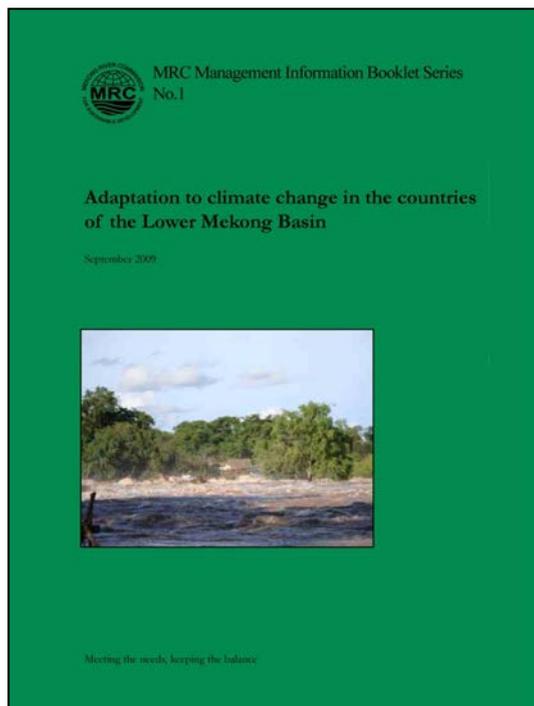
RGC/NCDD (January 2009) (revised October 2017): Commune/sangkat fund project implementation manual, prepared by the National Committee for the Management of Decentralization & Deconcentration Reform (369 pages)

This Manual describes the guidelines and procedures that commune/sangkat (C/S) councils must follow when they implement development projects using the development component of the C/S Fund. For projects funded by other sources of revenue than the C/S Fund, but where the project owner is the C/S Council, these guidelines may also be applied. It describes all the stages of C/S Fund development project implementation that includes project preparation, procurement, project implementation and project monitoring and evaluation. The C/S development planning process and the C/S investment programming are described in other Manuals (see KP-1, NCDDS, September 2017).

The Manual does not cover CCA and DRR aspects directly, but includes detailed procedures and check lists for project classification, scoping, screening, tendering, monitoring, and good practices for implementation. It is intended for

- the C/S chiefs, who are responsible for project implementation in their communes;
- technical staff and consultants who are employed to advise the communes on project implementation;
- NCDDS staff who provide support to the C/S councils;
- staff at Provincial and Ministry level who are responsible for monitoring and evaluating the projects of the C/S Fund;
- NGOs and others who want to understand the operation of the C/S councils; and
- contractors, service providers and goods suppliers who intend to contract C/S Fund projects.

D.3 Adaptation to CC in the Lower Mekong Basin



MRC (September 2009a): Adaptation to climate change in the countries of the Lower Mekong Basin. MRC Management Information Booklet Series No.1 (8 pages)

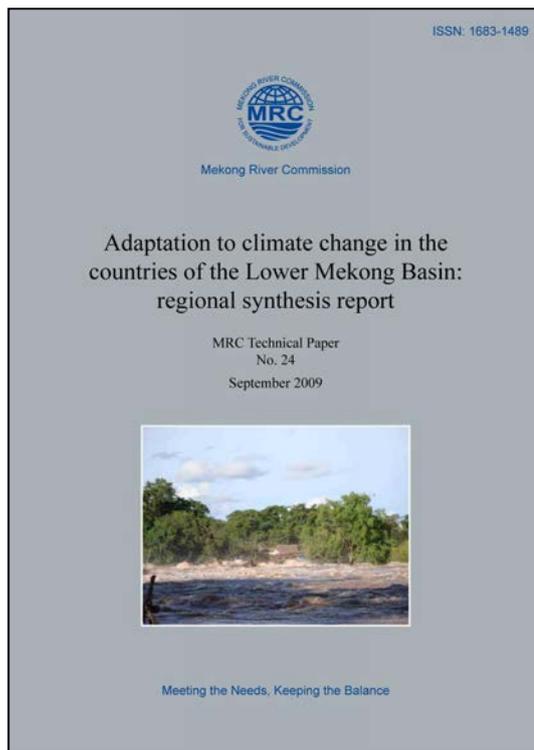
This booklet provides a summary of existing regional and national knowledge on climate change, national responses to climate change, and an overview of stakeholders involved in supporting the LMB Governments and climate change. It concludes by providing a gap analysis and recommendations for priority action for improving the capacity of the LMB countries.

In Cambodia, the study assumes an increase in mean annual temperature of between 1.4 and 4.3°C by 2100. Mean annual rainfall is also assumed to increase, with the most significant increase experienced in the wet season. As with the other countries in the LMB, flooding and droughts are expected to increase in terms of frequency, severity and duration. The potential impacts of climate change include changes to rice productivity, with increases in wet season crops in some areas and decreases in others; acceleration of forest degradation including the loss of wet and dry forest ecosystems; inundation of the coastal zone and higher prevalence of infectious diseases.

The study acknowledges Cambodia's National Adaptation Program of Action to Climate Change (NAPA), and makes the following additional recommendations:

- (i) implementation of CC awareness-raising campaigns;
- (ii) mainstreaming of CC adaptation into development programs;
- (iii) institutionalization of an inter-organizational CC coordination mechanism;
- (iv) integration of CC adaptation into the national budgetary process; \\
- (v) formulation of CC adaptation legislation/policies; and
- (vi) strengthening of CC research.

D.4 CC in the Lower Mekong Basin: Synthesis report

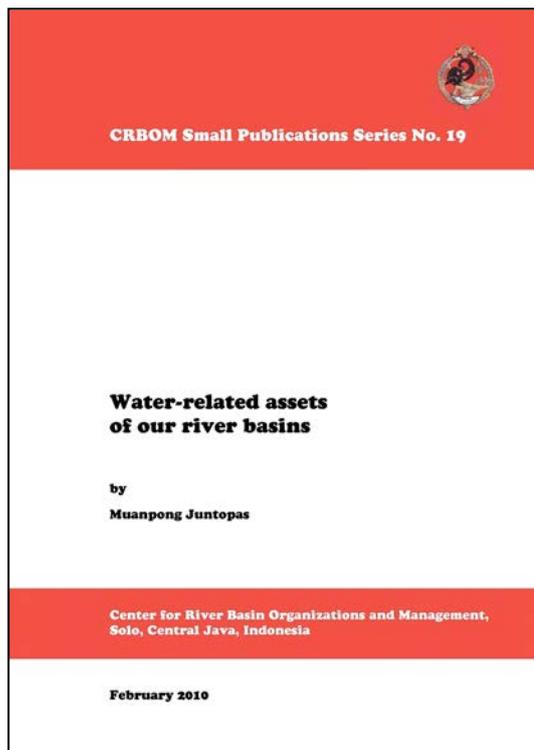


MRC (September 2009b): Adaptation to climate change in the countries of the Lower Mekong Basin: Regional synthesis report. MRC Technical Paper No. 24 (112 pages)

This report captures analyses and recommendations by four national expert teams, one in each member country. It was found that (at that time), Cambodia's CC resilience was affected by the following gaps:

- I. low awareness of CC in the general population;
- II. low awareness of CC at different institutional levels;
- III. low adaptation capacity to CC in the general population;
- IV. low technical knowledge among government agencies & NGOs;
- V. perception of CC as a sector issue rather than a mainstreaming necessity;
- VI. not much CC literature translated into Khmer;
- VII. lack of analytical studies on CC impacts;
- VIII. lack of reliable CC data;
- IX. low progress in implementation of the National Adaptation Program of Action to CC (NAPA);
- X. inadequate financial support for CC initiatives.

D.5 Water-related assets



***Muanpong Juntopas (February 2010):
Water-related assets of our river basins.
CRBOM Small Publications Series No.
19, Center for River Basin Organizations
and Management, Solo, Central Java (12
pages)***

At the basin level, a water-related asset can be taken as a specific feature that is significant for people living in the basin and which provides some environmental, social and/or economic benefits.

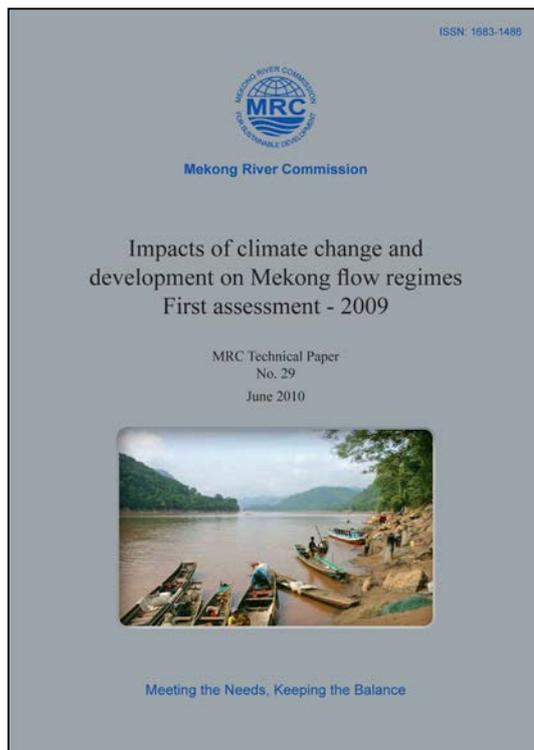
While assets are not entirely overlooked in basin-level planning, they are sometimes given less attention than immediate sector development needs and opportunities.

Water-related assets span across natural resources, livelihoods and culture, and are for that reason well suited for highlighting the linkages between these perspectives. Knowledge and awareness of them can expand the decision basis for development planning, land management, cause-effect analysis and impact prediction. Due regard for assets can assist in identification of 'shared values' within a basin and can contribute to a visionary focus for its long-term development.

Management of assets is not merely about conservation, but can very well be oriented towards pro-active development while paying attention to an appropriate balance between present and future needs.

Illustrated by examples from the Lower Mekong Basin, this paper suggests an asset perspective to be considered as an element in the knowledge base for basin-level planning and management.

D.6 Impacts of CC and development on Mekong flow regimes



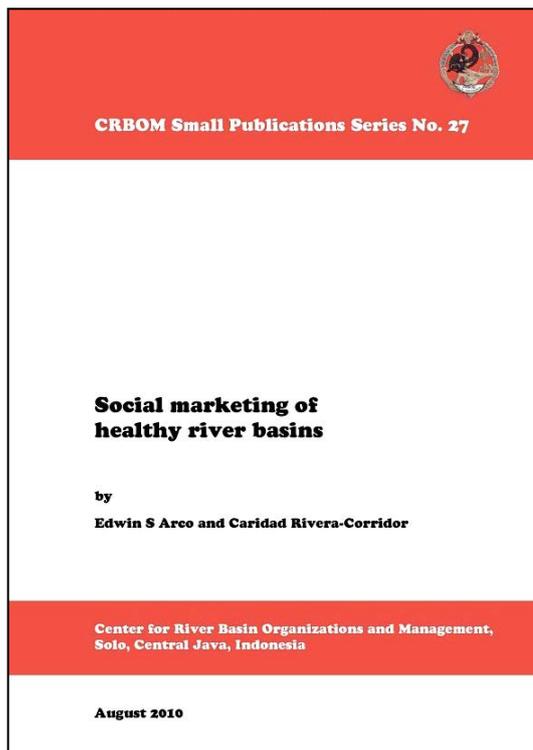
MRC (June 2010): Impacts of climate change and development on Mekong flow regimes - First assessment - 2009. MRC Technical Paper No. 29 (104 pages)

This report captures analyses and recommendations by four national expert teams, one in each member country. It was found that (at that time), Cambodia's CC resilience was affected by the following gaps:

- I. low awareness of CC in the general population;
- II. low awareness of CC at different institutional levels;
- III. low adaptation capacity for CC in the general population;
- IV. low technical knowledge among government agencies & NGOs;
- V. perception of CC as a sector issue rather than a mainstreaming necessity;
- VI. not much CC literature translated into Khmer;
- VII. lack of analytical studies on CC impacts;
- VIII. lack of reliable CC data;
- IX. low progress in implementation of the National Adaptation Program of Action to CC (NAPA);
- X. inadequate financial support for CC initiatives.

The MRC is well placed to develop tools and policy frameworks on assessing the impacts and adaptation strategies on climate change. It is a cross-cutting issue that affects many aspects of the basin including the hydrological regime, environment, ecology, fisheries, agriculture, hydropower generation and social well-being of people living in the basin. Also, MRC can provide independent and balanced advice and information and facilitate awareness building on climate change to its member countries.

D.7 Social marketing



Arco, Edwin S and Caridad Rivera-Corridor (August 2010): Social marketing of healthy river basins. CRBOM Small Publications Series No. 27, Center for River Basin Organizations and Management, Solo, Central Java (18 pages)

Social marketing is the use of traditional commercial marketing for social development. Based on education and awareness-building, social marketing takes on the further step of changing attitudes and improving the behavior of the target group for their own benefit, as well as for the benefit of society as a whole.

Social marketing can be an inexpensive and highly efficient supplement to costly structural developments (such as water supply, sanitation, or flood protection). Sometimes, social marketing is an attractive option in its own right, to achieve some development where formal regulation can be less practical or have unintended side effects (such as the appropriate use of pesticides in agriculture).

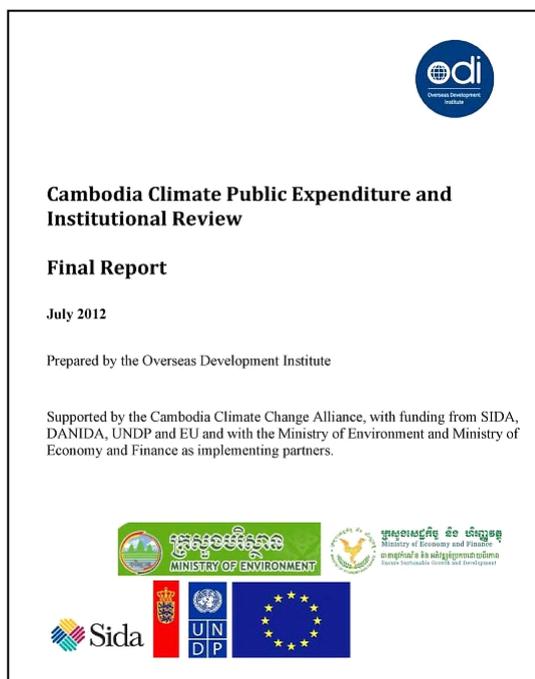
Social marketing for IWRM can give people the behavioral experience that change is not only possible, but can be positive and beneficial for them.

This paper introduces the concept and presents some suggestions on its application, together with an example from Central Cebu, the Philippines.

As in commercial marketing, a sharp (and possibly narrow) delineation of the target group can support a successful outcome, so can a good understanding of the attitudes and motivational factors of the target group.

When promoting a clever message, where everyone stands to win, the question may be asked why this message has not been adopted a long time ago? There may be barriers - perceived or real - to an otherwise desired behavior. Awareness of such barriers, and appropriate ways to get around them, can be important for a successful outcome.

D.8 The CPEIR review

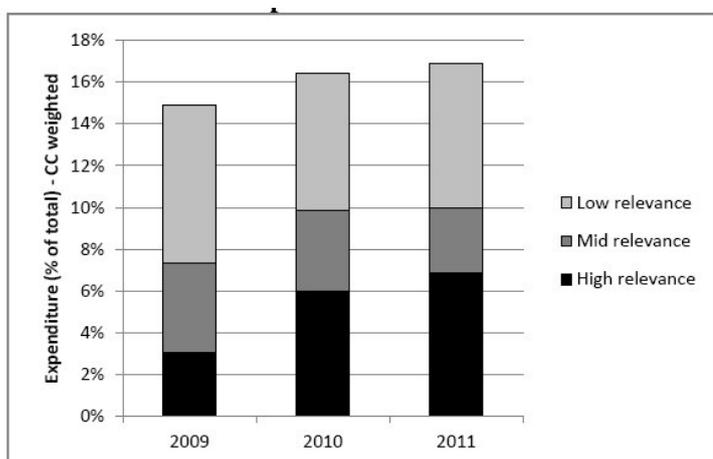


CPEIR (July 2012): Cambodia Climate Public Expenditure and Institutional Review. Prepared for Ministry of Environment and Ministry of Economy and Finance by the Overseas Development Institute with support from Cambodia Climate Change Alliance (119 pages)

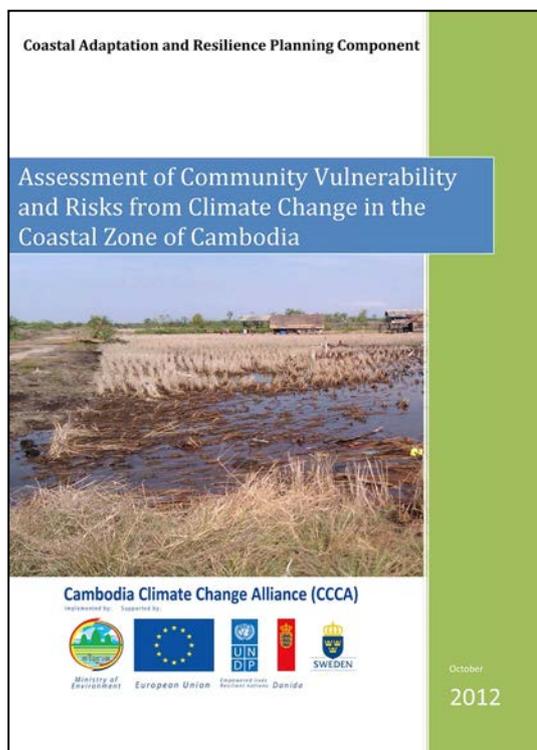
The Cambodian CPEIR took place between March and June 2012 with a background of an NSDP that included specific actions addressing climate change as well as frequent references to climate change in sectoral chapters. Its objective was to show how climate change related expenditure is integrated into the budgetary process, and to review the achievements of climate-related programs and financing schemes in progress at the time, including the LGCC.

The project defined three categories of climate relevance: (i) High relevance programs with clear primary objectives for delivering concrete and visible outcomes that improve climate resilience or contribute to mitigation; (ii) Mid relevance programs that make strong contributions to adaptation or mitigation but are motivated primarily by broader development concerns; and (iii) Low relevance programs that contribute to adaptation and mitigation only indirectly. The observed expenditures are shown in the figure below.

Climate-related expenditure as percent of total public expenditure



D.9 Community vulnerability and risks from CC



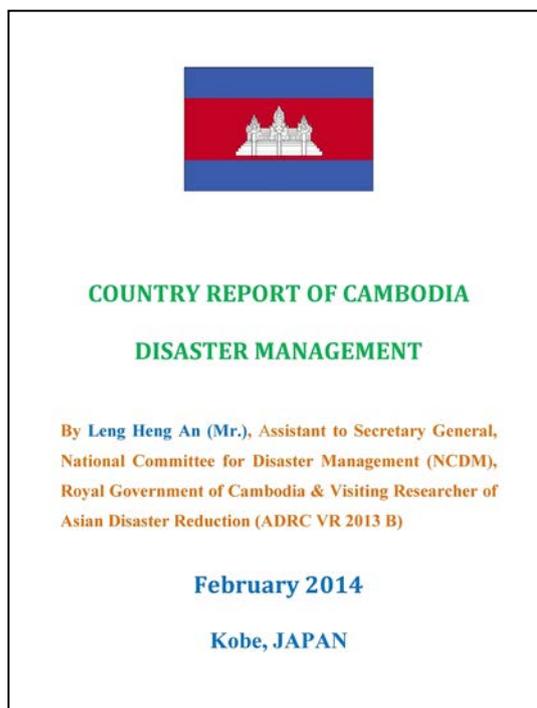
CCCA (October 2012): Assessment of community vulnerability and risks from climate change in the coastal zone of Cambodia. Prepared under the Coastal Adaptation and Resilience Planning (CARP) Component (120 pages)

Cambodia's coastal zone is threatened by severe climate change impacts, as storms, storm surges, sea level rise and seawater intrusion. This report is an assessment of vulnerability and risk to livelihoods in relation to current climatic conditions and projected trends with a view to introduce alternative or modified livelihoods.

Sea Level Rise (SLR) combined with a decline in mangrove vegetation and an increase in the frequency and intensity of storms and storm surges, has already led to some coastal inundations. A consequence is the salinization of the land surface as well as the groundwater, impacting the fertility of farming areas as well as freshwater ecosystems. This poses a threat to food security and livelihoods because most agriculture in the coastal zone is concentrated on these flood-prone low-lying coastal areas. The infrastructure in the coastal zone also comes under pressure, which can lead to an increased vulnerability over time and lost income and revenue from tourism.

Storms occur almost every year from mid-October and through December. However, with climate change causing more variable weather, there may be an increase in the intensity and frequency of flooding events. Flooding, heavy rainfall and storms destroy property and productive assets, such as crops and livestock. Flooding will often lead to poor water supply and unsanitary/unhygienic conditions, causing serious health issues and serious disease outbreaks. An increased frequency of storms will also affect cultivation, fisheries and coastal erosion. Droughts or heat waves will ultimately cause problems regarding water scarcity.

D.10 Disaster management - country report



Leng Heng An (February 2014): Disaster management - country report of Cambodia. Asian Disaster Reduction Center (ADRC), Kobe, Japan (27 pages)

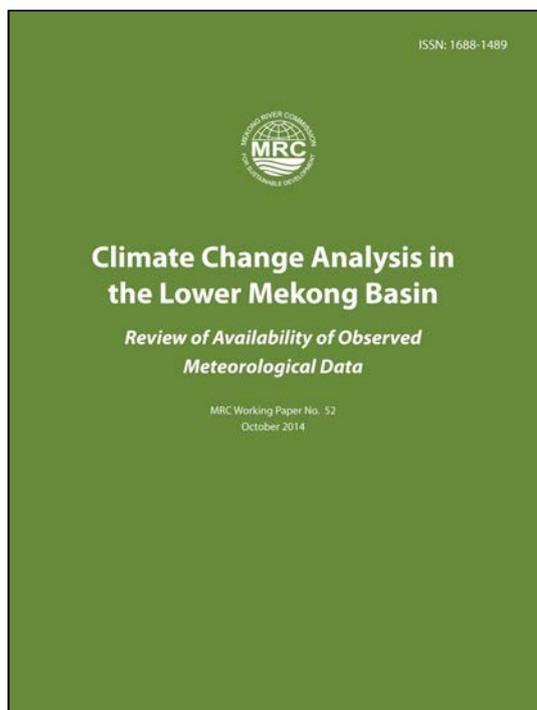
As the majority of Cambodians are farmers and their livelihoods mainly depend upon agriculture, the vulnerability of people living in rural areas is very high and may continue to rise, requiring improved preparedness and planning.

In 2011, floods affected 350,000 households (over 1.5 million people) and 52,000 households were evacuated. 18 (out of 24) provinces in Cambodia were affected. 431,000 hectares of transplanted rice fields were affected and 267,000 hectares of rice fields were damaged. 925 kilometers of the national, provincial and urban roads were affected and 360 kilometers of the roads were damaged. The 2011 floods caused an estimated loss at 630 million USD.

In 2013, floods affected 20 provinces, 377,354 households and claimed 168 lives and forced 31,314 households to evacuate themselves to safe areas. Compared to the floods in 2011, floods in 2013 appear to have been less extensive in scale although in some provinces the impact – including number of evacuated families, damaged crops, damaged infrastructure – was more significant due to a combination of factors, such as the unexpected nature of the floods, both in extent and intensity, longer time for waters to recede, repeated floods and flash floods, limited preparedness undertaken in advance, and limited early warning.

In 2009, 13 provinces were affected by severe droughts. 57,965 hectares of rice crops were affected and 2,621 hectares were destroyed. In 2010, 12 provinces were affected by severe droughts. 14,103 hectares of transplanted rice were affected by droughts, 3,429 hectares of transplanted rice seedlings and 5,415 hectares of subsidiary crops were damaged. In 2011, drought affected 3804 hectares of rice fields and destroyed 53 hectares. In 2012, drought was recorded in 11 provinces affecting 14,190 hectare of rice fields and destroyed 3151 hectares.

D.11 CC analysis in the Lower Mekong Basin



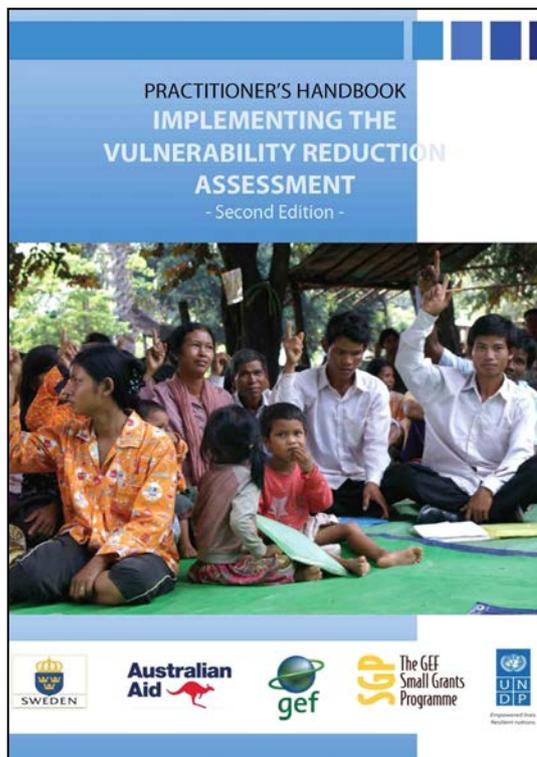
MRC (October 2014): Climate change analysis in the Lower Mekong Basin; review of availability of observed meteorological data. MRC Working Paper No. 52 (76 pages)

The Climate Change and Adaptation Initiative (CCAI) of the Mekong River Commission (MRC) was established in August 2009 as a regional collaborative initiative to support the Lower Mekong Basin (LMB) countries in adapting to the impacts and new challenges of climate change. Adopting a basin-wide integrated approach, the CCAI focuses on: (i) climate change impact and vulnerability assessment, adaptation planning and implementation in priority locations within the LMB; (ii) knowledge and capacity building at different levels (institutional, technical and managerial capacity); (iii) regional adaptation strategy supporting national frameworks; and (iv) regional partnership and collaboration for sustainability of adaptation actions.

Meteorological data (precipitation, temperature, evaporation, etc.) are important for climate monitoring and historical climate change analysis such as trend analysis as well as the analysis of trends for extreme weather events. It is also necessary for future climate change projections. Since the establishment of the Mekong Committee in 1957, the riparian countries have shared a significant amount of meteorological and hydrological data for project development, design and operation. However, the current hydromet database in the MRC Secretariat (MRCS) primarily stores data on flow and rainfall data while other meteorological data (temperature, evaporation, humidity, etc.) still have limited coverage.

To analyze climate change and its impacts, long-term meteorological data are required. Therefore, the aim of this review of the availability of meteorological data in the riparian countries is to assess the current status and gaps of meteorological data in the LMB for supporting climate change adaptation planning at different levels.

D.12 The UNDP VRA handbook



**UNDP Cambodia (December 2014):
Practitioner's handbook: Implementing
the Vulnerability Reduction Assessment.
2nd Edition. Phnom Penh, Cambodia (95
pages)**

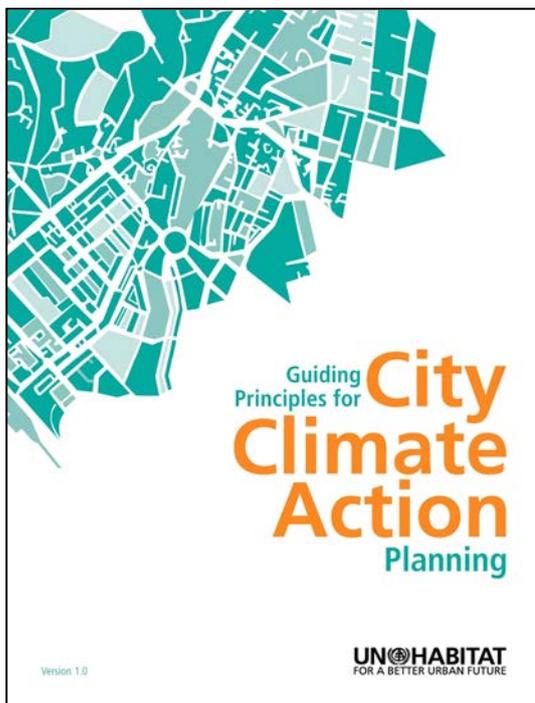
This handbook is intended for CCA practitioners, donors, NGOs, community-based organizations, government agencies, and development service providers, to support their implementation of the Vulnerability Reduction Assessment (VRA) methodology and the design of climate change vulnerability reduction projects that reflect community needs. It provides basic preparatory guidance, and a step-by-step process to investigating and establishing a baseline that outlines climate change vulnerability perceptions, impacts, adaptive capacities, and barriers to adaptation capacity development in the context of climate change resilience building.

The handbook describes a modality for a community-level VRA data analysis. It outlines good practices for stakeholder participation, along with check lists for consultation workshops.

It applies the 'H-Form' with four questions, used to capture information on different aspects of climate change including an analysis of current and future CC risks and impacts, resources and strategies used to reduce the impacts of CC, barriers to adaptation, and adaptation capacity building support needed to reduce the CC vulnerability.

Also, the handbook provides guidance on how to prepare a concise and useful VRA report.

D.13 City climate action planning



UN-Habitat (April 2016): Guiding principles for city climate action planning. United Nations Human Settlements Programme (UN-Habitat), Nairobi (40 pages)

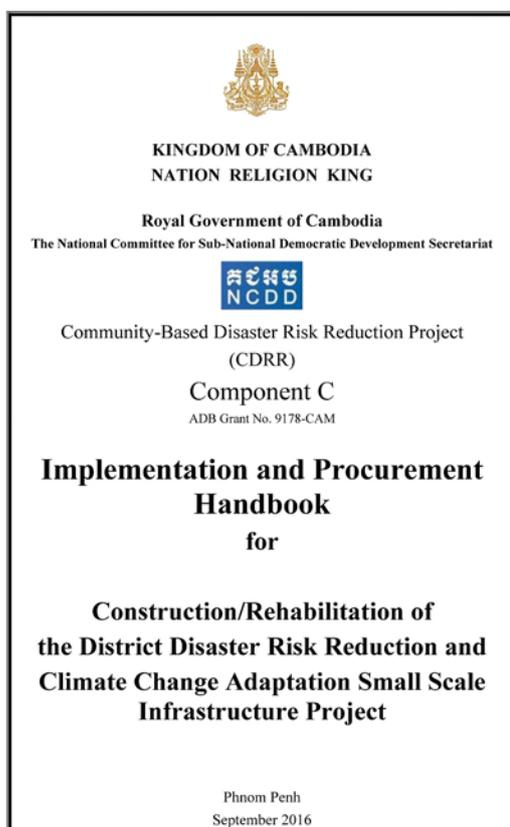
This publication reviews typical steps in the city-level climate action planning process in light of a proposed set of globally applicable principles. These principles, listed below, developed through a robust and open multi-stakeholder process, support local officials, planners and stakeholders in climate action planning. Such plans aim to help cities to reduce greenhouse gas emissions and adopt low emission development trajectories, as well as adapt to the impacts of climate change and build local climate resilience.

City climate action planning should be:

- I. ambitious;
- II. inclusive;
- III. fair;
- IV. comprehensive and integrated;
- V. relevant;
- VI. actionable;
- VII. evidence-based; and
- VIII. transparent and verifiable.

These Guiding Principles are intended to be applied flexibly, together with more detailed 'how-to' manuals, to help cities more effectively play their role in reducing greenhouse gas emissions and building climate resilience.

D.14 NCDD implementation and procurement handbook for DRR and CCA



NCDD (September 2016): Implementation and procurement handbook for construction/rehabilitation of the district disaster risk reduction and climate change adaptation small scale infrastructure projects. Prepared under the Community-Based Disaster Risk Reduction Project (CDRR), Component C (93 pages)

This handbook provides all information needed to implement small-scale DRR and CCA initiatives at the district level under the Community-Based Disaster Risk Reduction Project (CDRR).

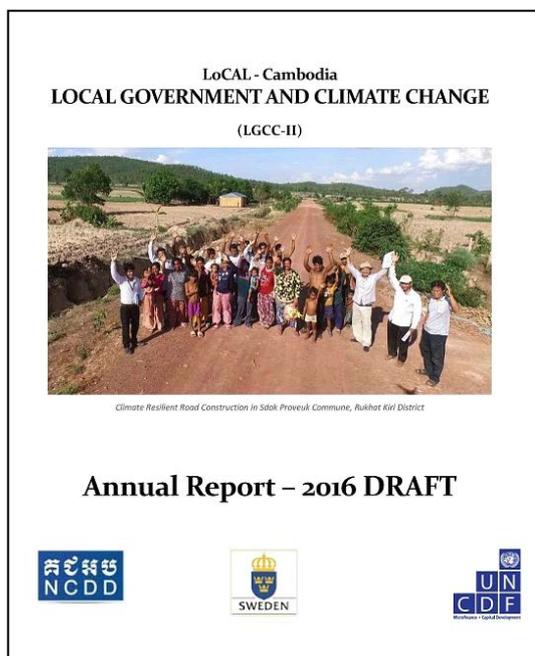
It provides step-by-step information on the process until completion of the project, to assist in administrative and technical matters. It also describes how to proceed with the work in accordance to established government guidelines and regulations for procurement of works by the district administration.

The procurement will take place according to the most recent government regulations regarding operations at the district level. These requirements, to be strictly followed, are reflected in this handbook.

If well organized, the bidding period, the bid evaluation and recommendation for award should be completed within a period of 8 weeks, so that construction can start without undue delays.

The CDRR project team at NCDDSDS will arrange training on the application of this handbook to all District Procurement Committees and other relevant persons who are involved in DRR and CCA funds implementation. Also, throughout implementation of the CDRR project, the project team will monitor the work undertaken and provide technical backstopping as needed.

D.15 Local government and climate change- draft annual report 2016



LGCC (March 2017): Local government and climate change- draft annual report 2016. Prepared by NCDs under the LoCAL Cambodia Project (62 pages)

(Additional information extracted from <http://www.uncdf.org/local/cambodia>)

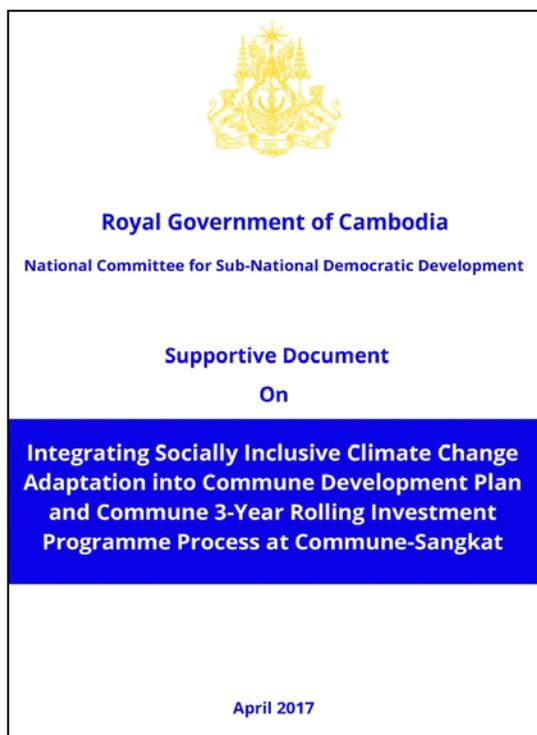
The LGCC project was implemented from 2011 to 2018 by NCDs with financial support (4.5 million USD) from the UN Capital Development Fund (UNCDF) and the Swedish International Development Cooperation Agency (SIDA).

Cambodia is expected to experience increased variation in, and intensity of, precipitation. Over 2 million farming households, or over 8 million people, rely heavily on the climate for their livelihoods. Coastal communities and ecosystems will be affected by sea level rise. Low-lying areas will be increasingly prone to floods while the higher areas are likely to experience more incidences of drought. Increases in temperature and humidity may create conditions of increased health risk to humans and an exacerbation of diseases in crops and livestock. These changes will amplify and compound already existing development challenges.

On this background, the LGCC has built a comprehensive sub-national capacity for CCA and DRR mainstreaming into development and investment planning, supported by awareness-building, practical procedures and guidelines, targeted financing, collaboration between district/municipal and commune/sangkat councils and administrations, and by implementation of pilot and demonstration projects.

LGCC is implemented within the gender mainstreaming framework of the National Program for Sub-National Democratic Development (NP-SNDD) (launched in August 2010) and includes specific measures to ensure that women's views and interests are represented at all stages of implementation. Environmental and social safeguards have been developed to comply with World Bank standards.

D.16 Socially inclusive CCA in the commune development planning



NCDD (April 2017): Integrating socially inclusive CC adaptation into the commune development planning and the commune 3-year rolling investment programme process. Supportive document prepared by the National Committee for Sub-National Democratic Development for the Royal Government of Cambodia (38 pages)

Erratic rainfall patterns have been a noticeable trend for several decades in Cambodia, especially in recent years. The 10-year Cambodia CC Strategic Plan (2014-2023) estimates that temperatures will continue to rise and rainfall levels in the dry season will decrease along with a delay in the arrival of the rainy season.

In response to these challenges, the Cambodia CC Strategic Plan has introduced appropriate measures at both the national and the sub-national levels. The NCDD Secretariat, with technical assistance from the UN World Food Programme, has prepared the present Supportive Document, which builds on national and sub-national consultations in May and June 2016 with practical testing in 12 communes of 6 districts in 3 provinces, Kampong Thom, Siem Reap and Pursat, in August 2016.

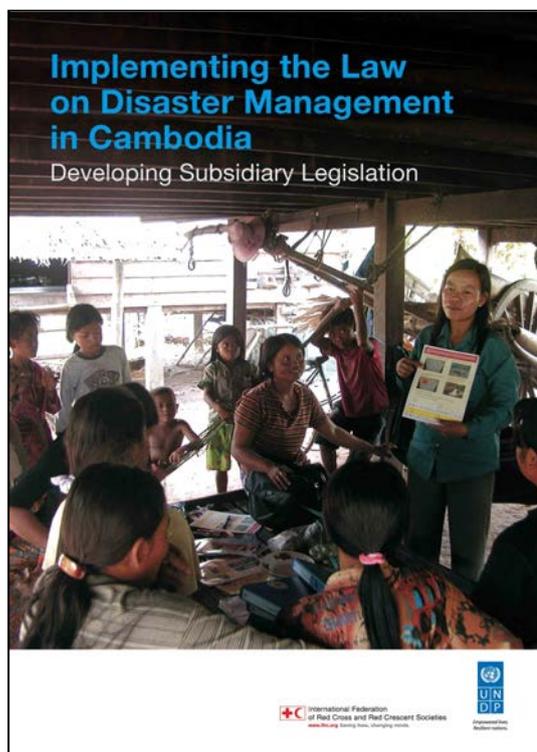
The document provides tools and modalities for determining the priorities related to the adaptation to CC, with a particular view to the community level, with guidance for the commune councils and the commune/ sangkat planning and budget committees for their discussions with vulnerable groups in the community about their problems emerging from CC, and finding suitable solutions for incorporation in the commune-sangkat development plans and 3-years rolling investment programs.

An exposure and impacts calendar



The document describes tools for CC impacts analysis; social services mapping; and seasonal calendars for CC exposures and impacts.

D.17 The law on disaster management in Cambodia



Humayun, Salman and Mary Picard (June 2017): Implementing the Law on Disaster Management in Cambodia - developing subsidiary legislation. Published by the International Federation of Red Cross and Red Crescent Societies (IFRC) and the United Nations Development Programme (UNDP) (64 pages)

In June 2015 Cambodia's legislature passed the Law on Disaster Management. This represents a major shift from an institutional system for disaster management based only on subsidiary legislation, which had been in place since 1995, to a broader and more authoritative legislative mandate on disaster management. The DM Law aims to regulate disaster management in Cambodia and has three stated goals:

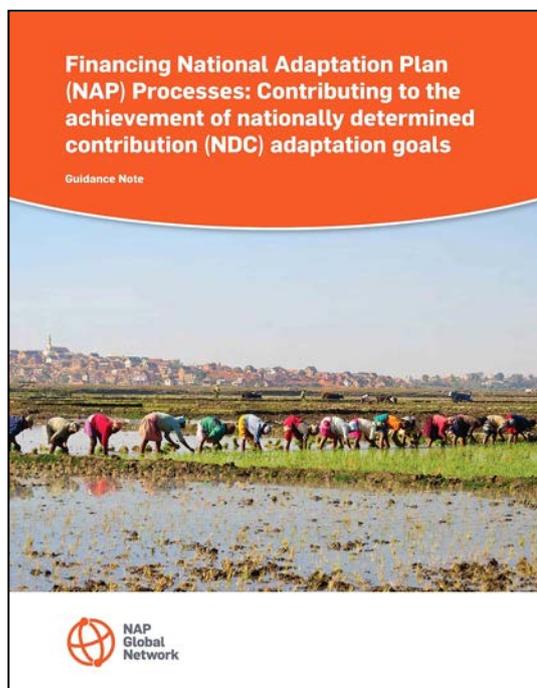
- Prevention, adaptation and mitigation in the pre-disaster period due to natural or human-made causes;
- Emergency response during the disaster;
- Recovery in the post-disaster period.

In addition, the law clarifies that hazard risk prevention programs are needed to address climate change adaptation.

The DM Law formalizes the National Committee for Disaster Management (NCDM) as the main authority of the Royal Government of Cambodia (RGC) on disaster management, and mandates it to 'lead, administer and coordinate all disaster management activities. The NCDM is to be supported by a Secretariat, focal points in line government ministries, and Sub-National Committees for Disaster Management down to the local level, which has a key operational role.

The DM Law, like most legislation in Cambodia, provides an '*umbrella*' mandate that relies on subsidiary legislation to be made by the executive branch, the Royal Government of Cambodia (RGC), to provide for more detailed implementation. Royal decrees and sub-decrees, together with the principal law, will provide the basis for policies, plans and implementation strategies on disaster management.

D.18 Financing national adaptation plan processes



IISD (July 2017): Financing national adaptation plan (NAP) processes - contributing to the achievement of nationally determined contribution (NDC) adaptation goals. Guidance note. International Institute for Sustainable Development (IISD) (74 pages)

Many developing countries are demonstrating their commitment to preparing for and adapting to the impacts of climate change by initiating national adaptation plan (NAP) processes. Concurrently, most have also included an adaptation component in their nationally determined contributions (NDCs) to fulfillment for the purpose of the Paris Agreement. These initiatives can be complementary and reinforcing. NDCs enable countries to share their adaptation goals, objectives, priorities and actions with the international community while NAP processes provide a concrete means for successful achievement of these initiatives.

Financing is needed throughout the entire NAP process to enable its potential to be reached - from its initiation to the implementation, monitoring and evaluation of prioritized adaptation actions. The amount of financing needed by countries will vary depending on their circumstances, but is expected to be significant. This guidance note aims to assist countries with the development of strategies for securing this funding. Specifically, it has the following objectives:

- To provide a clear understanding of the NAP process from a financing perspective;
- To present the range of potential sources of finance and identify which sources may be more appropriate for different phases of the NAP process;
- To suggest practical steps that countries might take throughout the NAP process to increase their likelihood of securing finance from different sources.

Practical guidance is also provided in subsections labeled '*Key issues for consideration.*' These subsections identify issues governments might want to take into consideration when assessing the appropriateness of a financing source given their needs and circumstances and when taking concrete steps toward accessing this source.