ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESEARCH

Climate Adaptation Framework
Regional Research Final Report



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Assessing the Linkages between Climate Change Adaptation (CCA), Disaster Risk Reduction (DRR), and Loss and Damage (L&D): Case Studies in the Low-lying Coastal Cities of Indonesia, Philippines, Thailand and Vietnam

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Project Overview

Project Duration	**:**	2 years (with extension)
Funding Awarded	**:**	US$ 32,000 for Year 1; US$ 45,600 for Year 2
Key Organizations Involved	**:**	**MAIN PROJECT LEAD** Philippines: Dr. Rodel D. Lasco, Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation, Inc. (The Oscar M. Lopez Center) **REGIONAL COLLABORATORS** Indonesia: Dr. Rizaldi Boer, Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific (CCROM-SEAP) Thailand: Mr. Suppakorn Chinvanno, Global Change System for Analysis, Research and Training - Southeast Asia Regional Center (START-SEA RC) Vietnam: Dr. Nguyen Huu Ninh, Center for Environment Research Education and Development (CERED)

Project summary

Climate-related disaster events are common phenomena in Southeast Asia (SEA), particularly in the low-lying major cities of Cambodia, Indonesia, Philippines, Thailand, and Vietnam. The projected changes in climate are expected to worsen the impacts of these climate-related disaster events, hence, science and policy communities have come to recognize the importance of promoting and supporting a development agenda that is climate-sensitive and disaster resilient. With this in mind, the project tried to link loss and damage (L&D), disaster risk reduction (DRR) and climate change adaptation (CCA) synergistically through (1) reviewing existing frameworks for assessing L&D due to climate-related disasters; (2) identifying emerging issues, gaps and opportunities in linking CCA, DRR and L&D assessment; (3) developing a robust framework in linking CCA, DRR and L&D assessment; and (4) recommending research and development (R&D) and policy agenda for implementation. The project employed a series of participatory approaches to gather relevant information about the topic. It also involved key actors from the communities and experts from various sectors (science, policy, and private). Ultimately, the main goal of the project is to reduce or avoid L&D, decrease vulnerability, and increase resiliency at the local, national, regional, and even up to the global level.

Keywords: *Loss and damage, climate change adaptation, disaster risk reduction, climate-related disasters, resilience*

Project outputs and outcomes

Output	Outcome
An analysis of the current L&D assessment system in Indonesia, Philippines, Thailand and Vietnam showed emerging gaps, challenges and opportunities in addressing L&D assessment and in linking this with CCA and DRR, such as: • While these countries have existing L&D assessment tools and mechanisms, there is a need to make them more responsive to the needs each country. • Issues with regard to data, governance, translation, funding, sector-specific risk assessment, technical capacity, and partnership are among the key challenges.	Increased awareness and deeper understanding of the current state of L&D assessment in the vulnerable areas in Southeast Asian Region, which can lead to the identification and prioritization of appropriate initiatives and interventions in addressing the worsening impacts of climate-related disasters, and to strengthening the linkages among L&D, CCA and DRR.
A Regional Framework which highlights the linkages between L&D, CCA, and DRR was developed. This aims to reduce or avoid L&D, decrease vulnerability, and increase resilience at the local, national, regional, and global levels. National frameworks were also developed.	Strengthened capacity to address L&D interlinked with CCA and DRR through a guiding framework which will direct all of the initiatives towards achieving community and ecosystems resilience.
Recommendations for potential R&D and policy-relevant agenda to address the gaps were also determined. These recommendations include: • data gathering and management mechanisms on L&D; • governance system in addressing the L&D, CCA and DRR linkage; • translation of knowledge products into concrete actions; • finance mechanisms to fund appropriate initiatives in addressing L&D, CCA and DRR; • promotion of sector-specific risk assessment; • strengthening the technical capacity of key actors on L&D assessment; and • reinforcement of strong partnership between and among key actors and relevant stakeholders involved or may contribute in the assessment.	Increased opportunity to improve the existing L&D assessment system by validating the gaps, opportunities, especially in the vulnerable countries of Southeast Asia.

Key facts/figures

a. Scientific Publication and Knowledge Products
   - No. of conference papers (international) - 3
   - No. of conference poster presentations (national) – 2
   - No of Infographics produced – 4
   - No. of Journal Articles published/submitted – 2 (1 article is under review, 1 is published under *Climate and Development Journal*)
   - No. of science-policy briefer produced – 2
   - No. of published workshop report and handbook - 2

b. Events
   - No. of workshop/meetings/case studies organized– 14
   - No. of Science-Policy fora organized – 3
   - No. of lectures conducted - 6
   - No. of conference oral presentations (international, local) - 23

c. Reach
   - No. of people surveyed – 406
   - No. of people who participated in the events organized – 594
   -

d. Partners and Sponsorships
   - No. of experts engaged – 59
   - No. of institutional links established – 42
   - No. of partners who sponsored travel/activities - 5

Potential for further work

Key findings and outputs of the project revealed that there are other possibilities to further expand the project in the future. Some of the specific research and development areas and activities that can be explored are as follows:

- Identify and test appropriate tools/mechanisms for inclusion in the Regional L&D Framework
- Develop a web-based app for L&D info management system (for recording, archiving, retrieval, etc.)
- Conduct trainings for the development planners, policy makers, and other relevant key actors on the step-by-step process on how to operationalize the Regional L&D Framework
- Present the L&D Framework in the international fora and climate negotiations to gather relevant inputs that may help further improve the framework making it replicable in other countries and regions.
- Contribute to the existing global and national agreement and mechanism on L&D which focuses on the approaches to address L&D associated with the impacts of climate-induced disasters such as the Warsaw International Mechanism for L&D by sharing the project's findings and writing policy-relevant papers and briefs.

Publications and Knowledge Products

Journal Article

- Gabriel, A.V., Pulhin, P. M., and Lasco, R. (nd). State of Loss and Damage Assessment System in the Philippines and the Proposed L&D Framework (submitted to the Climate and Development Journal for review). Also available at: https://drive.google.com/open?id=0B4hwFOVJ_jlkQ3Y2UEVsRnROWm8
- Hop H.T.B, Ninh N.H, Hien L.T.T. (2017). The Role of Traditional Ecological Knowledge in the Disaster Risk Management Strategies of Island Communities in Cat Hai, Vietnam. *Climate, Disaster and Development Journal. 2(2). 23-32.* DOI - https://doi.org/10.18783/cddj.v002.i02.a03

Conference Paper

- Gabriel, A.V., Pulhin, P., and Lasco, R. (2015). Assessing the linkages between CCA, DRR, and loss and damage in the Philippines*. Proceedings of the Resilient Cities 2015 Congress.* Also available at: http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Resilient_Cities_2015/RC2015_congress_proceedings_Gabriel__Pulhin__Lasco.pdf
- Hop H.T.B. (2016). Linkage between Risk Perspective and Disaster Risks in Cat Hai Island Story. Paper presented at the 2016 Summer Institute for Disaster and Risk Research. Beijing Normal University, China.
- Ninh, N. H. and Hop, H.T.B. (2016). Vietnam ENSO Study. Paper presented at the ThinkShop– a side event of COP 22. University of Colorado, Marrakech, Morocco.

Science-Policy Brief and Workshop Report

- Gabriel, A.V., Pulhin, P. M., Lasco, R., and Baclayo, T. P. (2015). Development Implications of Assessing Loss and Damage in the Philippines. Science-Policy Brief Vol. 3 Issue 3. The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation, Inc. Pasig City, Philippines. 2 pp. Also available at: https://drive.google.com/file/d/0B_VqwmZCEk80MWdOT2JXcmR6cVU/view
- Gabriel, A.V., Pulhin, P. M., and Lasco,R. D. (2015). Workshop Report on Linking Loss and Damage with Climate Change Adaptation, and Disaster Risk Reduction in the Philippines. The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation Inc. Also available at: https://drive.google.com/file/d/0B3IBWrvXyOuqR2gtbF90ekdVWnM/view
- Ninh, N. H. and Hop, H.T.B. (2015). Linkage between Climate Change Adaptation (CCA), Disaster Risk Reduction (DRR), Loss and Damage (L&D) – Vietnam Case. Center for Environment Research, Education and Development (CERED). Also available at: https://drive.google.com/open?id=0B4hwFOVJ_jlkNF9UQ1dzOHRIR0E
- The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation Inc. (2017). The Links Between Loss and Damage, Climate Change Adaptation, and Disaster Risk Reduction *Briefer.* Also available at: https://drive.google.com/file/d/0BzbudTixMEIZWjR5Tlo0UEdvb2M/view

Other IEC materials

- Gabriel, A.V., Pulhin, P. M., Lasco, R., and Baclayo, T. P. (2015). Development Implications of Assessing Loss and Damage in the Philippines. Poster presentation at the Asia-Pacific

Economic Cooperation (APEC)'s Senior Disaster Management Officials Forum, Iloilo City, Philippines, 22-23 September 2015 and at the 4th National Climate Conference, Pasay City, 23 September 2015 . The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation, Inc. Also available at: https://drive.google.com/file/d/0B4hwFOVJ_jlkbTkyZkdlMHItb2s/view

- Ninh, N. H. and Hop, H.T.B. (2016). The Assessment of L&D for Reducing Disaster Risks. *Handbook*. Hanoi, 12p (in Vietnamese). Also available at: https://drive.google.com/open?id=0B4hwFOVJ_jlkNWQ3enp0R0hqazQ
- The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation Inc. (2016). Infographic Part 1 – General knowledge on loss and damage. Also available at: https://drive.google.com/open?id=0Bx1jC_Sg7aqMQ0xPUkc1WU83aGs
- The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation Inc. (2016). Infographic Part 2 – Loss and damage in Southeast Asia. Also available at: https://drive.google.com/open?id=0Bx1jC_Sg7aqMVlRsdXhJenA5TGc
- The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation Inc. (2016). Infographic Part 3 – Loss and damage in the Philippines. Also available at: https://drive.google.com/open?id=0Bx1jC_Sg7aqMZTNTTlhlYlcteHM
- The Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation Inc. (2016). Infographic Part 4 – Ways to reduce loss and damage. Also available at: https://drive.google.com/open?id=0Bx1jC_Sg7aqMU2V6M01ZclMyNU0

Pull quote

"This is a great framework considering that we are yet to establish one, this is a very good attempt. That's why we are here to refine the needs of this country considering the global aspects, but we need to consider how we relate this to the scenario in the Philippines. I agree with Dr. Ebinezer Florano that we need to identify what's the cause of it, who are involved, what are the methods and what are the data involved and standardization of data needed. The intent of the framework will not just focus on compensatory. We have no mechanism yet in the country. We are even trying to lobby the concept of predictability. When will that be? While we wait, we suffer. This will have to be established because we want no L&D. We are trying the first approach here - having no L&D. There is a long work ahead of us. We have to put in your mind that this is something we need to act on. These are the important things we need to consider - the methodologies on gathering data and standardization and the definition of L&D. The Department of Environment and Natural Resources is doing its best to establish the database and then put value into it. This will be an integration and harmonization of all outputs." – *Commissioner Noel Gaerlan, Philippines Climate Change Commission during the Science-Policy Forum*

"I commend the framework, it is the first time I see this kind of framework that links L&D, CCA and DRR. Our job is to popularize L&D especially to the vulnerable countries." – *Dr. Ebinezer Florano, Professor, University of the Philippines Diliman, National College of Public Administration and Governance (UPD-NCPAG) during the Science-Policy Forum*

"Dealing with L&D is not merely about climate change, it's about development." – *Prof. Rizaldi Boer (Executive Director of CCROM SEAP)*

"Research on environmental economics is an important field in the National Economics University generally, in the faculty of Environment and Urban. The project gives us a view that the research on linkages between CCA, DRR and L&D is really important when we have to face up-ward trends of climate change and disaster impact. With background on environmental economics, it is so great that we can understand more about our role in CCA, DRR activities. Hence; we can contribute more to the resilience of our country. I am also happy when [the] project held a lecture in our University, which has provided profound knowledge on this field for not only students in our faculty but also lecturers. We are waiting for further opportunities to work with partners in the framework." - *Dr. Le Thu Hoa – Dean, Faculty of Environment and Urban, National Economics University, Hanoi, Vietnam*

"Hai Phong is a vulnerable coastal province in Vietnam, annually the city suffer storms and flooding. The knowledge provided in a lecture in Hai Phong helps us to enhance our knowledge in terms of L&D assessment and disaster prevention/post-disaster actions. We suppose that the Hai Phong Union of Science and Technology Association could proactively work with local authorities, CERED and other partners in the framework to develop our city's resilience system." - *Mrs. Hoang Minh Ngoc - Hai Phong Union of Science and Technology Associations, Vietnam*

Acknowledgments

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1. Introduction

There is a growing recognition among scientists that the world's population will be exposed, if not already exposed, to the impacts of climate change (IPCC, 2013). Several reports have highlighted that Southeast Asia (SEA) in general, and more particularly Cambodia, Indonesia, Philippines, Thailand, and Vietnam, have been and are currently bearing the brunt of the effects of extreme climate-related events such as flooding, sea level rise, and tropical cyclones, which are likely to increase in the future (Harmeling & Eckstein, 2013; IPCC, 2012; United Nations, 2013). Most of the major cities in these countries are concentrated in low-lying areas, making their populations more and more vulnerable to these events (IPCC, 2012). In recent years, these areas including Manila, Bangkok, Hanoi, Jakarta, and Siem Reap have experienced severe flooding as influenced by monsoon and tropical cyclones causing billions worth of damages to infrastructure (urban and rural), agriculture (including loss of livelihoods) and private properties (Harmeling & Eckstein, 2013; Maiti, 2007).

Climate-related events in Southeast Asia

Southeast Asian countries such as Indonesia, Philippines, Thailand, and Vietnam are not new to extreme weather-related events and its accompanying disasters. They have experienced and are still experiencing numerous climate-related disasters, especially floods, droughts, and tropical cyclones (UNCCD & IFAD, 2009). Their coastal cities are especially vulnerable due to higher exposure to various risks. In the recent report of Germanwatch (Sönke, et. al., 2015), the Philippines, Vietnam, Thailand, and Indonesia ranked 4th, 7th, 9th, and 66th respectively as the most affected by extreme weather events from 1995 – 2014, making them among the most vulnerable to the impacts of climate change. According to Pachauri & Reisinger, (2007), the heavy reliance of these countries on agriculture and natural resources contributes greatly to their vulnerability.

Meanwhile, a study on the Long-Term Climate Risk Index (CRI) of SEA countries show that the countries most affected by climate variability from 1994 to 2013 are the Philippines and Vietnam, with a CRI of 19.50 and 23.50, respectively (Harmeling & Eckstein, 2013). In 2013, Philippines, Cambodia, and Vietnam were all included in the top ten countries most affected by climate-related disasters with a CRI of 2.17, 6.67, and 17.83, respectively (Kreft, Eckstein, Junghans, Kerestan & Hagen, 2015). The high risk index is mainly due to various extreme events that happened during that year such as Typhoon Haiyan in the Philippines, intense floods in Cambodia, and heavy precipitation in Vietnam.

In terms of vulnerability in SEA, all the regions of the Philippines, the Mekong River Delta region of Vietnam, almost all the regions of Cambodia, North and East Lao PDR, the Bangkok region of Thailand, the west and south of Sumatra, and western and eastern Java in Indonesia are the most vulnerable areas to changes in the climate (Yusuf & Francisco, 2009). This assessment considered not only the exposure to multiple climate hazards but also the adaptive capacity and population density of the areas. The National Capital Region in the Philippines is the most

vulnerable to multiple climate hazards while parts of Indonesia are identified as the overall most vulnerable area in the SEA region (Yusuf & Francisco, 2009).

Impacts of climate-related events in terms of loss and damage

Indonesia, Philippines, Cambodia, Thailand, and Vietnam have experienced several kinds of climate-related disasters of various intensity and frequency. They have suffered various consequences – from economic loss to loss of life.

Cambodia

The 1994 drought in Cambodia affected around 5 million people while a flood during that same year killed 506 people. In 2000, the country suffered its highest economic loss of 160 million USD because of flooding. From 1980-2010, a total of around 536.1 million USD were lost due to drought and flooding. In 2011, Siem Reap, Cambodia's capital, was also severely flooded, killing hundreds of people (Collerton, 2011).

Indonesia

Indonesia experienced a wildfire in 1994 that affected around three million people. A similar event in 1997 brought Indonesia economic losses of about eight billion USD. From 1980-2010, a total of 11 billion USD were lost due to wildfire and flooding. In January of 2014, Jakarta, the capital of Indonesia, was flooded due to continuous rainfall (Setiawati & Fidrus, 2014). Around 52,000 people were affected by the flood in the largest and most populous city in the country.

Philippines

A storm hit the Philippines in 1991 and killed around 6,000 people. From 1980-2010, a total of 2.98 billion USD were lost due to flood and storm. Typhoon Haiyan, that devastated the Philippines in November of 2013, is the strongest cyclone that made landfall with sustained winds of 190 to 195 mph (Fischetti, 2013). It caused more than 6,000 deaths and around 1,800 are still missing (Associated Press, 2013).

Thailand

A massive drought in Thailand in 2008 affected around ten million people. From 1980-2010, a total of 3.84 billion USD were lost due to flood, storm, and drought. Last 2011, Bangkok, the capital of Thailand suffered a flooding so severe that it was considered the worst flooding in a century (Landelle, 2012). This flood took more than 680 lives and cost around 46.5 billion USD worth of economic loss (World Bank, 2012).

Vietnam

In 1980, Vietnam experienced a strong storm that affected around nine million people. The country also lost around 1.3 million USD due to flooding in 1993. From 1980-2010, a total of 4.51 billion USD were lost due to flood, storm, and drought. Typhoon Haiyan also hit Hanoi, the capital of Vietnam, and caused widespread flooding (BBC, 2013).

Last year, the Centre for Research on the Epidemiology of Disasters through the International Disaster Database released its 2016 data on the impacts of flood, typhoon, drought, and wildfire to the countries of Indonesia, Philippines, Thailand, and Vietnam under the Emergency Events Database (EM-DAT). From 1900 – 2015, extreme weather events have caused them more than 100,000 deaths, about 380 million people affected, and 99 billion worth of damages (Table 1; EM-DAT, 2016).

Table 1. Impacts of flood, typhoon, drought, and wildfire to Indonesia, Philippines, Thailand, and Vietnam (EM-DAT, 2016)

Country	**No. of deaths**	**No. of affected**	**Worth of damage (in USD)**
Indonesia	18,227	18,162,700	16.91 B
Philippines	52,583	192,797,634	25.08 B
Thailand	5,661	89,762,576	46.73B
Vietnam	24,740	84,811,570	10.83 B

Note: For a disaster to be entered into the database at least one of the following must be fulfilled: (1) ten or more people reported killed, (2) hundred or more people affected, (3) declaration of a state of emergency, and (4) call for international assistance.

These events in SEA killed hundreds to thousands of people, displaced a lot more, and damaged almost every possible resource. Climate change adaptation (CCA) and disaster risk reduction (DRR) strategies, even when put in place, may no longer be enough to respond to the extreme nature of current and future climate-related disasters.

Relevance of linking L&D, CCA, and DRR

For a couple of decades now, mitigation and adaptation have been viewed as the answer to the climate problem. This is evident even in international law (customary international law, UNFCCC, Kyoto Protocol, among others), which obligates countries to address climate issues through mitigation and adaptation (ActionAid, et. al., 2012). In fact, industrialized countries not only have to reduce their emissions and find ways to adapt to the changing climate, they must also support developing countries in dealing with the impacts. Such countries are challenged to

respond. Japan, for example, announced that they would reduce their emission target for 2020, which is 3% higher than the 1990 baseline level for emissions.

To further complicate, the climate situation has further worsened, making these efforts seem insufficient. This has then triggered the emergence of integrating CCA and DRR, and mainstreaming it into local development planning. CCA is defined by the IPCC (2007) as the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities; while DRR is focused on “preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development” (UNISDR, 2017). The linkage between the two approaches were seen as a tool to be able to cope with the impacts of climate-related disasters, but even with the combined efforts of adaptation and DRR to reduce vulnerability and increase resilience, the impacts of climate change are still too great especially for the developing countries. The gravity of the current climate situation and future scenarios requires countries not just to use mitigation and adaptation strategies extensively, but also to look into loss and damage (L&D) brought about by climate variability.

L&D happens when mitigation efforts are not enough and adaptation strategies have reached their limitations (ActionAid, et. al., 2012). The United Nations Framework Convention on Climate Change (UNFCCC) uses a working definition of L&D as “the residual costs, which are not avoided through adaptation and mitigation, and which can be further split into economic and non-economic losses” (Fankhauser, Dietz, & Gradwell, 2014). If the impacts of climate change cannot be avoided and lessened, irreversible and permanent L&D may occur.

The proposition to take L&D into consideration springs from the observation that the seeming lack of a sense of urgency to respond to climate change, especially on the part of developing countries, can actually lead to permanent L&D which may be evaded if only they do their own share of obligations (ActionAid, et. al., 2012). Rich countries are reported to emit the most greenhouse gases, but developing countries and other small island states are in most instances, the most vulnerable to the impacts of climate change (ActionAid, et. al., 2012). It is feared that because the rich and high-emitting countries are not at the forefront of the effects of climate change and are not among the most vulnerable is what engenders the lack of urgency.

With the worsening extreme events and slow-onset impacts of climate change, and the weak response of countries, mitigation and adaptation are no longer enough to address L&D (ActionAid, et. al., 2012). The problem is so severe that a new kind of strategy has to emerge – a mechanism for L&D. This new mechanism seeks to address not just the permanent L&D caused by extreme weather events but also the impacts of the slow-onset processes. Moreover, aside from economic and environmental L&D, non-economic losses must also be assessed.

International negotiations and agreements on loss and damage

Under the UNFCCC, the current approaches to dealing with the impacts of climate change and disaster risks are mitigation and adaptation. Global efforts to discuss L&D have also emerged at UNFCCC climate change negotiations (Figure 1), expert meetings, and regional workshops (Shamsuddoha, Roberts, Hasemann, & Roddick, 2013), specifically about the development of an international mechanism and of institutional frameworks. L&D associated with climate change is getting its share of attention at the global scale, as developing countries highlight the need to strengthen institutional arrangements for addressing L&D (Akanle, et. al., 2010; Shamsuddoha, et. al., 2013).

The Conference in Warsaw has also made significant progress by putting L&D under the adaptation scheme through the "Warsaw International Mechanism for Loss and Damage" (UNFCCC, 2013). There has also been significant effort and practice in relation to implementing national and local instruments to offset the effects of climate change in Asia (UNFCCC, 2012, 2013). However, while the mechanisms are already at work at the global level, the L&D currently being experienced at the local level, particularly in the developing countries of SEA, should reinforce the formation of a coherent framework to facilitate the L&D strategies of these countries.

Currently, there is no universally accepted definition for "loss and damage" but the term broadly refers to the adverse effects of climate change that can no longer be avoided through adaptation and mitigation (Huq, Roberts, & Fenton, 2013; Roberts, Huq, Hasemann, & Roddick, 2013; Stabinsky & Hoffmaister, 2012). This comes from the realization that there can be a point when the impacts of climate change go beyond the ability of people and systems to adapt. With the lack of established institutional frameworks to address L&D at both international and national scales (Roberts, Huq, et. al., 2013) and limited literature dealing with the issue (ActionAid, Care, & WWF, 2012; Al Faruque & Islam Khan, 2013; Mace & Schaeffer, 2013; Roberts, Bavishi, et. al., 2013; Roberts, Huq, et. al., 2013), efforts in implementing effective national and local instruments will remain a great challenge. However, there is an opportunity for current approaches to complement each other (UNFCCC, 2012) and thus facilitate regional coordination on CCA, DRR, and L&D. Therefore, there is an urgent need to adopt a coherent approach in developing frameworks that will provide a deeper understanding of the concept to deal with L&D associated with climate change and disaster risks.

Figure 1. UNFCCC policy milestone and technical work related to L&D

Basic concepts and principles in L&D

L&D refers to the "negative effects of climate variability and climate change that people have not been able to cope with or adapt to" (Warner et al., 2012). This comprises direct damage, indirect loss, and intangible loss. Direct damages are defined as follows:

> "Damage means the effects the disaster has on the assets of each sector, expressed in monetary terms. These occur during the event giving rise to the disaster. Depending on the sector, assets may include:
> (a) Physical assets such as buildings, installations, machinery, equipment, means of transport, storage facilities, furnishings, irrigation systems, dams, road systems and ports.
> (b) Stocks of final and semi-finished goods, raw material, materials and spare parts" (UN ECLAC, 2014).

Indirect losses, on the other hand, are:

> "Losses: goods that go unproduced and services that go unprovided during a period running from the time the disaster occurs until full recovery and reconstruction is achieved. Examples include a reduction in the size of future harvests because of the flooding of farmland or prolonged droughts, a decline in industrial production because of damage to plant or lack of raw materials or inputs such as water and electricity, and revenues forgone by utility firms because their services have been interrupted or reduced" (UN ECLAC, 2014).

Intangible losses pertain, but are not limited, to: loss of life, physical injury, loss of heritage or archaeological site, mental ailments, and increased medical-related problems (APEC, 2009).

L&D assessments are done particularly after disasters have occurred in order to estimate the L&D that the disaster has brought upon a community. This assessment evaluates various sectors such as infrastructure (flood control, drainage and irrigation; transport; telecommunication; electricity; water supply and sanitation); economic (macroeconomics; livelihoods and migrant workers); cross cutting (environment; gender; disaster risk management); productive (agriculture; industry and commerce; tourism; financial and insurance); and social (health; education; housing; cultural heritage; social protection; social impacts assessment). However, effective L&D assessment should have a comparison evaluation between the baseline data (pre-disaster information) and post-disaster data.

About the project

In 2014, the Asia-Pacific Network for Global Change Research (APN)[1] under its Climate Adaption Framework (CAF) awarded a grant to the Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation, Inc. (Oscar M. Lopez Center) to assess the linkages between CCA, DRR, and L&D. The project was led by the Oscar M. Lopez Center, with project country collaborators in SEA: Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific (CCROM-SEAP), Indonesia; Global Change System for Analysis, Research and Training - Southeast Asia Regional Center (START-SEA RC)[2], Thailand; and Center for Environment Research Education and Development (CERED), Vietnam.

Rationale

The low-lying coastal cities in the Philippines and of partner countries suffer significant L&D from climate-related disaster events. Identifying the available tools, methods, approaches, and data applications (geographic, sectoral, temporal) will improve DRR and CCA initiatives. These efforts are aligned with the negotiations and agreements made under the Conference of Parties (COP) of UNFCCC which puts L&D as an independent third pillar of the climate action – in addition to mitigation and adaptation. This project tried to understand, at the local, national and regional scales, the gaps and needs for assessing and addressing the economic, social, and environmental aspects of L&D related to risk from current climate variability and future climate change. The study put emphasis on the main action areas (enhance knowledge, strengthen dialogue and coordination, and enhance action and support, including finance for L&D) highlighted in the "Warsaw International Mechanism on Loss and Damage" wherein the decisions agreed upon are gradually moving towards the creation of a cooperative framework and the identification of potential concrete areas of action (Conway, 2016).

[1] APN is an inter-governmental network which aims to investigate changes in the earth's life support systems, and their implications for sustainable development and to promote policy-oriented research and capacity building activities related to global change in the Asia-Pacific region.

[2] Collaboration with START-SEA RC is only for the 1st year of project implementation as noted in succeeding narrative.

Scope and limitations

The study focused on high priority areas specifically low-lying coastal cities in SEA, recognizing the need for a framework where succeeding research, policies and programs on CCA, DRR and L&D can be based on. Initially, five SEA countries agreed to collaborate on this initiative which included Cambodia, Indonesia, Philippines, Thailand, and Vietnam. Cambodia did not pursue its involvement in the project as the project representative fell ill, while Thailand did not pursue their participation for the year 2 activities since their country assessment of the L&D system revealed that their country did not have an L&D assessment system yet.

In Year 1, the project assessed the status of L&D system in each collaborating country, and looked into possible or existing L&D integration with CCA and DRR. Case studies were conducted to validate the results of the assessment. Year 2 activities aimed to integrate the results and experiences of each country to develop a regional framework. A proposed framework that integrates L&D, CCA, and DRR has been developed through a series of activities: experts' meeting, national workshops, case studies, key informant interviews, and household surveys with selected key stakeholders. This project also tried to recommend R&D and policy agenda to ensure communities' and ecosystem resilience.

Although only four (4) collaborating SEA countries were involved in this study, the key findings and outputs were intended to represent the current status of L&D assessment system in the local, national, regional and even the global scales. It also aimed to contribute to the global discussions and negotiations on L&D.

Objectives of the study

This project aimed to answer the following questions: What is the current state of L&D assessment system in select SEA countries? Who are the key actors and what are their roles? What are the gaps, issues, and needs in integrating L&D with CCA and DRRM? What are the researches and policy recommendations needed to address these gaps, issues, and needs?

Assessing the linkages between CCA, DRR, and L&D in the low-lying coastal cities of Indonesia, Philippines, Thailand and Viet Nam, is the main objective of this collaborative project. The specific objectives are as follows:

1. Review existing frameworks for assessing L&D due to climate-related disasters;
2. Identify emerging issues, gaps and opportunities in linking CCA, DRR and L&D assessment;
3. Develop a framework in linking CCA, DRR and L&D assessment; and
4. Recommend research and development (R&D) and policy relevant agenda for implementation.

Methodology

The methodological framework (Figure 2) employed in this project follows six main activities which involved both qualitative and quantitative research designs such as various participatory and systematic methods of data collection, analysis and integration.

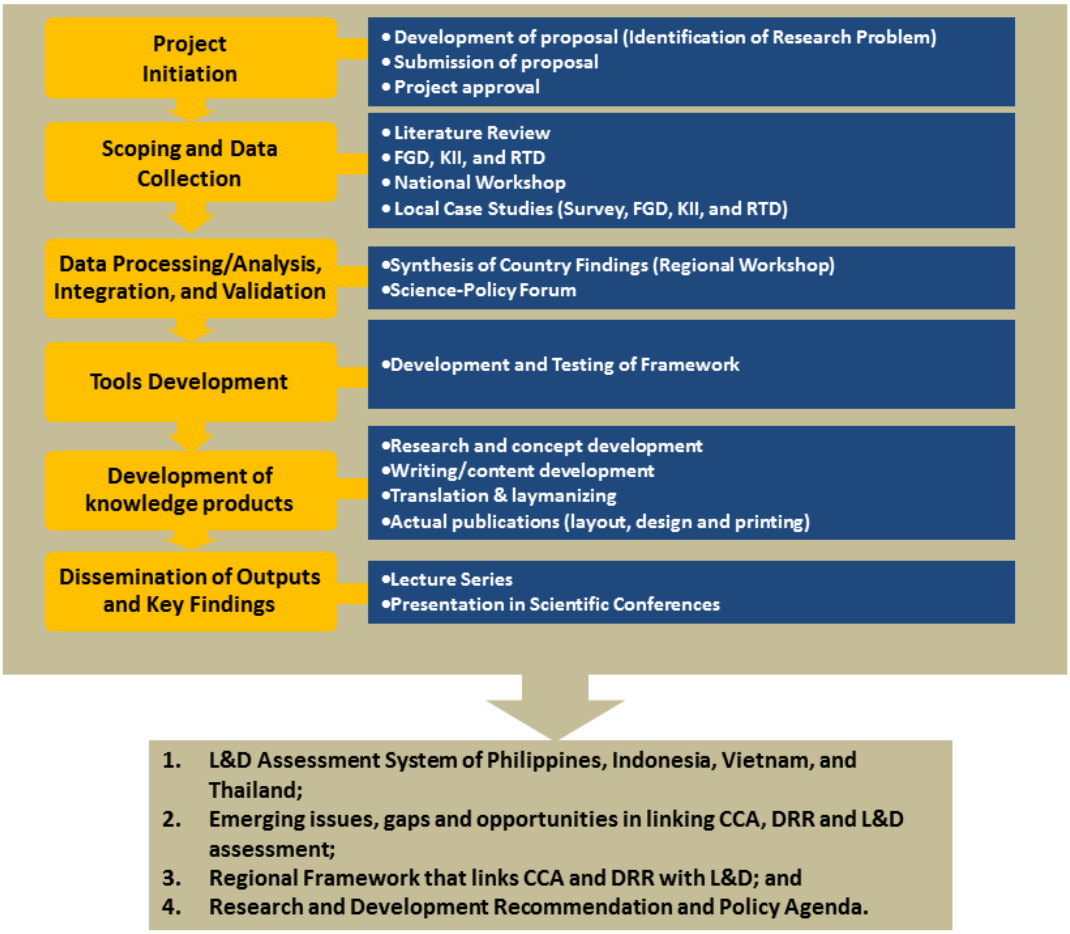

Figure 2. Methodological framework of the project

Project initiation

Part of the preliminary stages of the project is the development of the project proposal which involved conceptualization and identification of the research problem, target project collaborators, budget proposal, methodologies involved and other relevant information.

The research problems were identified and the project was conceptualized based on the detailed guidelines of the Call for Focused Activities that was launched in August 2013 under the APN Climate Adaptation Framework. Some of the key considerations in the proposal development based on the guidelines include: 1) scientific regional research must include at

least three (3) member/approved APN countries, two (2) of which must be developing; 2) activities must have high potential to provide positive outcomes for developing countries that could also be used by the international community; 3) activities must address all three areas of CCA, DRR and Loss + Damage and explain the linkages, priorities and limitations in doing so; and 4) activities must focus on an area of interest or theme as outlined in the guidelines. A rapid review of literature was conducted by the OML Center Team and series of writeshops were carried out to ensure that the proposal would address the knowledge gap(s) as mentioned in the Call for Expression of Interests, contribute to the national and global discussions on L&D, and also meet the requirements and focus of the APN Call.

The collaborators were selected based on network and snowball sampling wherein the OML Center Team identified experts they had worked with that were from any of the APN member/approved countries. The following were also used as basis for selection: 1) with previous or existing work/research/project related to the topic(s); 2) with good reputational record with APN as former project leader or collaborator; 3) organization is willing to leverage some funds or in-kind support; and 4) capacity to administer the funds and also can accept remittance in dollars.

The proposal was then submitted to the funding agency (APN) for approval. The approval from APN and contract signing signalled the official commencement of the project.

Scoping and data collection

This is one of the critical stages of the project since this part involved identification of the issues and information that were likely to be of most importance in achieving the objectives and goals of the project. Prior to the concept development and proposal writing, a desk review of relevant literature was conducted to identify what had already been done on the topic and to have a strong basis on the information that was gathered and surveyed.

In terms of chosen mixed methodologies, the intention was to have multiple participatory approaches and to solicit inputs from multi-sector (experts, science-policy groups, practitioners, private sector, etc.) at different scales (regional, national, local/community). Brief explanation on the methodologies used is provided below:

Literature review	This methodology is a way to review current knowledge on the topic from secondary sources including substantive findings, as well as theoretical and methodological contributions. Combinations of integrative and theoretical reviews were conducted. Integrative Review – The project team reviewed and synthesized representative literature on L&D as it relate to CCA and DRR in an integrated way such that new frameworks and perspectives on the topic were generated. The body of literature includes studies that address related or identical hypotheses.

	Theoretical Review - The review examined the theory that has accumulated in regard to L&D concept. It looked into what theories already exist, the relationships between them, to what degree the existing theories have been investigated, and new hypotheses to be tested. This type of review is often used to help establish a lack of appropriate theories or to reveal that current theories are inadequate for explaining new or emerging research problems. The unit of analysis can focus on a theoretical concept or a whole theory or framework. In this case, the focus is on the framework.
Focus Group Discussion (FGD) - *Roundtable Discussion is used by the project in a similar context*	FGDs can be used to explore the meanings of survey findings that cannot be explained statistically, the range of opinions/views on a topic of interest and to collect a wide variety of local terms. In bridging research and policy, FGD can be useful in providing an insight into different opinions among different parties involved in the change process, thus enabling the process to be managed more smoothly. It is also a good method to employ prior to designing questionnaires. An FGD is a good way to gather together people from similar backgrounds or experiences to discuss a specific topic of interest. The group of participants is guided by a moderator (or group facilitator) who introduces topics for discussion and helps the group to participate in a lively and natural discussion amongst themselves. The strength of FGD relies on allowing the participants to agree or disagree with each other so that it provides an insight into how a group thinks about an issue, about the range of opinion and ideas, and the inconsistencies and variation that exists in a particular community in terms of beliefs and their experiences and practices. Two common types of focus groups were used. One is the classical type called single focus group where all respondents are placed in one group to interactively discuss a topic. The other one is mini focus groups, a format that uses smaller groups of four to five participants. From the single group, the respondents were divided into smaller groups for a more in-depth discussion on the topic.
Key Informant Interview (KII)	KII is qualitative in-depth interviews with people who know well or with particularly informed perspectives on a topic and can offer specific, detailed or specialized information and opinions. The informant's knowledge and understanding can provide insight on the nature of problems and give recommendations for solutions. A set of questions were prepared in advance and an appointment was set with the key informants before the interview. While an initial set of questions were listed, probing questions emerged during the interview to clarify and deepen the understanding of a particular topic.
Survey	Survey is a form of data collection which involves asking questions to respondents. In Indonesia, 49 respondents from the 10 sub-districts of North and West Jakarta participated in the survey.

	In the Philippines, 307 households were surveyed in the five (5) coastal barangays of Pila, Laguna. In Vietnam, the survey was administered to 50 residents of three (3) communes in Cat Hai Island.
Workshop and Forum	In this project, workshops and fora were used as platforms to present and also validate findings. They are types of meeting at which a group of people engage in active discussion and activity on a particular subject. The three countries organized and joined series of workshops, lectures and fora with a wide-ranging type of audiences from high-level government officials to business leaders, local government and community representatives.

A series of participatory approaches in data collection were employed in the project, as such approaches are said to build social cohesion especially in policy-making (Slocum, 2003). It also enabled the participants/stakeholders to share their perspectives, values, and reasoning on emerging issues as these develop and mature. In addition, Venne (2005) claimed that participatory data collection is usually linked with qualitative methods of information gathering and that these focus on the interpretation of the social phenomena based on the views of the participants of a particular social reality.

For this research project, primary data was collected using Participatory Rural Appraisal (PRA) methods such KII, survey, FGD. PRA method is effective at the community level because communities usually respond well and openly during the conduct of PRA (Ramasubramanian, Seeralan, & Sekar, 2010). It is an effective tool in capturing the community perception (Cornwall & Pratt, 2011). A list of specific activities that were conducted by each of the collaborating countries is listed in appendices including the participants and stakeholders involved in each of the activities.

FGD is one of the most frequently used types of participatory methods of data collection. This method provides insights on the way people think, thus it provides a deeper thought on the issue or problem being studied (Nagle and Williams, 2011). This method was employed in various activities conducted by each of the collaborating countries such as in the national workshops, local case studies, and round table discussions.

In Indonesia, a national consultation meeting was organized to get experts' and relevant stakeholders' opinion on different issues. The format includes two presentations on: 1) Supporting policies (national and international) for integrating CCA and DRR for reducing L&D; and 2) Proposals on framework for linking CCA, DRR and L&D followed by participatory group discussion. These presentations triggered discussions on the entry points and opportunities for

linking CCA, DRR and L&D as well as the state-of-the art policy and negotiation process of CCA-integrated disaster management. The 27 participants representing 11 organizations identified key actors and institutional setting for implementation of CCA-integrated DRR and discussed the current L&D system, gaps in the system and some recommendations. Effective channels to integrate the issue to development plans and monitoring and evaluation arrangement for implementation of CCA-integrated DRR were discussed.

In the Philippines, a similar national consultation meeting composing of 18 representatives from national government agencies, academic institutions, LGUs, NGOs, bilateral and unilateral organizations was organized to: 1) bring together key actors and experts and discuss the current loss and damage system, identify gaps and recommendations; and 2) consult the participants on possible entry points in linking L&D, CCA, and DRR. The FGD started with the presentation of the initial findings of the literature review and presentation of the initial framework that integrates CCA, DRR and L&D. The floor was opened for reactions and comments followed by mini group discussion on the topics. Guide questions and templates were provided to them. The smaller groups were asked to present their outputs and the floor was again opened for feedback and suggestions.

With the same objective as the two previously discussed countries, 31 participants (including observers like media) were invited to participate in the FGD organized by the Vietnam Team. The project head in Vietnam provided an overview of the project and its objectives followed by an initial presentation of the CCA-DRR-L&D linkage based on available literature. There were also three technical presentations related to the main topic. The presentations were proceeded by information-sharing in a form of group discussion.

KIIs, on the other hand, provided in-depth information from the experts/practitioners on various topics related to L&D, CCA and DRR. The KII type of data collection aims to collect information from a wide range of people who have first-hand information and knowledge about the topic being studied and it allows a free flow of ideas and information (Ali, et al., 2013). Key informant interview was used to validate the key findings of the initial assessment from the FGD and literature review that was conducted.

This method was carried out in the Philippines and Vietnam. The representative of the Philippine National Disaster Risk Reduction and Management Council –Office of Civil Defense (OCD-NDRRMC) did not make it to the first FGD organized by the Philippine Team. Since this organization is a very important actor in the CCA-DRR-L&D landscape in the country, the project team decided to conduct a one-on-one interview with its key official.

KIIs were also carried out with key actors on L&D, CCA, and DRR and management in the barangay and municipal levels of selected local government as part of the case study in the Philippines. Follow-up interview with some respondents of the household survey were also conducted. Technical experts were also interviewed for the development and refinement of the methodology used in the case study.

Vietnam Team used KII to pre-identify the target respondents of the survey for the case study.

The local case studies were conducted to build an assessment and understanding of the current L&D system in each of the collaborating countries. The country teams engaged in various data collection methods such as surveys (semi-structured and structured), FGD, and KII. Relevant stakeholders and experts involved in the project were identified, from whom an initial assessment on the existing and emerging challenges and gaps in L&D assessment and its possible linkages to CCA and DRR was established.

The case study in Indonesia focused in North and West Jakarta which are considered flood-prone areas. An index-based method was used with the following indicators: flood characteristics, health access, water access, adaptive capacity to flood, human capital physical capital, and economic capital. A survey was administered with the provincial government of Jakarta to gather information on each of the indicators.

The Philippine case study focused on the five coastal barangays of Pila, Laguna. The methodological framework of the study is shown in Figure 3.

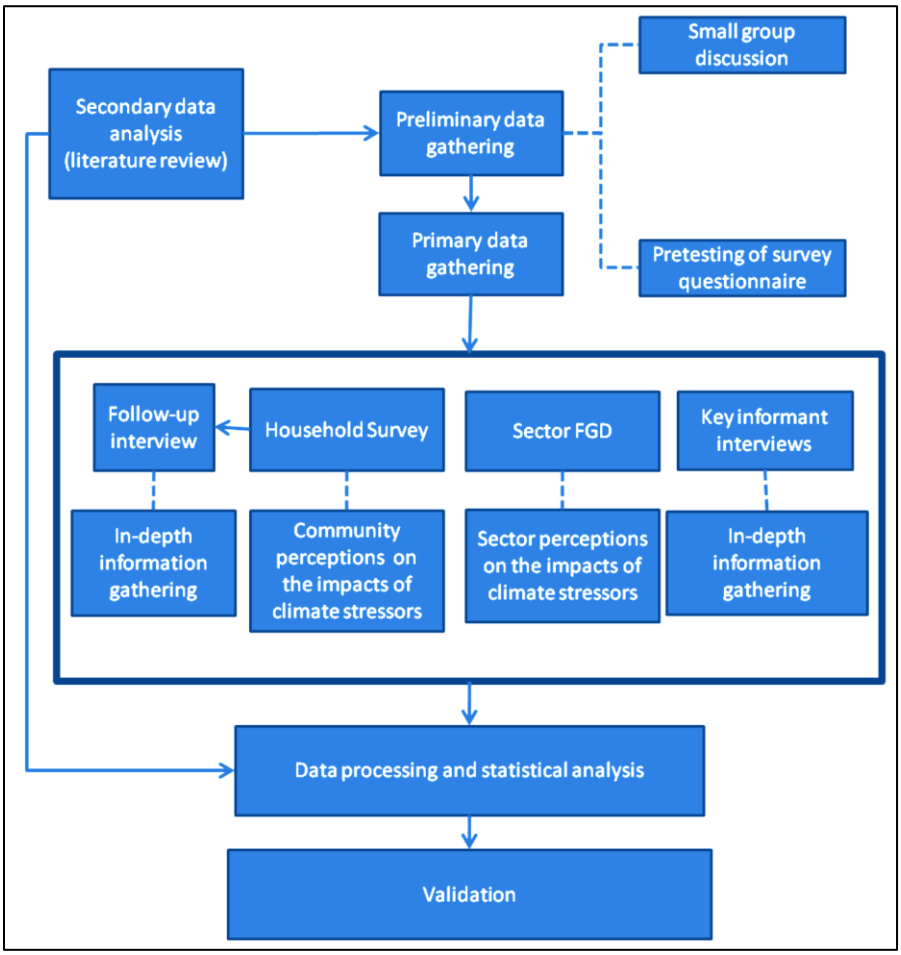

Figure 3. Methodological framework of the case study conducted in Pila, Laguna, Philippines

The case study in Vietnam surveyed 50 households in Cat Hai Island. The island is considered as one of the most vulnerable areas to storm in Vietnam with 28% of the storms in the country crossing the island (Thung, 2014). An FGD with the authorities in Cat Hai Town (representatives of Commune Committee for Natural Disaster Prevention and Control and Search and Rescue [CCNDPC and S&R], Cat Hai Town People's Committee, Cat Hai Town Military Affairs, and Cat Hai Town Veteran Affairs) was conducted to validate the survey results and to gather information on the disaster risk management of the island.

Data processing/analysis, integration, and validation

A regional workshop was held in Bogor, Indonesia last 2015 to bring together all collaborators and selected experts to present the initial findings of each country. It served as an avenue for the collaborating countries to discuss country assessments and local case studies, and to validate the findings amongst the collaborators.

A synthesis of the findings and presentations was presented covering the following: a) tabulation of the disasters experienced by each of the countries and other members of the ASEAN; b) summary matrix of the issues/needs in L&D assessments, recommendations to address these issues and needs, and potential impacts/results should these recommendations will be carried out. The synthesis presentation was followed by an FGD among the collaborators to develop the regional L&D framework. Facilitated by the OMLC representative, the group assessed each of the country frameworks looking at their similarities, differences and the approach on how they were drawn. The group attempted to draw different versions and later agreed to adopt the proposed framework of the Philippines with some modifications and provided that this will be further improved after getting feedback from other stakeholders. The details of these can be found on the appendix.

A Science-Policy Forum was also conducted by each of the partner countries to present the proposed L&D framework which tries to integrate L&D with CCA and DRR. It aimed to gather relevant comments and revisions to further improve the proposed framework. It was also designed to identify relevant research and development (R&D) recommendations, policy directions, and collective inputs in pursuing L&D, CCA, and DRR integration.

Development and testing of framework

The proposed framework that integrates L&D with CCA and DRR went through various deliberations, dialogues, and workshops until each of the countries finally came up with their own country frameworks. Participatory data collection methods such as the FGD, KII, and workshops contributed to the development of the framework. It was then pilot-tested and presented in the selected study sites of Philippines and Vietnam (Table 5).

Table 5. Pilot-testing sites of the proposed L&D Integration Framework in Philippines and Vietnam

Country	Pilot-Testing Site
Philippines	Ormoc City, Leyte
Vietnam	Nam Dinh province Hai Phong province

For an appreciation of the pilot-testing process, below is a brief summary of how it was done in the Philippines. Please refer to the appendix for the full details.

An FGD was organized to solicit comments and to test the applicability of the framework (figure is presented in the results section so as not to pre-empt the discussion). Seven heads/representatives from selected sectoral offices/departments in Ormoc City and four Chairmen/representatives from vulnerable barangays of Macabug, Panta, Batuan and Linao participated in the FGD.

The process started with the identification of the climate stressors, specific and actual examples of climate/disaster risk they experienced, and the socioecological system to contextualize the succeeding discussion. A series of questions were asked following the processes in the framework.

Loss and Damage Assessment (Potential)

- Before [climate stressor], were there any loss and damage modelling in Ormoc? Or were there any studies that you are aware of that assessed the potential loss and damage in Ormoc/Leyte/Visayas if a climate change-related event will occur?
    - If yes, who were responsible for this study? Is there policy support to carry out the assessment? If yes, please enumerate or identify. What was the methodology used? Were you able to utilize this information?
    - If not, why?
        - Not aware/never came to mind?
        - Not a priority?
        - No technical assistance?
        - No policy support?
        - Others:_____
- Currently, are there any efforts that you are aware of that assesses potential loss and damage? Or are there policies and institutional mechanisms that require this assessment?
- If given the necessary technical assistance, would you use the information for your planning? Explain.
- Do you think that it is advantageous or beneficial to you if you know the potential losses and damages in your community? Explain.
- What are the slow onset and extreme events that affect your community that need to be assessed?

Loss and Damage Assessment (Actual)

Rapid/early assessment

- Has rapid/early assessment been done in your community after [climate stressor]?
    - Who are in charge of the rapid/early assessment?
    - Are there policies or institutional mechanisms that require this assessment? What are these?
    - What is the methodology used in the assessment?
    - What are the information gathered?

In-depth assessment and analysis

- Has in-depth assessment and analysis been done in your community after [climate stressor]?
    - Who are in charge of the in-depth assessment and analysis?
    - Are there policies or institutional mechanisms that require this assessment? What are these?
    - What is the methodology used in the assessment and analysis?
    - What are the information gathered?

Resilience Building

- Was the information from rapid/early assessment used to plan the relief and recovery activities? If not, what was the use of the assessment?
- Was the information from in-depth assessment used to plan the rehabilitation and reconstruction activities? If not, what was the use of the assessment?
- For medium- to long-term plans, were CCA and DRRM measures/strategies incorporated in the planning?
- Were the people consulted during the planning of programs/policies/ordinances? How were they consulted (workshop, dialogue, interviews)?

Implementation

- Were there new programs/policies/ordinances that were implemented/created using the plans supported by assessment reports?

Monitoring and Evaluation

- Were existing programs/policies/ordinances monitored and evaluated to check if they are still appropriate or if they needed improvement?

Each component of the framework was tackled one-by-one by the research team in an interactive way. All the processes and significant details were documented while noting the best practices and lessons learnt. Through the FGD and follow-up interviews, applicability of the framework in the City was determined. Opportunities, challenges and gaps were also discussed with the FGD participants to further improve the design of the framework.

A similar process and almost same questions were asked in the pilot-testing that was conducted in Vietnam but on a different context since the climate stressors, climate/disaster risk, and socioecological system varied.

The country frameworks were consolidated to generate a robust regional framework which is targeted to be replicated in other regions and at the global level.

Development of knowledge products

Integrating and consolidating all the outputs and key findings of the project entailed further research and concept development. It also consisted of the development of the content of the final outputs. In order for the end users to easily comprehend the key findings of the project, the write-ups and other materials produced were laymanized and translated according to the needs of the target beneficiaries. The materials and other publications that were produced were also designed and laid out to make the results more appealing for the end-users.

Dissemination of outputs and key findings

Over the two-year project implementation, a series of international presentations were done by each of the collaborating countries. The initial and key findings of the project were presented in various conferences and workshops. These are listed in the appendices section.

A series of lectures were also conducted by each of the countries (see appendices 2.11, 3.4, and 4.7) which aimed to present the whole range of outputs and lessons learned out of the activities conducted by the project. The ultimate goal of increasing awareness about L&D-related issues is to minimize or prevent further L&D, build or improve the resilience of the communities, and reduce their vulnerability to future climate-related disasters.

Study field areas

The project focused on high priority areas specifically low-lying coastal cities in SEA. Among the most vulnerable countries in Southeast Asia, Indonesia, Philippines, Thailand, and Vietnam were the selected project collaborators. The most dominant risk in each country is presented in Figure 4.

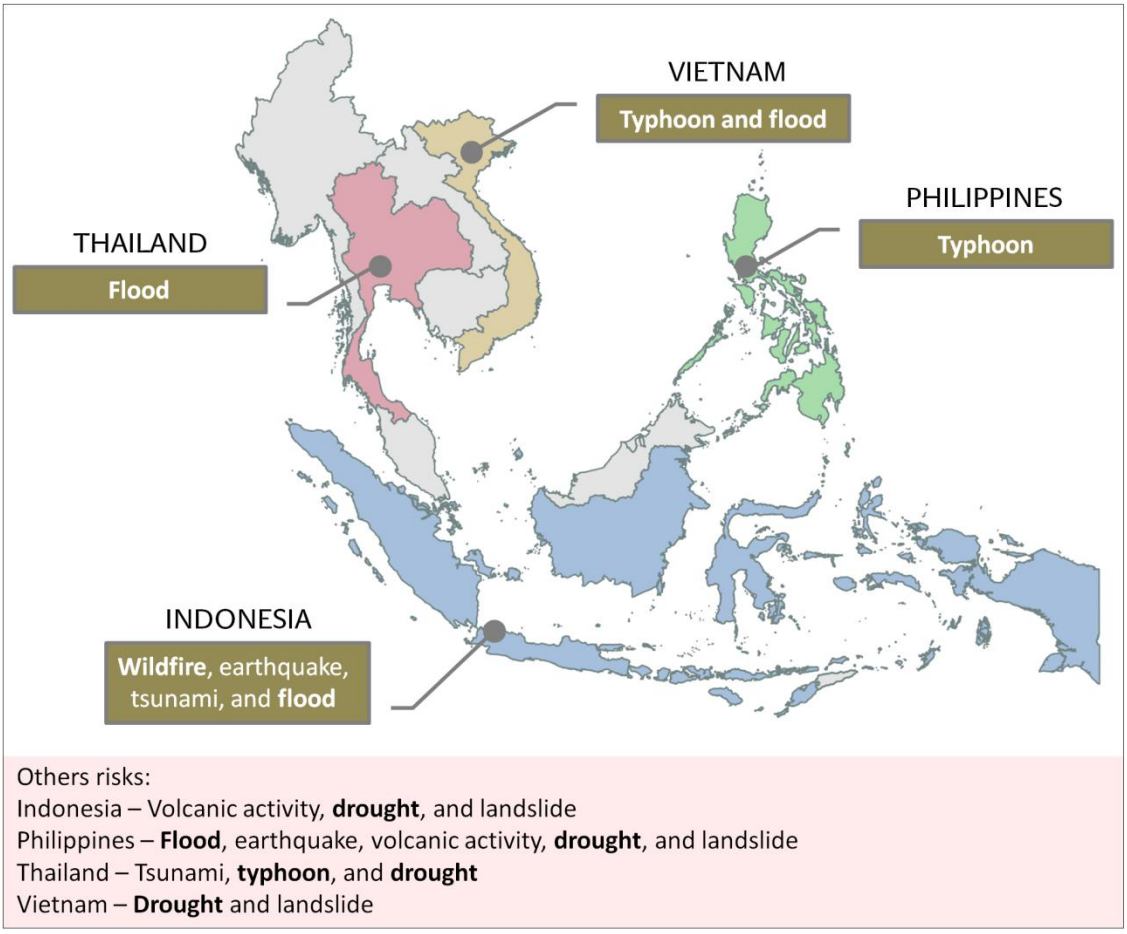

Figure 4. Dominant risks present in Indonesia, Philippines, Thailand, and Vietnam. Data from UNISDR 2010. Image from OML Center 2016.

Results and Discussions

Current loss and damage system in Southeast Asia

L&D assessment has already been a part of every country's post-disaster assessment system. This is to gauge the impacts of the disasters not just on the economy but also in other aspects that cannot be computed directly. This also aims to determine the support needed by the affected regions for recovery and rehabilitation. Aside from that, this also helps to determine the investments that can be undertaken in order to increase their resilience and reduce their vulnerability in the future (UN ECLAC, 2014).

Considering that L&D is a new topic in the climate regime, desk reviews of existing literature show that although there is no existing framework for assessing L&D, there are current initiatives and mechanisms to assess L&D from various countries and organizations. These mechanisms may differ in approach and scope (geographic, sectoral, temporal) depending on the kind of climate stressor present in a particular country. It is imperative to look closely into the components of the L&D system of each country especially of the most vulnerable countries in SEA – Philippines, Thailand, Indonesia, and Vietnam.

1. Existing systems and tool for assessment

There is no definite or universal L&D assessment system yet but there are various methods or approaches that are used by governments and other organizations based on the literature review, FGDs, KIIs, and local case studies that were conducted by the collaborating countries. These are as follows:

I. Damage and Loss Assessment (DALA) Methodology from the United Nations Economic Commission for Latin America and the Caribbean (UN ECLAC) Handbook for Estimating The Socioeconomic and Environmental Effects of Disasters.

   a. The DALA Methodology was created in the early 1970s as a framework to assess damages and losses due to disasters. It was originally constructed for Latin America and the Caribbean but in the late 1990s it started to be used by various organizations around the world (APEC, 2009). Since then this method has been constantly updated to suit different situations for various regions. It is used by government agencies, international organizations, and the like.

   b. This methodology aims to assess the damage on the socio-economic state of a country after a disaster. This disaster may either be man-made or natural, and either caused by an extreme event or by slow-onset events. The assessment helps countries to determine their post-disaster needs for recovery and rehabilitation. This aggregates the different sector-specific assessment to determine the totality of the damages and losses of an area.

c. For example, the Royal Thai Government, along with World Bank and other organizations, assessed the 2011 flood caused by incessant rainfall in 26 out of 66 affected provinces in Thailand using the DALA methodology (World Bank, 2012). The rapid assessment after the flood was used to assess the L&D in five different sectors namely: infrastructure, economics, cross cutting, productive, and social. The Republic of the Philippines also used the same methodology to assess the L&D caused by typhoons Ketsana ("Ondoy"; 2009), Parma ("Pepeng"; 2009), and Haiyan ("Yolanda"; 2013). Please see annex 1.2 for the copy of Thailand L&D assessment report, and annex 1.1 for the Philippines L&D report.

d. However, DALA has some limitations. This methodology does not assess the social or psychological effects of the disaster to the victims (Kelly, 2008). Thus, these victims may be given insufficient or no support at all for their recovery. Moreover, this does not also take into consideration the recovery capacity of the victims. More support may be needed for less able victims than others. However, since this is not assessed, everyone gets an equal amount of support even if it is not necessarily needed.

e. In 2014, UN ECLAC released its third edition of the handbook as *Handbook for Disaster Assessment* (UN ECLAC, 2014). This updated handbook aims to strengthen "procedures for estimating the effects and impacts of disasters and provides an integral accounting approach to bring them together into a coherent picture, distinguishing between losses and additional costs and with due account of linkages between different sectors of the economy. It also addresses cross-cutting issues such as gender and the environment."

II. Post-disaster Needs Assessment (PDNA)

a. The conception of the PDNA framework was inspired by the discussion of several international and national agencies and through the *Joint Declaration on Post-Crisis Assessments and Recovery Planning* (APEC, 2009). The United Nations, European Commission, and World Bank signed this declaration in October 2008.

b. Unlike the DALA methodology, the needs and rights of the disaster-stricken are already incorporated in PDNA. This assesses the needs for "recovery, reconstruction, and risk management" in terms of financial, technical, and human resources. Moreover, it takes into consideration the resources available for disaster response when determining the impact of a disaster.

c. PDNA has three parts: (1) DALA, (2) Human Recovery Needs Assessment (HRNA), and (3) Recovery Framework. The first part of the assessment which is

DALA assesses the damages and losses caused by a disaster. The second part of the assessment determines the "societal recovery needs" of the victims of a disaster. Aside from the immediate recovery needs (up to 2 years), PDNA also addresses medium and "long-term development concerns" (3 years or more).

d. As discussed in annex 1.1, the Philippines has been using the PDNA approach in assessing the impacts of disasters in the country. It follows a five step procedure: 1) planning stage, (2) assessment stage, (3) analysis stage, (4) approval stage, and (5) action stage. Although PDNA is still a work in progress in the Philippines, this tool has been used during various typhoons from 2009 up to present, especially during the devastation of typhoon Haiyan in 2013. This typhoon proved that while the system is useful to small-scale disasters, it was problematic for a disaster as big as Haiyan. There was a delay in developing the Comprehensive Rehabilitation and Recovery Plan because the PDNA took so long to be completed. This experience pushed the OCD-NDRRMC to modify the PDNA system further and consider varying scales in terms of the scope of the disaster impacts.

e. In the case of Thailand, development of PDNA is one of the strategies used to enhance disaster recovery in the country. It consists of DALA and HRNA, both of which intend to assess the social need in communal and industrial sectors in addition to physical and economic losses from large scale catastrophes. The assessment process using PDNA in Thailand consists of 2 stages: (1) a rapid assessment (conducted immediately after the occurrence of the event or within the first week after the occurrence of the event); and (2) a detailed assessment (conducted right after the end of the emergency or at least two weeks post-disaster, depending on the accessibility to the disaster areas). They also have a standard protocol for the content of the final report which should consist of: (1) type of disaster, (2) date and time of occurrence, (3) disaster situation, (4) disaster area and (5) L&D report/assistance arrangements.

f. Pakistan used PDNA to assess the direct damages, indirect losses, and reconstruction needs brought about by the 2005 earthquake (APEC, 2009). The report assessed the various sectors like infrastructure (transport, electricity, water supply and sanitation), economic (livelihoods), cross cutting (environment), productive (agriculture, industry and commerce), social (health, education, housing), and governance and institutions.

g. A handbook that uses PDNA is available from the World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR). It is entitled *Handbook on Post-Disaster Housing and Community Reconstruction*. In this handbook, Early Recovery Needs Assessment (ERNA) is used instead of HRNA.

III. Disaster Loss Assessment Guidelines by the Emergency Management Australia (EMA)

a. The EMA Disaster Loss Assessment, also called the EMA Manual 27 Guidelines, aims to provide an assessment tool that is accessible even to non-experts and non-professionals in terms of loss assessment (APEC, 2009). Its scope includes direct and indirect losses, and tangible and intangible losses. Although it is originally for inundation, it can be modified to cater to other disasters.

b. The Guidelines suggest that potential loss should be assessed instead of the actual loss in order to get the real impact of the disaster. Referencing actual loss will result in a discriminatory assessment due to the varying efforts between rich countries with good disaster risk management and developing countries with poor management strategies. Assessment of the potential loss, on the other hand, will show the real extent of a disaster that can be comparable between countries.

IV. Socio-economic impact assessment (SEIA) model for emergencies

a. The SEIA model was created to answer the gap of other assessment frameworks. It was formed to assess, among others, the "socioeconomic impact for intangible elements such as health, the environment, and memorabilia" (APEC, 2009). This also allows "identifying the resilience and recovery ability of a regional economy and that regions' social wellbeing." This model emphasizes the importance of a standardized and regular collection of data.

b. Vietnam mentioned in their country assessment report in appendix 1.3 that they are also using this kind of mechanism but it was only used by the universities, research institutions, and other organizations.

V. Damage and Needs Assessment (DANA)

a. This tool is used by Vietnam and Thailand. Vietnam described this tool as a hardware and software for data collection and reporting with more than 150 indicators and 21 years' time period. For the case of Vietnam, it includes humanitarian relief data and collected damage data. The system is divided into 2 parts: damage assessment (physical and financial) and needs assessment. In the case of Thailand, this tool allows the government to allocate suitable aid and compensation to disaster-stricken communities.

Results of the assessment in Indonesia revealed that there is no existing current framework/mechanism in L&D system in their country. Nonetheless, an attempt was made to analyze the kind of mechanisms they are using in case of disaster events. Risk retention and risk transfer from the Work Programme on L&D were the two mechanisms identified in the

analysis. Risk retention functions in Indonesia by providing emergency aid, social safety nets and contingency fund or loan. Risk transfer, on the other hand, was successfully implemented in Indonesia by transferring the risk through insurance mechanism such as crop insurance and climate insurance index to the farmers.

There are some other mechanisms on L&D assessment that were used by some of the collaborating countries of the project. Aside from PDNA and DANA, Thailand used the damage assessment for crop insurance. This mechanism is primarily concerned with the agricultural sector which was formed by a collaboration between the government and private sector. It involves various crop insurance schemes piloted over the past few years. Vietnam, on the other hand, uses the Disaster Information Management System (DesInventar) in addition to DANA and SEIA. This mechanism is developed with support from United Nations Development Programme's (UNDP) Strengthening Institutional Capacity for Disaster Risk Management (SCDM) Project. It is a software which shows the disaster trends in a certain area. It has two main components: (1) Administration and Data Entry Module and (2) Analysis Module (see appendix 1.3).

Table 6. Summary of the identified tools for assessment and key actors in L&D assessment system

Country	Tools for Assessment	Key Actors
Philippines	Post-Disaster Needs Assessment	LGUs, sectoral agencies, OCD-NDRRMC, PDNA team, cabinet cluster.
Thailand	PDNA	DDPM-Ministry of Agriculture, TMD, head of local administration, District/Deputy Governor, Provincial Governor, Head of National Disaster Prevention and Mitigation Committee, and Prime Minister/Appointed Deputy Prime Minister, private Institutions, disasters committees (local, provincial, and national)
	DANA	
	Damage assessment for crop insurance	
Vietnam	DANA	National Agencies - CSCNDPC (province, city, commune/ward) Red Cross, and GSO, VINSARCOM, NGOs, Vietnamese Academy of Science and Technology
	Disaster Information Management System (DesInventar)	
	Socio-economic Impact Assessment (SEIA)	
Indonesia	Risk Retention and Risk Transfer (Introduced/Proposed)	Government and non-government agencies, Ministry of Agriculture, National Boards of Disaster Management, Military Forces, NGOs, private sector, academes, and communities

2. Key actors and their roles

Assessing L&D brought about by climate-related disasters is a big task. A lot of factors have to be considered in order to come up with a comprehensive result. With the current climate-related events and climate projections, it is inevitable that L&D will occur, one way or another. Assessments are part of the role of officials or heads of communities after a disaster in order to gauge the magnitude of the effect of that disaster on the different sectors in their community and the appropriate action that are required of them. Although it is the national government that creates a comprehensive report on a disaster, LGUs and related sectoral agencies are expected to provide on-the-ground data and local information. This is because they are the ones that have the first-hand experience and have the direct capacity to deliver such information.

The key actors in the L&D assessment in the Philippines, Thailand, Vietnam, and Indonesia range from various government and non-government institutions, from local and national levels, that play a crucial role in the assessment process. A series of country workshops and interviews revealed who these various actors are and what their roles were on the assessment, which is discussed in detail in their country assessment reports (see appendices 1, 2, 3, and 4). For instance, the SP Forum in the Philippines resulted in the identification of the roles of the science, policy and private sectors in the proposed L&D framework and in the L&D system of the country (see appendix 2.10). These actors were also summarized in Table 6 which shows the involvement of various stakeholders in each of the assessment systems/tools present in each country.

Linking L&D with CCA and DRR: Proposed regional framework

The inclusion of L&D in the Paris Agreement under Article 8 is recognition of the fact that irreversible impacts are already taking place for many people, cultures, livelihoods and ecosystems. Discussions on dealing with these impacts are part of the climate negotiations via the Warsaw International Mechanism (WIM) for L&D associated with climate change impacts. As a contribution to the ongoing debate on the scope, framing and on how the mechanism will eventually be implemented and to help address the challenges that Southeast Asia and the globe are facing, this paper proposes a regional framework that links L&D with CCA and DRR.

To interweave L&D, CCA, and DRR into the ongoing initiatives and ultimately reduce L&D, decrease vulnerability, and increase resilience, a framework was drafted that utilizes existing integration of CCA and DRR, and strengthens it with the aid of L&D information to improve the resilience of each country to climate-related events (e.g. extreme weather and slow-onset events).

Each of the collaborating countries conducted their own activities to initiate the formulation of the country frameworks (Figures 5, 6, 7). These country frameworks were conceptualized and created as an output of the series of workshops, FGDs, and interviews that were conducted as seen in appendices 2, 3, and 4.

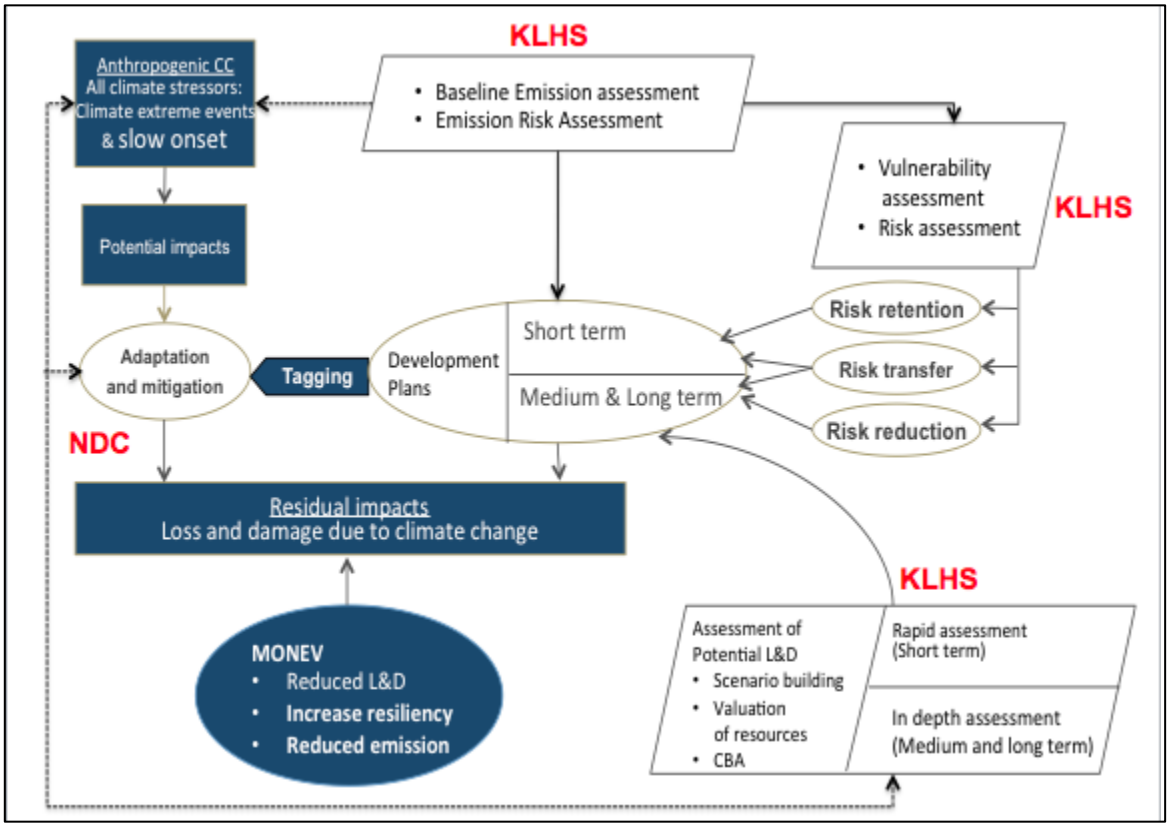

Figure 5. Proposed L&D Integration Framework by Indonesia

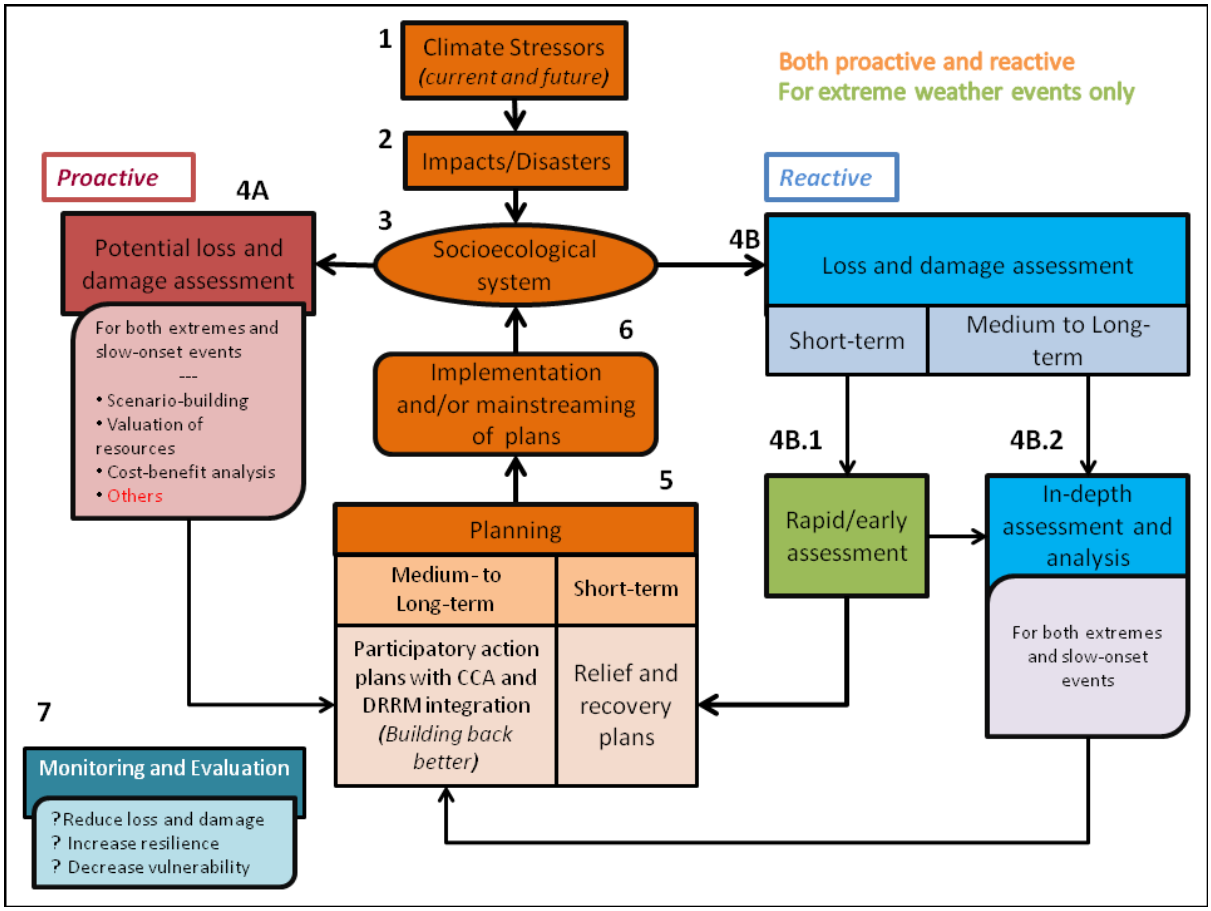

Figure 6. Proposed L&D Integration Framework by the Philippines

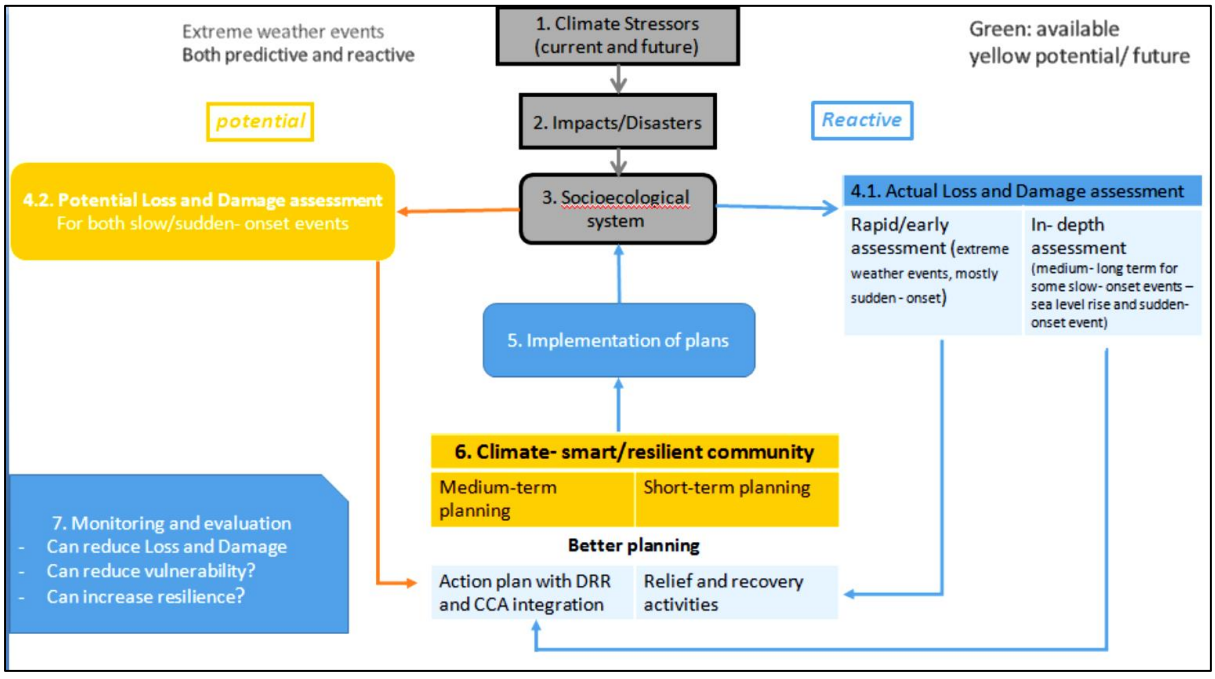

Figure 8. Proposed L&D Integration Framework by Vietnam

Testing of the framework in the selected cities and localities in Vietnam and the Philippines revealed the potential of the framework to be applied in the development planning process of each area. However, there are numerous gaps and challenges that were identified to successfully integrate the proposed framework into the current system of each locality, which is further discussed in the report. As noted earlier, the proposed L&D Integration by the Philippines was adopted and modified to come up with the Regional L&D Integration Framework (Figure 9).

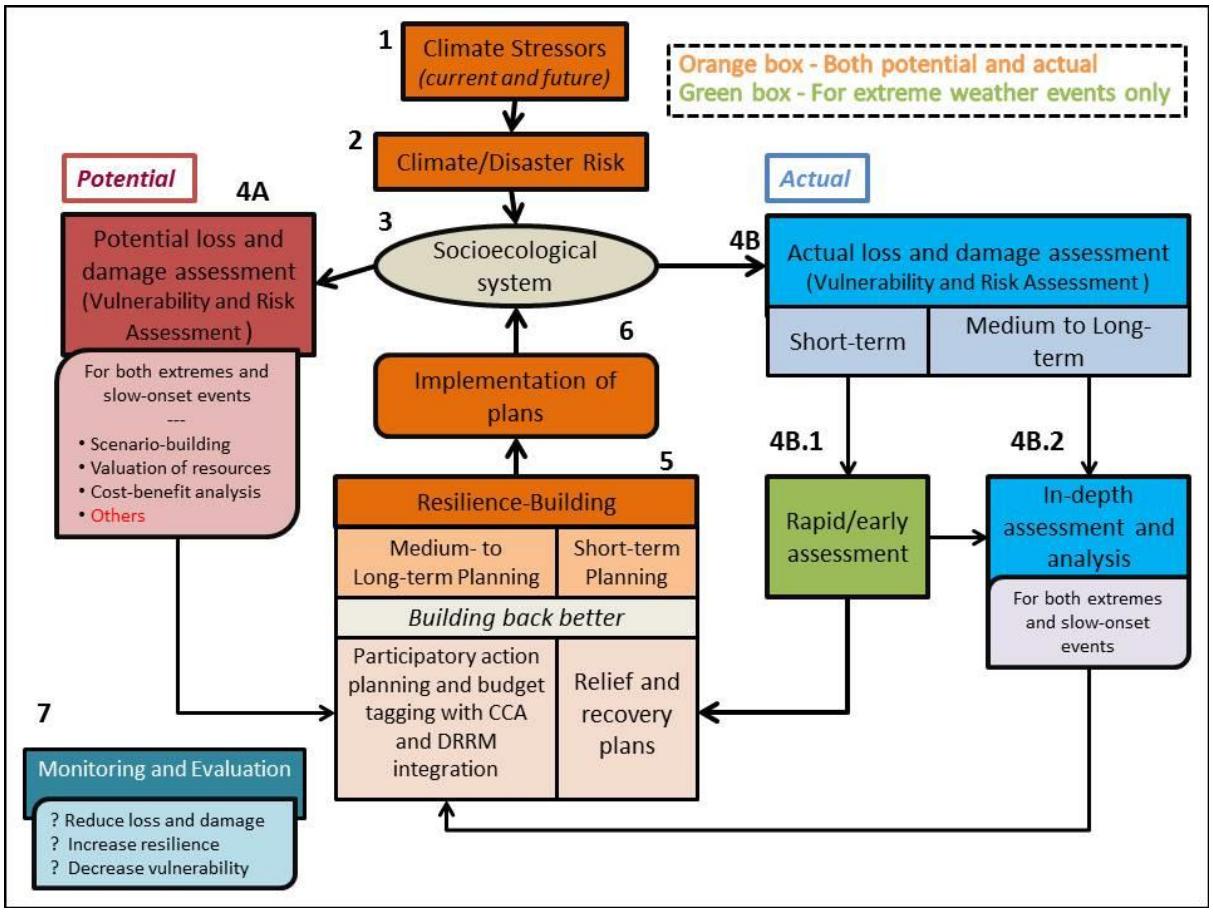

Figure 9. Regional L&D Integration Framework

The framework aims to show the holistic approach of integrating L&D information into the system addressing climate impacts/disasters through CCA and DRR strategies. The framework highlights the following:

- Consideration of both the current experiences and potential impacts through L&D modelling as guide and basis in planning
- Importance of the assessment (i.e. actual and potential) in creating effective and applicable CCA and DRR strategies, and/or improving existing ones
- L&D information as an integral component in building back better
- Optimal use of the available information (i.e. gaps, opportunities) – research and development, policy-making, and programs

The framework on L&D focuses on the importance of interlinking L&D knowledge with CCA and DRRM, to build back better an impacted socioecological system or strengthen a system in anticipation of a potential climate risk. It is general enough to be applied to both slow-onset and extreme weather events, to provide both proactive and reactive pathways, and to be usable across the Southeast Asian region. Although the initial scope is just for the use of the region, the framework is aimed to be replicated and used by any country.

1-3: Climate stressors, impacts/disasters and socioecological system

The framework puts emphasis on considering the climate stressors under current and future climate *(#1 of Figure 4*). Climate stressors were defined by Warner, et. al. (2013) as the manifestations of climate variability and climate change in specific ecosystems. Depending on the stressors, the extent of the climate change impact and magnitude of the disaster in a given socioecological system will vary *(#2 and #3 of Figure 9).* Socioecological system is a complex bio-geo-physical unit and its associated social actors and institutions, all interacting in an adaptive manner to produce outcomes (Brown, et. al., 2016) (e.g. Ormoc City community and Nam Dinh province).

4A: Potential L&D

Under the proactive pathway (*#4A of Figure 9*), the framework suggests determining the potential L&D information *(red box)* for both slow- and rapid-onset events through various methods such as valuation of resources, cost-benefit analysis, and scenario building among others. As an example, this step hopes to answer questions similar to “What would be the potential L&D to the current socioecological system if a typhoon of this intensity and severity hit this area?” or “If the sea level rises at this rate, what would be the potential L&D to the coastal areas in ten years?”

4B: Actual L&D assessment (4B.1 rapid/early assessment, and 4B.2 in-depth assessment and analysis)

While the reactive pathway is not encouraged, every climate change impact and disaster should be considered as an opportunity to build back better and learn from experiences. L&D assessment (*#4B of Figure 9*) is a critical component of this framework where L&D information from existing slow-onset and rapid-onset event *(green box for extreme weather events only)* are gathered, collated, processed, and analyzed. It can be done through existing tools and mechanisms such as the risk assessment among others. The two-pronged approaches are rapid/early assessment, and in-depth assessment and analysis (*#4B.1 and #4B.2 of Figure 5*).

Rapid/early assessment (*#4B.1of Figure 9*) is usually done to assess the basic needs of an affected community or sector for provision of immediate assistance. It also serves as the initial assessment which is then continued into in-depth assessment. Under #4B.2 of Figure 4, there is no regional or national standard tool and methodology yet in the SEA Region or individual participating countries to assess the impacts of slow-onset events such as sea level rise, increasing temperatures, ocean acidification, salinization, and loss of biodiversity among others. In terms of the impacts of rapid-onset events such as typhoons, floods,

landslides, wildfires, drought, heat waves, etc., there are existing practices on rapid or early assessment and in-depth assessment. However, the reports do not cover the entirety of L&D that is experienced. Although these events are frequently assessed, the current state of tools and assessment system are not robust, integrative, and responsive enough to address the challenges, needs and gaps identified by the participating countries and compounded by the magnitude of the disasters that might happen due to the worsening effects of climate change.

Box 1. Actual vs. Potential Assessment

There are two options in estimating L&D caused by a disaster - either by computing its potential L&D, or the actual costs. Depending on the objective of the assessment report, either can be used. If the ultimate goal is to provide statistics that show the effect of the disaster in a specific area, actual L&D may be used. However, if the objective is to provide a report that can be used for comparison with other countries, potential L&D may be used. Through this, discriminatory assessments in terms of adaptation strategies and disaster risk management between countries with varying capacities can be prevented or minimized. Since this option does not take into account the different strategies from either well-adapted countries or poor-adapted countries, the extent and gravity of the disaster will be given more emphasis. However, if the goal is to determine the effectiveness of the adaptation and DRR strategies of a community, it is best to estimate both potential and actual L&D. The actual L&D (with CCA and DRR strategies) may be compared with the potential L&D (without CCA and DRR strategies). Through this, the effect to the community of these strategies will be given more emphasis.

5: Resilience-Building

The L&D information generated from the rapid/early assessment is used for short-term planning for relief and recovery purposes and for provision of immediate assistance *(#5 of Figure 5*). Meanwhile, information from in-depth analysis and L&D modeling should feed into action plans, as basis for new CCA and DRRM plans or as assessments of existing ones towards building back better communities and ecosystems. The framework stresses the need for a participatory action planning that looks into the medium- to long-term plans. At this stage, the line of questioning may include: Are the current strategies or policies being used still applicable and effective? Is there a need to create or introduce new strategies, or is an improvement of existing ones sufficient? The information will serve as evidence-based inputs when creating, and monitoring/evaluating medium- to long-term action plans. The creation of the action plans with L&D, CCA and DRRM integration has its own detailed process or system, and is not reflected in the framework but the participatory approach is emphasized for its importance in decision-making to ensure sense of ownership and active involvement of stakeholders.

6: Implementation of plans

Under #5 (*of Figure 5*), the short-, medium-, and long-term plans are done not just to recover from the impacts but to build back better from what used to be the current state and function of the system. Implementation of plans (*#6 of Figure 9*) should contribute not just to the

recovery of the socioecological system but also to improve the system against future climate impacts and disasters. However, it is acknowledged that the implementation of such plans is still a challenge especially if these are not among the top priority of the governing authorities.

7: Monitoring and evaluation

Monitoring and evaluation (*#7 of Figure 9*) is as critical as all the other components in the framework and should be done at every step of the cyclic process. Active monitoring and evaluation through a set of indicators is required to make sure that the gaps and issues in the system will be tackled. The improved socioecological system could still be affected by the impacts of the climate stressors therefore monitoring and evaluation of both the step-wise and whole process is always essential. In this cycle, the ultimate goal is to continuously reduce L&D, increase the resiliency of the system, and decrease its vulnerability to the continuing and future impacts of climate change.

Emerging issues and gaps in addressing L&D and in linking L&D, CCA, and DRR

A number of gaps and challenges were identified in the course of the project activities. Each of the collaborating countries identified various challenges in addressing L&D and in adopting the framework. The challenges vary depending on the nature of activity and the involvement of the participants/experts, but these gaps and challenges all point to the same direction of finding the solutions to close the gaps and to lessen and avoid further losses and damages that can be incurred in the future. The analysis of the gaps and challenges revealed key issues that need immediate attention and concrete ways of actions.

1. **Data**

Data-related issues are among the most prevailing challenges identified in the series of activities conducted by each of the collaborating countries. According to the Joint Research Centre (2015), systematically collected, comparable and robust disaster L&D data is an essential component of the risk assessment and management processes. This was evidently supported by the key findings of this project regarding the gaps and challenges in addressing L&D. Series of participatory approaches in data collection such as the workshops and interviews among others revealed that the current practice of the partner SEA countries on L&D data management is very problematic. For instance, the Philippine's findings show that challenges with regard to data management range from: data usefulness and/or quality; data accessibility; data sharing; tools or methods to gather data; and database and/or database management system. Some of the specific samples of the data problems include: lack of standardized database/baseline data; absence of integrated data from various sectors; and differences in data gathering methodologies. Indonesia and Vietnam also experienced the same problems encountered by the Philippines. In particular, Indonesia reported problems with regard to availability and consistency of data from agencies in multiple sectors. On the other hand, findings in Vietnam showed that they have been experiencing data collection problems (standardization, methods), inconsistencies in data between various sectors, and lack of data updating initiatives. These data related issues

posed various challenges in successfully operationalizing the proposed L&D framework which tries to integrate L&D, CCA, and DRR.

2. Governance

Managing L&D incurred by various climate-related disasters requires complex disaster governance mechanisms. Tierney (2012) as mentioned by Gall, M., et al. (2014) defines disaster governance as a body consisting of sets of norms, organizational and institutional actors, and practices. It is designed to reduce the impacts of L&D and it is expected to go beyond governmental settings, powers, processes and tools by encouraging collective actions through the engagement of all stakeholders operating at all scales—from local to global. In this particular research project, disaster governance was seen as one of the key challenges in addressing L&D. Problems with regard to policy development or review, implementation or enforcement, monitoring and evaluation, and political will revealed to have affected the current L&D mechanisms and initiatives among the three collaborating countries of the project. The results of the assessment showed that these governance problems were rooted in the weak implementation of institutional arrangements to implement various L&D initiatives. There is also a lack of capability among the various local and national governments to properly distribute resources. The absence of law that requires the integration of L&D, CCA and DRR initiatives in the development planning was also seen as a major issue. Moreover, the absence or lack of strong political will to implement existing policies related to L&D, CCA, and DRR was also recognized as a burden in mainstreaming the integration of this three interrelated concepts.

3. Translations

It was identified in the key findings of each collaborating country that there is difficulty in translating the scientific knowledge into a form that can be understood, used, and applied by target stakeholders for climate disaster actions. This problem is rooted in the lack of capacity to translate research findings for specific end-users. Translation was seen as a key factor, and that seemed lacking in order to facilitate the transformation of knowledge into policies related to L&D, CCA and DRR integration and to eventually operationalize the framework.

4. Funding

Issues with regard to financing to address L&D initiatives were also seen as a key problem among the partner countries of the project. The usual complaint of the stakeholders, especially the local government officials, is on how to fund their L&D mechanisms and where to get enough financial assistance to operationalize it. In the Philippine assessment, financial aid for research on L&D mechanisms is also lacking. The government also lacks enough funds for the implementation of policies and regulations with regard to L&D, CCA, and DRR. For instance, findings from Vietnam showed that there is a lack of financial resource and financial regime or mechanism to invest in developing L&D assessment system. This creates hurdles in successfully adopting the L&D framework and mechanism.

5. Sector-specific Risk Assessment

Among the surveyed localities from the three partner countries, the absence of sector-specific risk assessment was also seen as a challenge particularly for the L&D, CCA, and DRR practitioners and development planners. The lack of enough sector-specific inputs and comprehensive framework on assessing risk per sector made it difficult for them to create and implement sound risk management plans. Policy makers were also affected since they needed a good baseline data in crafting L&D-CCA-DRR related policies.

6. Technical Capacity

Technical capacity to understand and mainstream the science of L&D, CCA, and DRR in the development of projects, programs, polices, and budgets is one of the identified key challenges in addressing L&D and operationalizing the proposed framework. It was clearly identified by the reports and findings from the three collaborating countries that the key players at the local, provincial, and regional levels are not well capacitated to create, update, or even understand vulnerability, risk, and climate maps and models. Due to the complexity of climate science and the uncertainties on risk, LGUs need to be equipped with information and training to understand the fundamental drivers of climate change and how they are linked to the local realities they are experiencing. Completed and ongoing capacity building activities may not be as appropriate or sufficient enough for the LGUs to be well empowered and equipped to be at the forefront of climate action.

7. Partnership

Collaboration between and among the science, policy, private sectors and other stakeholders is identified as lacking in the current initiatives on L&D system of the three partner countries. The absence of proper communication has led to misunderstanding between and among the relevant stakeholders which could impede the successful operation and implementation of the proposed L&D framework. For instance, in the Philippines, collaboration between the science, policy, and private sectors in formulating climate-smart development plans were not yet initiated and there was no institutional mechanism to create such one. This problem is one of the main reasons why there are some development mechanisms that are not directed towards building a resilient and sustainable community. In the case of Vietnam, it was realized from the country assessment that the inter-sectoral coordination in planning is still weak. Each sector or province develops its own plans without thorough consultation and coordination with other sectors. This only shows that designing a comprehensive L&D assessment strategy may also suffer if there is no coordination between relevant sectors and other stakeholders.

Identified opportunities and recommendations in closing the gaps through effective research and development and policy agenda for implementation

Given the identified challenges in addressing L&D interlinked with CCA and DRR, there are various recommendations/opportunities to close these gaps and improve the current system. Listed in Table 6 are some of the recommended course of actions and initiatives identified from the series of activities that was conducted by each of the collaborating country.

Table 6. Highlights of the Recommendations/Opportunities from Indonesia, Philippines, and Thailand

Key Challenges	**Highlights of the Recommendations/Opportunities from Indonesia, Philippines, and Thailand**
Data	• Develop baseline data • Develop a system for building an L&D inventory • Develop a more open policy on data sharing • Develop standard and unified tools and methods in data gathering • Obtain accurate and integrated information on L&D including scientific data and local/indigenous/traditional knowledge • Establish geographic information systems (GIS) for integrated management
Governance	• Mainstream L&D information in development plans through a policy • Streamline policy and policy implementation • Mandate LGUs to come up with a resiliency plan that integrates Local Climate Change Action Plan, Disaster Risk Reduction and Management Plan (DRRMP) and L&D • Initiate regular review of functions, roles, performance, and work processes of the related key stakeholders • Properly delegate tasks to appropriate personnel, which should be guided and supported by the government • Create a legally binding regulation that will address issues on L&D, CCA and DRR • Possess a strong political will to implement an effective L&D assessment system • Create a strong legal basis in integrating L&D with CCA and DRR • Present the key findings on L&D assessment to the government officials and inform them of their roles in addressing L&D • Develop policy for the open sharing of L&D assessment data • Develop a policy to enhance the flexibility of disaster management fund in all levels
Translation	• Develop a mechanism aimed at translating technical information into formats that are useful to policy makers, planners, and LGUs • Translate scientific information and key findings into actual and concrete action plan
Funding	• Allocate funds to generate knowledge and build knowledge data bases • Reach out to private sectors for funding • Pool funds from various sources in the local, national and global levels • Develop climate index insurance (involve funding agencies, research institutions, technology provider, insurance agencies, and farmers) • Develop and pilot-test strong risk transfer mechanism

Key Challenges	Highlights of the Recommendations/Opportunities from Indonesia, Philippines, and Thailand
	• Promote weather-based insurance mechanism • Develop disaster risk insurance as a tool to link DRR, CCA and L&D • Enhance the flexibility of disaster risk management fund in the global and national especially on the local level
Sector-Specific Risk Assessment	• Come up with a comprehensive sector specific risk assessment framework • Strengthen public-private partnership to create synergies in conducting sector-specific risk assessments • Develop a guideline which shows sector per sector tools and mechanisms in conducting risk assessment processes
Technical Capacity	• Build LGU's capacity to understand and translate science-based info into their specific contexts • Regularly train government agencies and key stakeholders on the PDNA process • Develop and promote a common understanding on the concept of L&D • Conduct continuous research on related fields and develop pilot studies (e.g. assessment system, resilience system, etc.) to improve the feasibility of new systems and address the impacts of climate change • Improve the accuracy of weather forecasting to prepare for major storm events among others
Partnership	• Build a strong partnership between different sectors especially the science, policy and private sectors in addressing L&D, CCA, and DRR • Actively share best practices on DRR, CCA, and L&D strategies on the global, national and up to the local levels • Encourage collaboration between local institutions and insurance agencies in order to provide loans for farming (farming tools, technologies) • Strengthen partnership between the scientific community and the government • Strengthen international cooperation • Enhance the involvement of stakeholders, especially, private sectors and local communities in various L&D initiatives • Strengthen the partnership between government agencies, private institutions, international agencies, and NGOs, and the academe in development of initiatives to close the gaps on the L&D assessment system

Climate information and knowledge needed to support effective L&D systems

The L&D framework developed here emphasizes the importance of prevention of L&D through CCA and DRR. However, it must be noted that effective CCA and DRR strategies should be science-based. These strategies use scientific information to determine what kind of plans should be implemented. Essential in the planning process of effective strategies is climate projections. Climate change projections, when well interpreted and understood can

help policy-makers identify possible extreme events and their impacts to various sectors, and plan accordingly.

Maps (i.e. vulnerability, hazard, risk etc.) are also critical information that may be used to prevent L&D in communities. With the help of these, proper disaster management strategies may be employed. Historical and geographical data are used in order to supply needed information for the generation of these kinds of maps.

Reiterating the statement in the previous section, L&D assessment does not start and end in the quantification of the losses and damages. Prevention of these losses and damages is a vital component. With the translation of the available climate information and knowledge to policy and action, L&D can be reduced.

Best approach for mainstreaming the L&D Integration Framework

Frameworks are not easy to mainstream. Introducing a new way of thinking to the public is sure to be a difficult task. Therefore, such effort should be done with the aid especially of the relevant stakeholders. Not only will it strengthen partnerships between and among them but also increase the participation of the affected stakeholders.

During the introduction of the framework, pilot-testing must be done first. A model community may be used such as, in this case, the low-lying cities in Southeast Asia (i.e. Phnom Penh, Jakarta, Manila, Bangkok, and Hanoi). All the processes and significant details must be documented while noting the best practices and lessons learnt. After observations have been made and certain adjustments have been done, the framework is then ready to be replicated to other areas. However, this must be done with transparency, accountability, and high level of participation from all stakeholders in order to be effective.

The participation of every stakeholder must be guided by the government. It must create enabling conditions that will reinforce the introduction of the framework such as promotion, increasing the awareness on the issue, and strengthening the capacities of the communities. One way to promote the framework is to create a law or policy that will enforce full engagement of the stakeholders including marginalized and vulnerable sectors and communities such as indigenous peoples group, women, and youth. This is to emphasize that everyone has a responsibility in and to this issue. Through this law or policy, the national government can establish programs that will capacitate the LGUs through development of manuals and holding of training programs. By capacitating the LGUs, programs can be made to suit local contexts. Eventually, knowledge can be shared to the rest of the community. The national government can also incorporate the framework in the educational system by including its basic concepts and ideas in the curriculum. This relates to the point that mitigation, adaptation and disaster risk management require continuous learning and discussion. These efforts will empower all the members of the community and reinforce their role in preventing L&D.

In order to strengthen and acknowledge the efforts of the participating localities or communities, best cities or model communities can be given awards and incentives. This will serve as an inspiration to them to continue their efforts and for others to improve.

Best approach for monitoring and evaluation

Monitoring and evaluation can be done through continuous and regular dialogue and consultation. Gaps and issues can be raised through these. This will help in reviewing the effectiveness of the law, policy, or programs. Reforms based on the issues raised can be lobbied for the improvement of the framework. Moreover, the government can take advantage of the available and emerging technologies such as the crowdsourcing of information and advanced options for connectivity.

Conclusion

The series of activities conducted by the project tried to understand emerging issues with regard to L&D at the local, national and regional scales. Specifically, it tried to (1) review existing frameworks for assessing L&D due to climate-related disasters; (2) identify emerging issues, gaps and opportunities in linking CCA, DRR and L&D assessment; (3) develop a robust framework in linking CCA, DRR and L&D assessment; and (4) recommend R&D and policy agenda for implementation. It focused on high priority areas particularly the low lying coastal cities in Southeast Asia. It employed various participatory approaches (dialogues, surveys, interviews, workshops and lectures) in gathering relevant information and key findings. It also engaged various stakeholders from the different sectors such as the government and NGOs, private institutions, science sector and the academe, and decision-makers among others at various stages of the project to ensure that the findings will be useful and relevant to the local, national, regional and even to the global communities.

The assessment on the current L&D mechanisms in Indonesia, Philippines, Thailand, and Vietnam showed that most of these countries have already a structured mechanism in assessing L&D. This is based on the existing international system on L&D assessment (UN ECLAC). Each of them has various tools for assessment which is still subject for further improvement to fit the needs of each country. The assessment also showed that each country has already identified the set of key actors involved in the whole L&D system which ranges from the government and non-government institutions, private sector, the academe and science community, L&D-CCA-DRR practitioners and the community people. However, Indonesia revealed that their system on L&D assessment is not guided by any framework and mechanism to assess L&D in their country; the analysis showed that the mechanisms in use are the risk retention and risk transfer mechanism from the UN Work Programme on L&D.

The series of dialogues and workshops that were conducted by the whole project team was able to identify emerging key issues, gaps and challenges in linking CCA, DRR, and L&D, and to successfully operationalize the L&D framework. These challenges can be further characterized as problems related with data, governance, translation, funding, sector-specific risk assessment, technical capacity, and partnership. This is the integrated list of challenges based on the results of the assessment in each of the collaborating countries. The findings show that there are still numerous gaps in terms of addressing L&D for improving the adaptive capacity of each vulnerable country to the impacts of climate-related events. Recognizing these challenges is essential in developing concrete areas of action to improve the L&D system and the mechanisms involved in the process.

The highlight of this project is the initiative to develop a framework that integrates L&D-CCA-DRR. This framework was developed out of the country frameworks that were created by each of the collaborating countries. Each of the country frameworks was pilot-tested and further refined in each of the respective countries. It was then integrated and conceptualized to finally come up with a robust framework that links L&D knowledge with CCA and DRRM to build back better an impacted socioecological system. It shows a cyclic process of reducing or avoiding L&D associated with climate change impacts and increasing resilience by combining both climate change adaptation and disaster risk reduction strategies through

these 7 major components: climate stressors, climate/disaster risk, socioecological system, potential and actual L&D assessments, resilience building as incorporated in the planning process, implementation, and monitoring and evaluation. This framework, when successfully operationalized, is envisioned to ultimately reduce and avoid L&D, decrease vulnerability, and increase resiliency in the local, national, regional, and global level.

The project was also able to identify opportunities and recommendations in closing the gaps through effective R&D and policy agenda for implementation. Each of the partner countries suggested recommendations as listed in Table 6.

Considering the identified gaps and challenges, the initiatives vary according to the type of issues they target to address. They aim to improve and develop various aspects related to: data management mechanisms on L&D; governance system in addressing the L&D, CCA and DRR; translation of knowledge products into concrete ways of action; finance mechanisms to fund appropriate initiatives in addressing L&D, CCA and DRR; promote sector-specific risk assessment; strengthen the technical capacity of key actors on the assessment; and reinforce strong partnership between and among key actors and relevant stakeholders of the assessment.

On the other hand, the proposed regional framework on L&D assessment can be successfully operationalized with the aid of advancement of climate information and knowledge needed to support effective L&D systems. The framework should also be mainstreamed in all levels of development planning and policy making. The participation of relevant stakeholders and the strong partnerships between and among them is important to effectively implement this new system. These new initiatives should always be supported with an efficient and effective monitoring and evaluation mechanism to ensure the improvement and continuity of the new system in assessing L&D interlinked with CCA and DRR.

Future Directions

L&D is an emerging topic in the international agreements. Recognizing the issues and gaps in addressing L&D is a good starting point to further explore areas of researches to contribute to the reduction of the impacts of climatic-disasters especially in the low-lying coastal cities of SEA. As a two-year project, the key findings of the project only captured the existing conditions in the L&D assessment system of each collaborating country. Then, it proposed a new framework as a new mechanism to address L&D and its linkages to CCA and DRR, adding the identified R&D recommendations for further studies. However, this mechanism is just a guiding framework in conducting the whole process of assessing L&D and in creating a development plan to reduce L&D, decrease vulnerability, and increase resilience. Hence, it is necessary to further assess the potential application of the framework, and the specific tools and methods to conduct each of the included components in the proposed system. Developing and testing of specific and appropriate tools for assessment is also recommended.

It will also be a good opportunity if the proposed Regional Framework on L&D can be presented at international climate negotiations under the UNFCCC to gather relevant inputs to further improve the framework and make this replicable in other countries and regions. Their comments are needed to make the framework globally relevant. The presentation of the project outputs and key findings of the project will also contribute to the existing global and national agreement on L&D which focuses on the approaches to address L&D associated with the impacts of climate-induced disasters.

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Appendices

Appendix 1. Country assessment reports

1.1 Assessing the linkages between climate change adaptation (CCA), disaster risk reduction (DRR), and loss and damage (L&D) in the Philippines (Philippines' working paper).
1.2 Disaster loss and damage assessment in Thailand (Thailand's working paper).
1.3 Closer look on the current state of L&D in Southeast Asia (Vietnam's working paper).
1.4 Current state of loss and damage in Indonesia. (Indonesia's working paper).

Appendix 2. Summary of conducted activities, conferences, workshops and produced IEC materials in Indonesia

INDONESIA			
Activities	**Date Conducted**	**Venue**	**Outputs***
National Expert Consultation Meeting	07 November 2014	IPB International Convention Center	• Meeting Report *Please see appendix 2.1*
Development of country framework	N/A	N/A	• Indonesia Country Framework *Please see appendix 2.2*
Science – policy forum: parallel session at Indonesia climate week	02 December 2016	Ministry of Environment and Forestry	• Climate Week Terms of Reference • Brief Report • Presentations (5) *Please see appendix 2.3*
Lecture series • Thematic FGD • Introduction of country framework	 23 June 2016 3 November 2016	 CCROM office CICO resort	 • Brief Report • List of Participants • Brief Report *Please see appendix 2.4*
Workshop with local government	21 April 2017	Savero Hotel Bogor	• Brief Report • Terms of Reference • Background Document • Presentations (3) *Please see appendix 2.5*
Presentation in conferences (local and international)			
Presentation at 5th LOCARNet annual meeting	26 October 2016	Sheraton Hotel Bandung	• Presentation • Brief Report *Please see appendix 2.6*

Supplement Table 2A. Activities and participants involved in Indonesia

Activities	Participants
National Expert Consultation Meeting	PKSPL IPB, DNPI, SCDRR-UNDP, KLH, BPLHD DKI, Pusat Riset Kesehatan untuk krisis dan Bencana UI, Mercy Corps Indonesia, IPB, Care, Intercafe, PSB, PSP3
Development of country framework	Research Team
Regional Workshop	Oscar M. Lopez Center (OMLC), Center for Environment Research, Education and Development (CERED), Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific (CCROM-SEAP), Global Change System for Analysis, Research and Training (START), Ministry of Environment and Forestry, Indonesia, and Indonesian Climate Alliance Board
Science – policy forum: parallel session at Indonesia climate week	Ministry of Environment and Forestry (KLHK), regional disaster management agencies (BPBD),Geospatial Information Agencies (BIG), Ministry of marine and fisheries (KKP), Statistic Center Bureau (BPS), Ministry of Agriculture, Students
Lecture Series (Introduction of country framework)	Ministry of Environment and Forestry (KLHK), regional disaster management agencies (BPBD), research center on agroclimatology and hydrology (Balitklimat-Bogor), Geospatial Information Agencies (BIG), Ministry of marine and fisheries (KKP), Local government (Pemda Bogor), Environmental agency, PKSPL IPB, students, etc.
Lecture Series (Thematic FGD)	MSI, WCS-IP, CCROM, Mercy Corps, and The Nature Conservancy Indonesia
Presentation of Results	Local governments, development planning agency of district and municipality, environmental office of district and municipality, development planning agency of province, environmental office of province, disaster management agency of district and municipality, Indonesia Climate Alliance, center for coastal and marine resources studies, Bogor Agriculture University, center for natural resources and environmental management, Bogor Agriculture University

Appendix 3. Summary of conducted activities, conferences, workshops and produced IEC materials in Philippines

PHILIPPINES			
Activities	**Date Conducted**	**Venue**	**Outputs**
Events organized/co-organized			
National Experts Group Meeting	November 26, 2014	38th Floor, One Corporate Center, Ortigas, Pasig City	• Concept Note and Program • FGD Summary *Please see appendix 3.1*
Interview with NDRRMC	January 8, 2015	NDRRMC Office, Quezon City	• Summary Notes *Please see appendix 3.2*
Ormoc City Case Study	February 24, 2015	Ormoc City Hall	• Ormoc City Case Study Write-up • Attendance *Please see appendix 3.3*
National Workshop	April 28, 2017	Richmonde hotel, Ortigas, Pasig City	• Concept Note and Program • Workshop Report *Please see appendix 3.4*
Case study in Pila, Laguna	2015-2016	Pila, Laguna	• Concept Note • Pila Case Study (Working Paper) *Please see appendix 3.5*
Regional Workshop in Indonesia	April 19-20, 2016	Amaroossa Hotel, Bogor, Indonesia	• Regional Workshop Program • Regional Framework (Working Paper) *Please see appendix 3.6*
Round Table Discussion with Office of Civil Defense and Climate Change Commission	July 19, 2016	19th Flr. Malabayabas Room, One Corporate Center Bldg., Pasig City	• Brief Report *Please see appendix 3.7*
Testing the Proposed Framework to Integrate Loss and Damage, Climate Change Adaptation and Disaster Risk Reduction, and Validation of the Case Study on the Loss and Damage Assessment System in Ormoc City	September 1, 2016	Ormoc City Hall, Province of Leyte	• Document Guide • Travel Report • Framework for L&D-CCA-DRR Integration: Pilot-testing in Ormoc City (Report) *Please see appendix 3.8*

PHILIPPINES			
5th TOP LEADERS FORUM "Investing in Resilience: Leveraging Science for Sustainable Development"	November 8, 2016	SMX Convention Center Mall of Asia Complex, Pasay City	• Forum Presentation *Please see appendix 3.9*
Linking Loss and Damage with Climate Change Adaptation and Disaster Risk Reduction in the Philippines: A Science-Policy Forum	December 5, 2016	Richmonde Hotel Ortigas, Pasig City	• Concept Note and Program • SP Forum Proceedings *Please see appendix 3.10*
Linking Loss and Damage with Climate Change Adaptation and Disaster Risk Reduction in the Philippines: Lecture Series	April 6, 2017 April 27, 2017	Rockwell Business Center, Ortigas Avenue, Pasig City Ormoc City Hall, Province of Leyte	• Lecture Kit • Results of Evaluation Survey *Please see appendix 3.11*
Presentation in conferences (local and international)			
ASEAN Technical Briefings on Disaster Risk Financing and Insurance in the Philippines (Oral Presenter)	February 9-10, 2017	Eastwood Richmonde Hotel, Metro Manila	• Conference Presentation *Please see appendix 3.12*
Low Carbon Asia Research Network (LoCARNet) 5th Annual Meeting (Oral Presenter)	October 25-26, 2016	Sheraton Bandung Hotel & Towers	• Conference Presentation *Please see appendix 3.13*
5th Asia Pacific Climate Change Adaptation Forum 2016 (Oral Presenter)	October 17-19, 2016	Bandaranaike Memorial International Conference Hall Bauddhaloka Mawatha Colombo, Sri Lanka	• Travel Report 1 • Conference Presentation *Please see appendix 3.14*
AASSA-NAST PHL Workshop and Annual Climate Conference (Poster Presenter)	September 28-29, 2016	Taal Vista Hotel, Tagaytay City	• Infographic *Please see appendix 3.15*
Adaptation Futures 2016 (Oral Presenter)	May 10-13, 2016	World Trade Centre Rotterdam: Beursplein 37, 3001 DB, Rotterdam, the Netherlands	• Post Event Article • Conference Presentations (2) *Please see appendix 3.16*
Asia-Pacific	September 22-	Diversion 21 Hotel,	• Conference Poster

PHILIPPINES			
Economic Cooperation (APEC)'s Senior Disaster Management Officials forum	23, 2015	Iloilo City	Presentation *Please see appendix 3.16*
4th National Climate Conference	September 23, 2015	Hotel Jen, Pasay City	• Conference Poster Presentation *(same as appendix 3.16)*
Regional Forum on Climate Change (RFCC) Low Carbon and Climate Resilient Societies: Bridging Science, Practice, and Policy	July 1-3, 2015	Asian Institute of Technology, Thailand	• Post Event Article • Conference Presentation *Please see appendix 3.17*
Resilient Cities 2015: 6th Global Forum on Urban Resilience and Adaptation	June 8-10, 2015	Bonn, Germany	• Post-event Article • Conference Paper • Conference Presentation *Please see appendix 3.18*
Publications Produced			
Paper/Journal Article Writing and production of Infographics and Briefer	N/A	N/A	• Science-Policy Brief • Infographics (4-part series) • L&D Briefer • Journal Article (for submission) *Please see appendix 3.19*

Supplement Table 3A. Activities and participants involved in the Philippines

Activities	Participants
National Experts Group Meeting	Government agencies (Department of Agriculture [DA], National Economic and Development Authority [NEDA], Philippine Statistics Authority [PSA], League of Provinces of the Philippines [LPP]), local government unit (LGU), nongovernment organizations (Oxfam, Earthquakes and Megacities Initiatives [EMI], ChristianAid), and research and academic institutions (University of the Philippines Los Baños [UPLB], Manila Observatory [MO], Dela Salle University [DLSU], International Rice Research Institute [IRRI], Ateneo School of Government [ASoG])
Key Informant Interview	Director Edgardo J. Ollet, MNSA, Chief of Plans and Programs

Activities	Participants
	of National Disaster Risk Reduction and Management Council – Office of Civil Defense (OCD-NDRRMC) Central Office
Ormoc City Case Study	Ormoc City Government Officials – Offices/Departments (interior and local government, planning and development, social welfare and development, disaster risk reduction and management, engineering, health, and environment and natural resources), randomly selected barangay chairmen, and local media staff
National Workshop	Government agencies (OCD-NDRRMC, Climate Change Commission [CCC], NEDA, Special Committee on Climate Change of the House of Representatives, Department of Education [DepEd], DA, Department of Industry [DTI], PSA, LPP, Department of Public Works and Highways [DPWH], Department of Health [DOH], Mines and GeoSciences Bureau [MGB], Housing and Urban Development Coordinating Council [HUDCC], Department of Finance [DOF], Department of Transportation and Communication [DOTC], and Philippine National Oil Company [PNOC]), LGUs, non-government organizations (Philippine Disaster Resilience Foundation [PDRF], Oxfam, United Nations Development Programme [UNDP], and EMI), research and academic institutions (MO, ASoG, and University of the Philippines [UP]), and other relevant stakeholders (Energy Development Corporation [EDC], and Metropolitan Waterworks and Sewerage System [MWSS])
Pila Case Study	Key actors on loss and damage, adaptation, and disaster risk reduction and management in the barangay and municipal levels of government, and randomly selected households from five coastal barangays in Pila, Laguna (Aplaya, Bagong Pook, Linga, Pinagbayanan, and Tubuan)
Regional Workshop	Oscar M. Lopez Center (OMLC), Center for Environment Research, Education and Development (CERED), Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific (CCROM-SEAP), Global Change System for Analysis, Research and Training (START), Ministry of Environment and Forestry, Indonesia, and Indonesian Climate Alliance Board
Round Table Discussion	OCD-NDRRMC, OMLC, and EDC
Pilot-Testing of the Framework	Heads/representatives from selected sectoral offices/departments (Department of Interior and Local Government, City Planning and Development Office, City Budget Office, City Environment and Natural Resources Office, City Disaster Risk Reduction and Management Office and City Engineering Office) and chairmen/representatives from barangays Macabug, Panta, Batuan and Linao
5th Top Leaders Forum	Philippine Insurers and Reinsurers Association, National Reinsurance Corporation of the Philippines, Center for Clean and Renewable Energy Development, National Panel of

Activities	Participants
	Technical Experts, Archdiocese of Manila, and some other representative from the insurance industry
Science-Policy Forum	Government Agencies (CCC, NEDA, Department of Interior and Local Government [DILG], Department of Social and Welfare Development [DSWD], Department of Public Works and Highways [DPWH], Housing and Land Use Regulatory Board [HLURB], Department of Tourism [DOT], Department of Science and Technology - Philippine Atmospheric Geophysical and Astronomical Services Administration [DOST-PAGASA]), Research and Academic Institutions (University of the Philippines – Los Baños [UPLB], Ateneo de Manila University – Ateneo School of Government [ADMU-ASoG] , ADMU – MO, UP-NCPAG [National College of Public Administration and Governance]), Business Group/Private Institutions (First Philippine Holdings Corporation [FPHC], EDC)
Lecture Series in Manila	OCD-NDRRMC, CCC, LPP, League of Municipalities of the Philippines (LMP), DRRM Officers of the Cities of Manila
Lecture Series in Ormoc City	OCD-NDRRMC, CCC, Ormoc City Offices/Departments (veterinary , health, social welfare and development, general services, interior and local government, planning and development, disaster risk reduction, paralegal, budget, environment and natural resources, engineering, agriculture, assessors, police station), representatives from Ormoc City high risk barangays

Appendix 4. Summary of conducted activities, conferences, workshops and produced IEC materials in Vietnam

VIETNAM			
Activities	**Date Conducted**	**Venue**	**Outputs***
National Experts Meeting	25 November 2014	Fortuna Hotel No. 6 Lang Ha street, Hanoi, Vietnam	• National Expert Meeting Report • List of Participants *Please see appendix 4.1*
Country Case Study	26-30 April, 2015	Cat Hai island, Cat Ba district, Hai Phong Province, Vietnam	• Case Study Report • Field Trip Summary • List of Interviewees *Please see appendix 4.2*
National Workshop	8 June, 2015	Fortuna Hotel No. 6 Lang Ha street, Hanoi, Vietnam	• National Workshop Report • List of Participants *Please see appendix 4.3*
Testing of Framework	29 December, 2016	GiaoThuy district, Nam Dinh province, Vietnam	• Testing of Framework (Report)
	24 October, 2016	Cat Hai district, Hai Phong province, Vietnam	*Please see appendix 4.5*
Science- Policy Forum	18 October, 2016	Fortuna Hotel No. 6 Lang Ha street, Hanoi, Vietnam	• Science-Policy Meeting Report • List of Participants *Please see appendix 4.6*
Lecture Series	30 November, 2016	National Economics Univeristy No.207 Giai Phong Street, Hanoi, Vietnam	• Report of the First Lecture • List of Participants
	07 December, 2016	Science The Office of Hai Phong Union of and Technology Associations No.17B Tran Hung Dao Street, Hai Phong city, Vietnam	• Report of the Second Lecture • List of Participants *Please see appendix 4.7*
Presentation in conferences (local and international)			
Presentation of Results	July 25-August 5, 2016	2016 Summer Institute for Disaster and Risk Research at Beijing Normal University, China	• Case Study Result Presentation *Please see appendix 4.8*
	8-12	CCB THINKSHOP	• Report Summary

	November 2016	IN MARRAKECH. Morocco – side event at COP 22	*Please see appendix 4.9*
	22 November 2016	Workshop of Environmental Protection in Hanoi – Vision to 2050 (Vietnamese)	• Report Presentation *Please see appendix 4.10*
Publications Produced			
Public IECs materials			• Handbook - in Vietnamese • Science-Policy Brief • Journal Article *Please see appendix 4.12*

Supplement Table 4A. Activities and participants involved in Vietnam

Activities/Events	Participants
National Experts Meeting	Climate Change Resilience Centre, Vietnam National University – University of Science, Center for Environment and Community Research, Vietnam National University - Centre for Natural Resources and Environmental Studies (VNU-CRES), Ministry of Agriculture and Rural Development- Department of Dyke Management and Flood Storm Control, National Economics University – Faculty of Environment and Urban, Hanoi School of Public Health, RMIT University, Ministry of Planning and Investment, National Institute of Occupational &Environmental Health, Network Coordinator, Gender and Community Development (GenComNet), Redcross Vietnam, and Vietnam Academy of Social Science
National Workshop	Center for Environment Research Education and Development, Hanoi Homeland Security Office, Vietnam Union of Science and Technology Associations, Center for Viet – brand information, Center for Meteorology and Climatology- Vietnam Institute of Meteorology, Hydrology and Environment - Ministry of Natural Resources and Environment, Climate Change Resilience Centre, Hanoi Homeland Security Office, Development Strategy Institutes - Ministry of Investment and Planning, Disaster Management Center – Ministry of Agriculture and Rural Development , Disaster Risk Reduction Programme - International Federation of Red Cross and Red Crescent Societies, Hanoi School of Public Health, Ministry of Information and Communications of the Socialist Republic of Vietnam, Ministry of Planning and Investment, National Economics University, Faculty of Environment and Urban, National Institute of Occupational & Environmental Health, Network Coordinator, Gender and Community Development (GenComNet), Institute of

Activities/Events	Participants
	culture study – Vietnam Academy of Social Science, Institute of culture study – Vietnam Academy of Social Science Institute of Regional Sustainable Development – Vietnam Academy of Social Science, Red Cross Vietnam, Research Center for Resources and Rural Development, RMIT University, Vietnam National University - Hanoi University of Science – Faculty of Postgraduate, Vietnam National University (VNU) - Hanoi University of Science - Faculty of Environmental Science, VNU-Hanoi University of Science - Faculty of Environmental Science, World Vision, Vietnam State Television - Parliament Channel, Radio Voice of Vietnam - VOV2, Tien Phong News - Tri Thuc Tre Magazine, Vietnam News Agency
Regional Workshop	Oscar M. Lopez Center (OMLC), Center for Environment Research, Education and Development (CERED), Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific (CCROM-SEAP), Global Change System for Analysis, Research and Training (START), Ministry of Environment and Forestry, Indonesia, and Indonesian Climate Alliance Board
Science- Policy forum	Disaster Management Center – Ministry of Agriculture and Rural Development, Faculty of Environment and Urban, National Economics University, Ministry of Planning and Investment Vietnam National University – University of Science, Institute of Regional Sustainable Development – Vietnam Academy of Social Science, Center for Environment Research Education and Development, Climate Change Resilience Center, University of Water Resources, VINARE, Center of the international Information and Collaboration – Vietnam Institute of Development Study, Department of Climate Change and Global Issues Institute of Strategy and Policy on Natural Resources & Environment, MONRE, Soils and Fertilizers Research Institute, Hygiene and Environmental Health Department- National Institute of Occupational and Environmental Health, Gia dinh vat Tre em Journal, CEACE, Công ty TNHH phát triển khí sinh học môi trường xanh, Foreign Trade University, Disaster Management Center – Ministry of Agriculture and Rural Development, Microstep – MIS Vn, Vietnam Academy of Social Science, Human research institute- Vietnam Academy of Social Science, Natural resource and Environment news, Nhan dan news, Quan doi newspapers, Thuonghieu&Congluan news, Vietnam 's Voice, Vietnam News Agency, Vietnam Forum of Environment Journalists, Doi song va Phap Luat newspapers, Vietnam science & technology
First lecture	Faculty of Environment and Urban, National Economics University, Center for Environment Research Education and

Activities/Events	Participants
	Development, Vietnam National Reinsurance Corporation (VINARE), Hanoi Medical University, Nhan dao newspapers, Climate Change Resilience Center, World Vision, Faculty of Insurance, National Economics University, Faculty of Economic Study, National Economics University, VTC10, Institute of Strategy and Policy on Nature Resources and Environment, Tập đoàn Tâm năng Thiên Hải (Thien Hai group), PanNature, Research Institute for Cop with Climate Change and Environment, Hanoi University of Natural Resources and Environment, ATC Automation Electrical Mechanical Trading Company, University of Water Resources, Research Institute for Cop with Climate Change and Environment, Scientific Research Institute of Sea and Islands, National Center for Socio-economic Information and Forecast, Ministry of Planning and Investment, Thienhai group, Foreign Trade University, Hanoi National University of Education, Business School- National Economics University, RMIT University, Vietnam Center for Environment Research Education and Development
Second lecture	Center for Environment Research Education and Development, Nhan dao newspapers, Hanoi Medical University, Climate Change Resilence Center, World Vision, ATC Automation Electrical Mechanical Trading Company, Department of Transportation in Hai Phong, Institute of Marine Environment and Resources, Mechanical Association, Hai Phong, Electronical Radio Association (hội vô tuyến điện tử), People 's committee of Tien Lang district, Department of Science and Technology, Hai Phong, Hai Phong Harbor, VINASTAS in Hai phong, Road and Bridge Association Vietnam, Fishery Association, Gaderning Association, Department of propagradation and dissemination knowledge, Hai Phong, Committee of scie-tech and Consulting, Hai Phong Union of Science and Technology, Association Center for Science and Technological Research, Hai Pho ng, Research Institute for Marine Fishes, Journal for Science and Technology, Hai Phong, Vietnam Maritime University, Dinh Vu Port, Hai Phong Union of Science and Technology Association

Appendix 5. Funding sources outside the APN

- **In-kind support from:**
  - Philippines: Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation, Inc. (OML Center) - **25,930 USD**
  - Indonesia: Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific (CCROM-SEAP) – **8,500 USD**
  - Vietnam: Center for Environment Research Education and Development (CERED) – **7,200 USD**
- **Sponsors to the events/conferences participation:**
  - International Centre for Climate Change and Development (ICCAD)
  - Adaptation Futures 2016
  - Institute for Global Environmental Strategies (IGES)
  - Asian Institute of Technology (AIT)

Appendix 6. List of Young Scientists

Philippines: Oscar M. Lopez Center for Climate Change Adaptation and Disaster Risk Management Foundation Inc. (OML Center)

Angelou Balba-Austria
Email:aaustria.omlopezcenter@gmail.com/angelou.balba@gmail.com
The opportunity given to me as the researcher of the project helped me to strengthen my abilities to do research in various levels – the local, national, regional, and even up to the global level. The research experience broadened my knowledge on the linkages between climate change adaptation, disaster risk reduction, and most especially on loss and damage. In addition, it opened my mind on various developmental issues that are not yet addressed given the current developmental system. Lastly, it heightened my eagerness to do further research on the related topics so I can contribute in successfully addressing these issues for the benefit of the present and future generations.

Ana Veronica Gabriel
Email: anvegabriel@gmail.com
My two years of involvement in the project provided me a lot of opportunities for both personal and professional growth and development. Aside from developing my research skills, I was also able to develop my project management and coordination skills. Moreover, through all the project activities and conference presentations, I was able to interact with different people from various government agencies and non-government institutions locally and internationally, widen my network, and learn a lot about loss and damage and its links to climate change adaptation and disaster risk reduction.

Indonesia: Center for climate risk and opportunity management in Southeast Asia and Pacific (CCROM SEAP)

Dr. Wiwin Widiyanti
Email: wiwin.widiyanti@hotmail.com
Prior to pursuing my PhD I was working on the area of disaster loss and damage.
However it was more on the technical analysis and did not cover the issue of loss and damage from climate change. So involvement in this project was a good opportunity for me to gain new knowledge, instead of technical analysis focus of this project was at policy level and the topic is also broader. I was responsible for the entire activities related to the survey including, preparation, coordination with enumerator and related agencies. However data analysis and report writing were supported by Kiki.

Kiki Kartikasari, MSc
Email: kkartikasari@gmail.com
I had a productive and pleasant research period during the project. I was responsible for project management in general, data analysis and report writing. Dynamics of the project was interesting because it was involving various type of activities from desk review, discussions to field survey. The nature of collaboration with an NGO – Indonesia Climate Alliance (ICA) was also an interesting part and I was introduced to a network of leaders.

There were changes in CCROM team member assigned for this project. Therefore we need to make some adjustment. I also learned to set priorities and address the most relevant agenda because there are some limitations along the way.

Diva Oktavariani, MSi
Email: maildeeva@gmail.com
I was involved partially during end of first year. Most activities during the period were a series of thematic meetings road to Indonesia National Climate Week. It was a tremendous opportunity to broaden my network and knowledge because the event involved a wide range of audiences, organized by a team consists of both governmental and non-governmental organizations, and covering several topics related to climate change.

Sulistyawati, SSi
Email: sulis.ipb46@gmail.com
My involvement was mainly in coordinating the workshops conducted during 2nd year of the project. Therefore first benefit from the project for me was network development. In addition, this project allowed me to learn about financial reporting because I was responsible for financial report of the workshops too. In the context of research topic, this was my first involvement in the area of loss and damage. I gained some knowledge on this issue through the project.

Vietnam: Center for Environment Research Education and Development (CERED)

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I am very happy when having a chance to involve in this project because I am into climate change adaptation and disaster risk reduction topic. Thanks to this project, I has gain research skills, especially fieldwork research skills via case study research and testing framework activities; presentation skills via presents in regional workshop and Beijing summer institute; project management skills; and writing skills via reporting project events and scientific journal writing. Dr. Nguyen Huu Ninh has given me a great deal of advices and partners in OML Center have helped me a lots, especially when I wrote my first English scientific journal relating to this topic. Although this paper is still reviewing, their comments have helped me to sharp my writing skills and logical thinking.

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I involved this project in fieldtrip in Cat Hai Island, Hai Phong province and regional meeting. This project brought me an opportunity to work with international partners and to gain scientific knowledge. And a part of results of the case study in Cat Hai Island was used to develop my bachelor's thesis which was loss and damage assessment activities in Cat Hai Island.

Appendix 7. List of Acronyms and Abbreviations

APN	Asia-Pacific for Global Change Research
ASoG	Ateneo School of Government
BPBD	Regional Disaster Management Agencies
BIG	Geospatial Information Agencies
BPS	Statistic Center Bureau
CCROM-SEAP	Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific
CERED	Center for Environment Research Education and Development
COP	Conference of the Parties
CCA	Climate Change Adaptation
CRI	Climate Risk Index
CCC	Climate Change Commission
CBA	Cost-benefit Analysis
DRR	Disaster Risk Reduction
DILG	Department of Interior and Local Government
DA	Department of Agriculture
DLSU	De La Salle University
DepEd	Department of Education
DTI	Department of Trade and Industry
DPWH	Department of Public Works and Highways
DOH	Department of Health
DOTC	Department of Trade and Industry
DOF	Department of Finance
DSWD	Department of Social Welfare and Development
DOT	Department of Tourism
DOST-PAGASA	Department of Science and Technology - Philippine Atmospheric, Geophysical and Astronomical Services Administration
DALA	Damage and Loss Assessment
DANA	Damage and Needs Assessment
DesInventar	Disaster Information Management System
EMI	Earthquakes and Megacities Initiatives
EDC	Energy Development Corporation
ERNA	Early Recovery Needs Assessment
EMA	Emergency Management Australia
FGD	Focus group discussion
FPHC	First Philippine Holdings Corporation
GenComNet	Gender and Community Development
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic Information System
HUDCC	Housing and Urban Development Coordinating Council
HLURB	Housing and Land Use Regulatory Board
HRNA	Human Recovery Needs Assessment
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
KII	Key informant interview
KLHK	Ministry of Environment and Forestry
KKP	Ministry of marine and fisheries
L&D	Loss and Damage
LMP	League of Municipalities of the Philippines
LPP	League of Provinces of the Philippines

MO – ADMU	Manila Observatory - Ateneo de Manila University
MWSS	Metropolitan Waterworks and Sewerage System
MGB	Mines and GeoSciences Bureau
NEDA	National Economic and Development Authority
OCD-NDRRMC	National Disaster Risk Reduction and Management Council –Office of the Civil Defense
PSA	Philippine Statistics Authority
PNOC	Philippine National Oil Company Renewables Corporation
PDRF	Philippine Disaster Resilience Foundation
PDNA	Post-disaster Needs Assessment
SEIA	Socio-economic Impact Assessment
START-SEA RC	Global Change System for Analysis, Research and Training- Southeast Asia Regional Center
UNDP	United Nations Development Programme
UP-NCPAG	University of the Philippines Diliman - National College of Public Administration and Governance
UNFCCC	United Nations Framework Convention on Climate Change
UPLB	University of the Philippines Los Baños
UNISDR	United Nations Office for Disaster Risk Reduction
UN ECLAC	United Nations Economic Commission for Latin America and the Caribbean
VNU-CRES	Vietnam National University - Centre for Natural Resources and Environmental Studies
VINARE	Vietnam National Reinsurance Corporation
WIM	Warsaw International Mechanism

Appendix 8. Glossary of Terms

Actual loss and damage assessment	Its ultimate goal is to provide statistics that show the effect of the disaster in a specific area.
Adaptive capacity	The combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities.
Anthropogenic	This means human-induced or resulting from human activities. It is often used in reference to environmental changes.
Climate change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.1 See also Climate variability and Detection and attribution.
Climate change adaptation (CCA)	It refers to the process of making adjustments in natural and human systems as a response to actual or projected climate and its effects. Adaptation initiatives are conducted in an effort to reduce harmful effects and benefit from favorable opportunities.
Climate projection	A projection of the response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based upon simulations by climate models. Climate projections are distinguished from climate predictions in order to emphasize that climate projections depend upon the emission/ concentration/radiative-forcing scenario used, which are based on assumptions concerning, e.g., future socioeconomic and technological developments that may or may not be realized and are therefore subject to substantial uncertainty.
Climate-related disasters	It comprises of the hydrometeorological (floods, storms, heat waves) and climatological disaster (droughts, wildfires) events.
Climate risk	The probability of harmful consequences or expected loss (e.g., death, injury, loss of livelihoods, reduced economic productivity and environmental damage) resulting from interactions between climate hazards and vulnerable conditions in the context of climate variability and change.
Climate risk index (CRI)	Indicates a level of exposure and vulnerability to extreme events, which countries should understand as warnings in order to be prepared for more frequent and/or more severe events in the future.
Climate stressor	The manifestations of climate variability and climate change in specific ecosystems.
Conference of the Parties (COP)	The supreme body of the United Nations Framework Convention on Climate Change (UNFCCC), comprising countries that have ratified or acceded to the UNFCCC.
Cost-benefit analysis	Designed to show whether the total advantages (benefits) of a project or policy intervention exceed the disadvantages (costs). This essentially involves calculating in monetary terms all of the costs and benefits. An adaptation option would represent a good investment if the aggregate benefits exceed the aggregate costs.
Damage	The cost of replacing destroyed assets with others that have the same physical and technological characteristics. Damage occurs during the event giving rise to the disaster. It is measured in physical units

	destroyed and a monetary value is subsequently assigned based on the prevailing replacement cost at the time the disaster occurred. Destruction may be partial or total.
Damage and loss assessment (DALA)	This is a methodology created in the early 1970s as a framework to assess damages and losses due to disasters particularly the socio-economic state of a country after a disaster.
Damage and Needs Assessment (DANA)	This method aims to determine the: nature and extent of a disaster; damage and secondary threats; needs of the population; resource availability and local response capacity; options for relief assistance; longer-term recovery and development; needs for international assistance.
Disaster	A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.
Disaster Information Management System (DesInventar)	A tool for generating National Disaster Inventories and constructing databases that capture information on damage, loss and general effects of disasters.
Disaster risk	The potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period.
Disaster risk reduction (DRR)	The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.
Economic losses	The loss of resources, goods, and services that are commonly traded in markets (e.g., income and physical assets).
Emergency Management Australia (EMA) Disaster Loss Assessment Guideline	Provides guidance in estimating direct and indirect losses.
Focus group discussion (FGD)	This is a group interview that gives the researcher the ability to capture deeper information more economically than individual interview. This method provides insights on the way people think, thus it provides a deeper thought on the issue or problem being studied.
Geographic Information System (GIS)	A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. By relating seemingly unrelated data, GIS can help individuals and organizations better understand spatial patterns and relationships.
Human Recovery Needs Assessment (HRNA)	It is an assessment that identifies human recovery needs, taking into account the impacts of disasters on human development and the resources needed for recovery and reconstruction of the key sectors.
Intergovernmental Panel on Climate Change (IPCC)	An international body established in 1998 by the United Nations Environment Programme and the World Meteorological Association, which conducts regular assessments of the scientific basis of climate change and its significant components.
In-depth	More specialised and separate assessment for certain sectors which is

assessment	usually carried out at a later stage. In-depth assessment in order to guide reconstruction planning.
Key informant interview (KII)	It is a type of data collection that aims to collect information from a wide range of people who have first-hand information and knowledge about the topic being studied and it allows a free flow of ideas and information.
Losses	Goods that go unproduced and services that go unprovided during a period running from the time the disaster occurs until full recovery and reconstruction is achieved.
Loss and damage (L&D)	Loss and damage refers to the “negative effects of climate variability and climate change that people have not been able to cope with or adapt to”.
Mitigation	A human intervention to reduce the sources or enhance the sinks of greenhouse gases.
Non-economic losses	This loss can be understood as the remainder of items that are not commonly traded in markets (e.g., environment, individual, and society).
Participatory data collection	This approach is usually linked with qualitative methods of information gathering and these focus on the interpretation of the social phenomena based on the views of the participants of a particular social reality.
Post-Disaster Needs Assessment (PDNA)	This method assesses the needs for “recovery, reconstruction, and risk management” in terms of financial, technical, and human resources. It takes into consideration the resources available for disaster response when determining the impact of a disaster.
Potential loss and damage assessment	It determines the potential L&D information for both slow- and rapid-onset events through various methods such as valuation of resources, cost-benefit analysis, and scenario building among others.
Rapid/early assessment	Undertaken after a major event, and conducted in one week or less. Provides immediate information on needs, possible intervention types, and resource requirements.
Rapid onset events/Extreme weather events	It may be a single, discrete event that occurs in a matter of days or even hours.
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
Slow onset events	Evolve gradually from incremental changes occurring over many years or from an increased frequency or intensity of recurring events.
Socioecological system	It is a complex bio-geo-physical unit and its associated social actors and institutions, all interacting in an adaptive manner to produce outcomes.
Socio-economic impact assessment (SEIA)	The SEIA model was created to answer the gap of other assessment frameworks. It was formed to assess the socioeconomic impact for intangible elements such as health, the environment, and memorabilia. This also allows identifying the resilience and recovery ability of a regional economy and that regions’ social wellbeing.
United Nations Framework Convention on Climate Change (UNFCCC)	The UNFCCC is a “Rio Convention”, one of three adopted at the “Rio Earth Summit” in 1992. The ultimate objective of the Convention is to stabilize greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system.
Valuation of resources	It aims to express non-economic impacts in monetary terms, rendering them comparable to economic impacts and costs.
Vulnerability	The predisposition of a system to cope with the adverse effects of climate change. Vulnerability to climate change is a combination of

	several factors, including the degree of exposure and sensitivity to climate risks and the capacity of the system to adapt to changes.
Warsaw International Mechanism (WIM) for L&D	The Conference of the Parties established the Warsaw international mechanism for loss and damage, under the Cancun Adaptation Framework. It aims to promote implementation of approaches to addresses loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change.

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