

**Non-economic loss and damage
in the context of climate change:
Comparative analysis of
Wakayama (Japan) and Khulna (Bangladesh)**

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ABBREVIATIONS

AHP	Analytic Hierarchy Process
CCA	Climate Change Adaptation
DRR	Disaster Risk Reduction
L&Ds	Loss and damages
NELDs	Non-Economic Loss and Damages
PTSD	Post-Traumatic Stress Disorder
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change

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CHAPTER 1 INTRODUCTION

1.1 Background

Loss and damages (L&Ds) caused by climate-related disasters, such as cyclones, droughts and sea level rise, is an urgent challenge in the context of climate change that the world is facing. There are several interpretations of the L&Ds. One of the related literatures interprets the L&Ds as ‘negative effects of climate variability and climate change that people have not been able to cope with or adapt to’ (Warner and Geest, 2013, p.369). International attention for addressing the L&Ds has been paid through the discussions at the Conference of Parties (COP) under United Nations Framework Convention on Climate Change (UNFCCC). However, there is an emerging issue of non-economic loss and damages (NELDs) which has not been adequately mainstreamed in the current countermeasures to disaster risk reduction (DRR) and climate change adaptation (CCA) (Hoffmaister and Stabinsky, 2012).

Japan is also one of the most prone countries to climatic events in the world. Climatic disasters such as super typhoons have been often reported during recent years (MOEJ, 2015). In responding to this situation, the Japanese government has strengthened its countermeasures to facilitate post-disaster recovery. However, the focus is responses to physical economic damages, such as damages to houses and properties while the NELDs have not been sufficiently considered in current policy decision-making. More emphasis on NELDs is essential for Japan as NELDs could exceed economic damages, especially in small rural towns vulnerable to climatic disasters, as is the case that NELDs in developing countries could be more significant than economic damages (UNFCCC, 2013).

1.2 Problem Statement

Adequate assessment frameworks for addressing NELDs have not been established, in part because of the difficulty of understanding, identifying and estimating NELDs (Tol and Fankhauser, 1998; UNISDR, 2004; Hoffmaister and Stabinsky, 2012). NELDs have also not been sufficiently reported in most post-disaster reports and databases (Swiss Re, 2013). The actual disaster losses can be significantly underestimated if NELDs are treated

as less emphasis, and this can lead to insufficient investments in post-disaster recovery and limited decision-making on DRR and CCA, and result in a decrease in community resilience to climatic disasters (Morrissey and Oliver-Smith, 2013; IPCC, 2014).

1.3 Research Objective

Keeping the above in view, the objective of this study is to identify a post-disaster assessment framework for integrating NELDs into policy decision-making, through:

- Understand NELDs caused by climate-related disasters;
- Identify and prioritize key NELD-related thematic areas, indicators, risk reduction practices, as well as relevant decision criteria, and
- Make recommendations to local and national governments to enhance existing DRR and/or CCA countermeasures for addressing NELDs.

1.4 Research Hypothesis

The NELDs have not sufficiently considered in current decision-making processes on DRR and CCA. This study attempts to establish that understanding the issues of NELDs from community-based perspectives and integrating NELDs into policy decision-making can contribute significantly to better post-disaster recovery from climatic disasters.

This study seeks to address the following questions:

- What are important NELDs caused by climate-related disasters?
- What are effective frameworks to identify and prioritize key NELDs?
- What commonalities and differences in NELDs are between the perspectives of communities and local governments and also between developed and developing countries?
- What risk reduction practices and how they should be enhanced for addressing NELDs?

1.5 Research Methodology

The methodology used in this study is described in the following steps:

1. Comprehensive literature review: A desktop study was undertaken to understand NELDs in the context of CCA and DRR and to identify key NELD-related thematic areas, indicators, risk reduction practices, as well as relevant decision criteria.
2. Expert consultations: Consultation workshops were conducted with relevant experts to vet NELD-related elements (decision-making criteria, indicators and practices) identified from the literature in each country's context of study locations;
3. Community consultations: Focus group discussions in affected communities were implemented to identify key NELD elements appraised by expert consultations from the community perspectives;
4. Questionnaire surveys: Questionnaire surveys were carried out to prioritize key NELD elements from the perspectives of affected local communities and local governments, and to identify the differences between these two stakeholders on the relative importance they give to various NELD elements.
5. Analytical method: Analytic Hierarchy Process (AHP) was used to prioritize the data about key NELD elements collected from questionnaire surveys; and
6. Make recommendations to local and national governments to enhance existing DRR and/or CCA-related plans/policies for addressing NELDs.

1.6 Study location

This study mainly focused on NELDs caused by recent past climatic disasters in Japan, such as extreme typhoons, and a case study was conducted in Nachikatsuura town, Wakayama prefecture in Japan to explore NELDs caused by Typhoon No. 12 in 2011. Nachikatsuura was chosen as the study site for reasons, including: 1) severity of loss and damages from the Typhoon No. 12; 2) vulnerability to climatic disasters as rural small

municipality; and 3) abundance of social, cultural and environmental assets which can be impacted by NELDs.

Another case study for the purpose of comparative analysis between the Japan case and developing countries was carried out in Koyra sub-district, Khulna district in Bangladesh to discover NELDs caused by Cyclone Aila in 2009 that Bangladesh suffered most severe disaster during recent years. Koyra was selected as the study location due to similar reasons as the Japan case in terms of: 1) serious loss and damages from the Cyclone Aila; 2) geographic location as remote rural community; and 3) richness of social, cultural and environmental assets.

1.7 Study Scope and Limitations

This study is based on literature review and stakeholder consultations in the study countries. The results are specific to these countries but it may be applicable to other country situations. In addition, since thorough explanations and longer questionnaires were needed to some extent in the survey forms to adequately explain respondents about the purpose and contents under the AHP method, it is unavoidable that the burden to answer by respondents might affect the survey result.

1.8 Structure of the Thesis

The thesis consists of seven chapters (Figure 1.1). Chapter 1 provides an introduction of the study by explaining the background, objective, hypothesis and methodology. Chapter 2 and Chapter 3 reviews literature and gives an overview of NELDs by describing the interpretation and importance of NELDs, existing methodologies related to NELDs, and current status of NELDs between developed and developing countries through cases of Japan and Bangladesh focusing on the national levels.

Chapter 4 focuses on the Japan case and provides firsthand local community and government perspectives on NELDs caused by recent past extreme typhoons, through an initial field survey in Wakayama. Then, Chapter 5 deals with the case of Nachikatsuura town and examines key NELDs caused by 2011 Typhoon No. 12 in 2011 and important risk reduction practices. Chapter 6 takes up Koyra sub-district in Bangladesh as a case of

developing countries and observes key NELDs caused by Cyclone Aila in 2009 and vital risk reduction practices by using same methodology as Nachikatsuura. Finally, Chapter 7 compares key findings from the Japan and Bangladesh case studies, and summarizes the conclusion of the study.

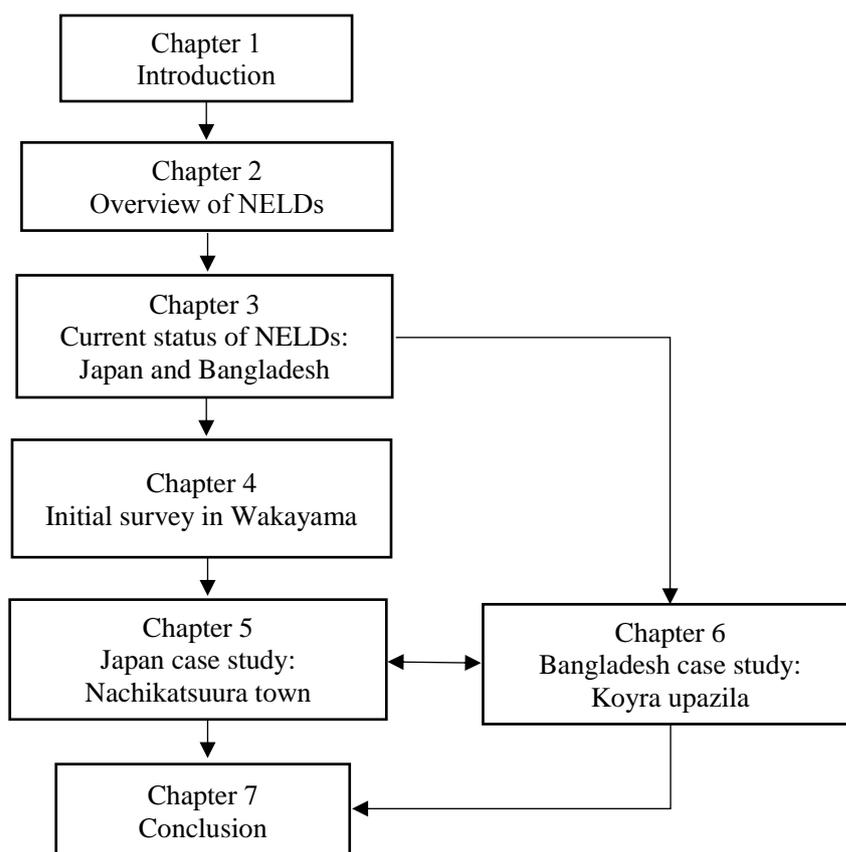


Figure 1.1 Structure of the thesis

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CHAPTER 2 OVERVIEW OF NON-ECONOMIC LOSS AND DAMAGE AND CHAPTER 3 CURRENT STATUS OF NON-ECONOMIC LOSS AND DAMAGE: JAPAN AND BANGLADESH

Purpose – This paper aims to assess climate change-related non-economic loss and damage (NELD) through case studies of Bangladesh and Japan, evaluate how NELD are addressed in these countries and provide the ways forward for further improvement.

Design/methodology/approach – This paper reviewed the literature to examine NELD and looked into currently available methodologies and their limitations. It reviewed governmental disaster reports and plans and interviewed with communities to understand NELD in each country's context.

Findings – This paper indicates that NELDs are not sufficiently reported in the countries studied. Underestimation of NELD may lead to limited outcomes in disaster risk reduction (DRR) and climate change adaptation (CCA). NELD should be measured and integrated into decision-making, through capacity-building from local to national level.

Research limitations/implications – This paper is based on the literature review and stakeholder consultations in the study countries. The results are specific to these countries. Readers may find them applicable to other country situations.

Practical implications – NELD-related information is directly relevant for preparing countries to achieve their sustainable development, CCA and DRR objectives as suggested by the recent international frameworks such as sustainable development goals (SDGs), Paris Agreement and Sendai Framework for DRR.

Social implications – This paper identifies several NELD indicators related to societal well-being in the study countries and beyond, and addressing them will have positive impact on the society.

Originality/value – Addressing NELD is a recent topic under United Nations Framework Convention on Climate Change, and nothing much has been done on how countries can address NELD in their developmental, CCA and DRR approaches. This paper identifies the importance of integrating NELD into decision-making and the ways forward to researchers, governments and policymakers for addressing NELD.

For full text, please refer to the link below:

<http://www.emeraldinsight.com/doi/abs/10.1108/IJCCSM-05-2016-0065>

CHAPTER 4 INITIAL FIELD SURVEY IN WAKAYAMA

4.1 Introduction

Among climate change adaptation communities, there is an emerging need of addressing the non-economic loss and damages (NELDs) caused by increasing natural disasters in a changing climate, such as extreme weather events (e.g., storms, cyclones, extreme precipitation, floods and heat waves) and slow onset events (e.g., sea level rise, increasing temperatures, ocean acidification and salinization) (UNFCCC, 2013). The reasons are that NELDs have not adequately emphasized but it began with awareness that NELDs may be more significant than economic aspects of loss and damages and that if the total loss and damages may increase if NELDs are considered. NELDs have the potential to weaken disaster resilience in communities and impede post-disaster recovery and rehabilitation (Morrissey and Oliver-Smith, 2013). Despite the importance of NELDs, there is not yet adequate assessment framework for addressing NELDs due to difficulty of the understanding, identification and estimation of NELDs (Chapter 2).

Japan is one of the most pluvial areas in the world as it is located in the Pacific Ring of Fire and in the Asian monsoon zone. Climatic events such as super typhoons with accompanying record-breaking heavy rainfall have increasingly been reported during recent years (MOEJ, 2015). In particular, Typhoon No. 12 in 2011 caused significant loss and damages (L&Ds) to Japan and has contributed significant lessons for improving the disaster risk management in this country. The typhoon brought significant economic damages and human casualties especially in Wakayama prefecture.

4.2 Field survey in Wakayama

An initial field survey was conducted in October 2014 in Wakayama prefecture. The purposes of this survey were to have firsthand experiences of L&Ds caused by most major typhoons during recent past years (i.e., Typhoon No.12 in 2011) and to understand both local community and government perspectives on NELDs. The affected community leaders (Nachikatsuura and Shingu) and local governmental officials (Disaster Prevention Division of Nachikatsuura town office) were interviewed about their thoughts on the NELDs which significantly emerged or increased after the typhoon.

The definition of NELDs has not been globally agreed yet while there are various interpretations on NELDs (Chapter 2). In the context of climate change adaptation, UNFCCC (2013) has interpreted non-economic losses as the loss of those that are not commonly traded in markets and sorted out into: losses of life; health; displacement and human mobility; territory; cultural heritage; social capitals; indigenous/local knowledge; biodiversity and ecosystem services. This framework on NELDs was used for the field survey.

Nachikatsuura town and Shingu city in Wakayama were selected for this survey since these municipalities have been often affected by typhoons while they have abundant social, cultural and environmental assets (Figure 4.1). They are located at rural, coastal and mountainous areas in the southeast part of the Wakayama prefecture in the Kii Peninsula, one of the most typhoon and intense rainfall prone areas in Japan. Nachikatsuura has major industries on fishery in particular with tunas and hot springs with the number of 177 sources (Nachikatsuura Town, 2016a). On the other hand, Shingu has historical background that it has developed with paper and lumber industries since the Meiji era (Shingu City, 2014). They have also world famous tourist destinations with UNESCO-designated World Heritage Sites, including Kumano Nachi Taisha Grand Shrine, Nachi Falls and Kumano Hayatama Taisha Grand Shrine. They lie in a warm-temperate zone and receive average 3.2 typhoons every year (JMA, 2017). The total populations as of 1 April 2015 are 15,759 of Nachikatsuura (ranked as 14th) and 29,652 of Shingu (ranked as 7th) out of 30 municipalities in Wakayama with its population of 965,597 (Wakayama Prefecture, 2015). The areas are 183 km² of Nachikatsuura and 255 km² of Shingu out of 4,726 km² in Wakayama (GSI, 2013). Depopulation, aging population and declining birth rate have been reported as important social issues that typical rural small or medium size municipalities are facing (Nachikatsuura Town, 2016; Shingu City, 2016).

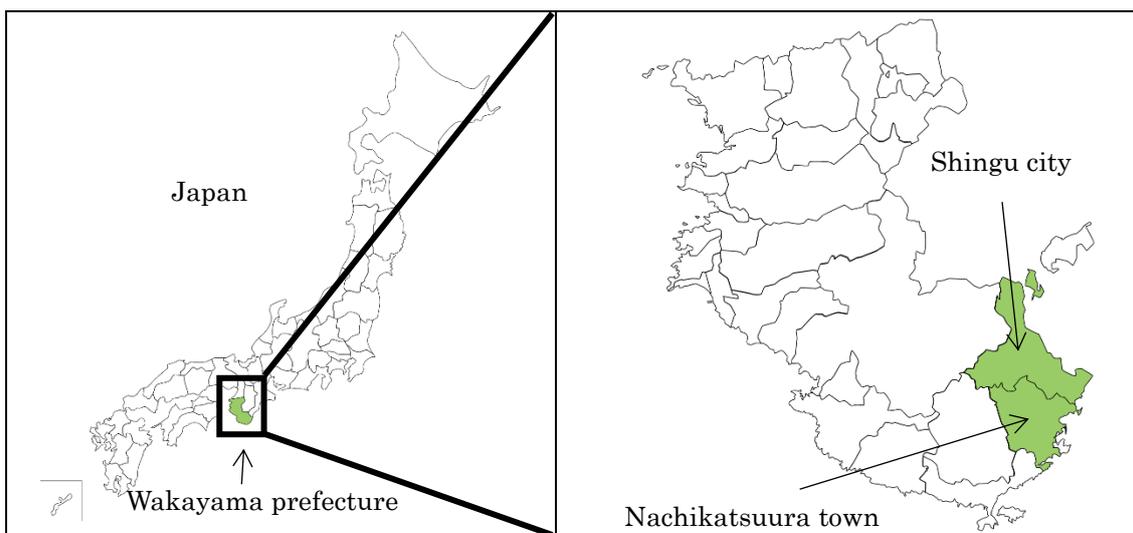


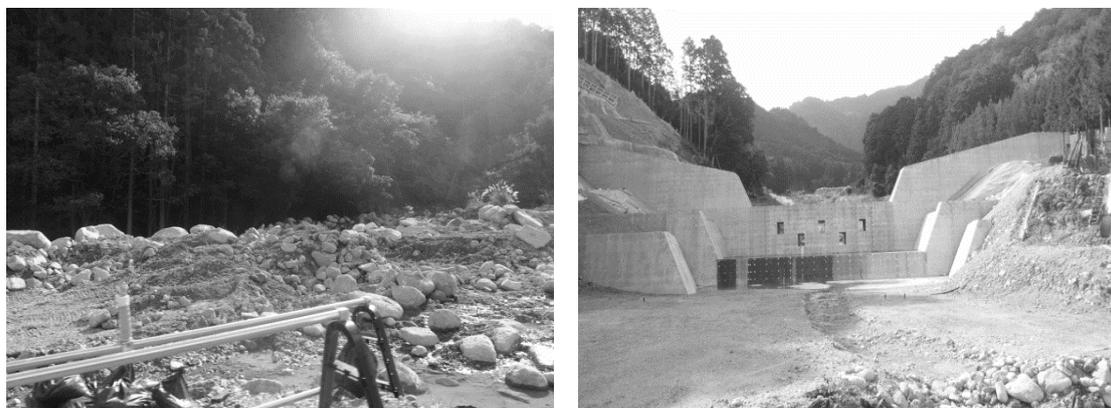
Figure 4.1 Nachikatsuura town and Shingu city, Wakayama prefecture (Source: Prepared from Sankakukei (2016))

Nachikatsuura and Shingu suffered serious L&Ds from the Typhoon No.12 particularly in Wakayama. Typhoon No. 12 in 2011 and its associated record-breaking heavy rainfall caused significant landslides, inundation and river flooding, and resulted in serious physical damages and human casualties. Wakayama recorded the highest number of deaths from the typhoon of 56 (of which, 28 from Nachikatsuura and 13 from Shingu) out of 82 in Japan (Table 4.1). Nachikatsuura largely suffered sediment disasters from the typhoon while Shingu primarily suffered flooding and inundation. (Nachikatsuura Town, 2013; Shingu City, 2015) (Figure 4.2).

Table 4.1 L&Ds from Typhoon No. 12 at glance

	Wakayama	Nachikatsuura	Shingu
Death toll	56	28	13
Evacuees (As of 14 September 2011)	652	122	305
Houses fully destroyed	240	103	81
Houses half destroyed	1,753	905	245
Houses inundated above floor level	2,698	440	1,472
Houses inundated below floor level	3,146	962	1,168
Affected households		2,410	3,154

Source: Prepared from Wakayama Prefecture (2011); FDMA (2012); Nachikatsuura Town (2013); Shingu City (2015)



(a) Debris flows

(b) Sediment control dam

Figure 4.2 Iseki-Ichinono district, Nachikatsuura town (Source: Chiba *et al.* (2017))

4.3 Results and conclusions

Table 4.2 presents the local community and government perspectives on NELDs identified in the field survey. The results could be categorized into the issues with health, social capital, education and environment. Regarding health aspects on NELDs, mental diseases such as fears, mental stresses and post-traumatic stress disorder (PTSD), were particularly stated. It was reported that many of these issues raised from evacuees at evacuation centers. In addition, damages to social capitals were found to be important. Social capitals can be interpreted as networks together with shared norms, values and understandings within communities (Keeley, 2007). Relevant problems, such as decrease in social capitals through displacement and relocation, and increase in troubles among affected people, were described. Furthermore, the loss of educational opportunity for children, such as children not attending school and schools discontinued, was considered important. The concerns about environment (i.e., biodiversity and ecosystem) were also recognized to some extent but put less emphasis than health, social capitals and education. This chapter contributed to enhanced understanding of local perspectives on NELDs caused by Typhoon No.12 in Wakayama.

Table 4.2 List of local perspectives on NELDs reported in the field survey

Category	Local perspectives on NELDs:	
	Communities (Nachikatsuura and Shingu)	Town office (Nachikatsuura)
Health	Physical illness (e.g., pneumonia), mental stresses, trauma	Mental stresses, post-traumatic stress disorder (PTSD), fears
Social/cultural capitals	Displacement/relocation, decrease in households, troubles between men and women or among affected people, deterioration of interpersonal relations within communities, disagreements in the Bon festival between affected and not affected communities	Displacement/relocation, decrease in households, decrease in number of people who participate in evacuation drills, decrease in tourists to cultural heritages
Education	children not attending school	Schools discontinued
Environment	Never-seen-before grasses, increase in mold	-

-: Not reported

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CHAPTER 5 CASE STUDY: NACHIKATSUURA TOWN

This report evaluates the current situation of non-economic loss and damages (NELDs) in the disaster risk reduction (DRR) and climate change adaptation (CCA) interventions in Japan using a case of Nachikatsuura town. The ultimate objective of this study is to identify the practices that will better mitigate the NELDs in the context of the study location and to provide recommendations to address some issues identified in this study. The NELDs caused by climate-related disasters, such as typhoons, are a challenge that Japan must face. The current measures to address the damages caused by typhoons mostly focus on physical damages, such as damages to assets including houses and crops. There is no empirical evidence on how these interventions affect the NELDs even indirectly. In contrast, the NELDs, which are related to health, education, social capital and local governance, have received less attention. It is important to address the NELDs since they form major part of the impacts of natural disasters and not considering them will not result in complete recover and long-term risk reduction. This study aims to identify and prioritize key NELDs caused by the 2011 Typhoon No.12 and identify appropriate practices to address these NELDs, which is necessary for the full recovery of the affected areas. A survey-based study was conducted in Nachikatsuura town, Wakayama prefecture, which has experienced depopulation due to aging of its residents, outmigration, a low birth rate, and which was severely affected by the typhoon. The analytic hierarchy process was applied to the survey data to identify key criteria, indicators and practice options that should be integrated into DRR and CCA decision making processes at the local level. The results indicated which NELDs should be prioritized, and suggested that DRR policy and planning, disaster compensation, and especially shelter policy as the most important intervention that could most effectively reduce NELDs. The results also indicated that the town's disaster management planning and shelter policy could be strengthened by addressing issues associated with mental and chronic diseases, collaboration between the local government and local communities, and participation of communities in decision-making.

For full text, please refer to the link below:

<https://pub.iges.or.jp/enja/pub/priority-practices-addressing-non-economic>

CHAPTER 6 CASE STUDY: KOYRA UPAZILA

The non-economic loss and damages (NELDs) caused by climate-related disasters, such as cyclones, are a challenge that Bangladesh must face. The current measures to address the damages caused by cyclones mostly focus on physical damages, such as damages to houses, crops, agricultural land and livestock. In contrast, the NELDs, such as deterioration in mental health, have received less attention. This study was conducted to identify and prioritize key NELDs caused by the 2009 Cyclone Aila and to detect appropriate practices to address the NELDs, which is necessary for the full post-disaster recovery of the affected areas. A survey was conducted in Koyra sub-district, Khulna district, which was severely affected by the cyclone. The analytic hierarchy process (AHP) was applied to prioritize key criteria, indicators and practice options that should be integrated into decision-making processes of disaster risk reduction (DRR) and climate change adaptation (CCA) at the local level. The results showed that NELDs should be prioritized in the local context, and especially DRR policy and planning was most crucial intervention that could mitigate NELDs. The results also indicated that the national disaster management plan could be enhanced to address issues related to inaccessible sanitation, waterborne and mental diseases, and schools discontinued.

CHAPTER 7 CONCLUSION

7.1 Key findings

The findings from Japan and Bangladesh case studies indicated that both of them emphasized the importance of addressing mental diseases. On the other hand, key features in each country context show that Japan's local communities highlighted the need for addressing local governance issues for post-disaster recovery, such as less collaboration of local government with local communities and less community participation in decision-making. In contrast, Bangladesh's local communities raised the demand for addressing water and sanitation issues, such as inaccessible sanitation and waterborne diseases.

7.2 Further research scope

This study identified and prioritized key NELDs in the context of the study location and identified important practices that could address these impacts. As a further research scope, it is important to develop an assessment framework to quantify key NELD indicators in terms of monetary values and to figure out the total loss and damages, including both economic and non-economic aspects.

APPENDIX

Appendix I: List of Publications

- Chiba, Y., Mori, N. and Shimizu, N. (2017), “Strengthening the Integration of Climate Risks in the Banking Sector”, IGES Policy Brief Number 38, Institute for Global Environmental Strategies (IGES), Kanagawa, May.
- Chiba, Y. and Prabhakar, S. V. R. K. (2017), “Priority Practices for Addressing Non-economic Loss and Damage caused by Typhoons in Japan: Case Study of Nachikatsuura Town”, IGES Research Report, Institute for Global Environmental Strategies (IGES), Kanagawa, 22 May.
- Chiba, Y., Shaw, R. and Banba, M. (2017), “Japan’s Experiences of Catastrophic Mountain Disasters in Wakayama”, in Banba, M. and Shaw, R. (Eds), *Land Use Management in Disaster Risk Reduction*, Springer Japan, Tokyo, pp. 215-235.
- Chiba, Y., Shaw, R. and Prabhakar, S. (2017), “Climate change-related non-economic loss and damage in Bangladesh and Japan”, *International Journal of Climate Change Strategies and Management*, Vol. 9 No. 2, pp. 166-183.

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