

Lost in Mobility and Immobility

*Examining Trade-off Relation on Disaster Recovery through
A Multiple-Case Study in Myanmar and U.S.*

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List of Abbreviations and Acronyms

APA	American Planning Association
CBO	Community-based Organization
DHS	Department of Homeland Security
DRR	Disaster Risk Reduction
EOC	Emergency Operation Center
ESF	Emergency Support Functions
FEMA	Federal Emergency Management Agency
GEJET	the Great East Japan Earthquake and Tsunami
HUD	Department of Housing and Urban Development
IPCC	Intergovernmental Panel on Climate Change
LMS	Local Mitigation Strategy
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
NGO	Non-Government Organization
NPO	Non-Profit Organization
PDRP	Pre-disaster Recovery Plan or Post-disaster Redevelopment Plan
ROC	Recovery Operation Center
RSF	Recovery Support Functions
UN	United Nations
UNEP	United Nations Environment Programme
UNISDR	United Nations International Strategy for Disaster Reduction
US-AID	United States Agency for International Development

Chapter.1

Introduction: Who are the Most Vulnerable? Disaster Recovery and Human Mobility

1.1 Background

1.1.1 Unequal Disaster Impact in the World

Confronting natural disasters has been one of the global issues. While the number of earthquakes in this half century has been steady, typhoons and floods, so called meteorological natural hazards, have shown an incremental trend since the 1990s (Figure. 1.1-1). The Sendai Framework for Disaster Risk Reduction 2015-2030 pointed out the relationship between Climate Change and the frequency and intensity of natural hazards are growing nowadays, and its projection would go worse (UNSIDR, 2015a).

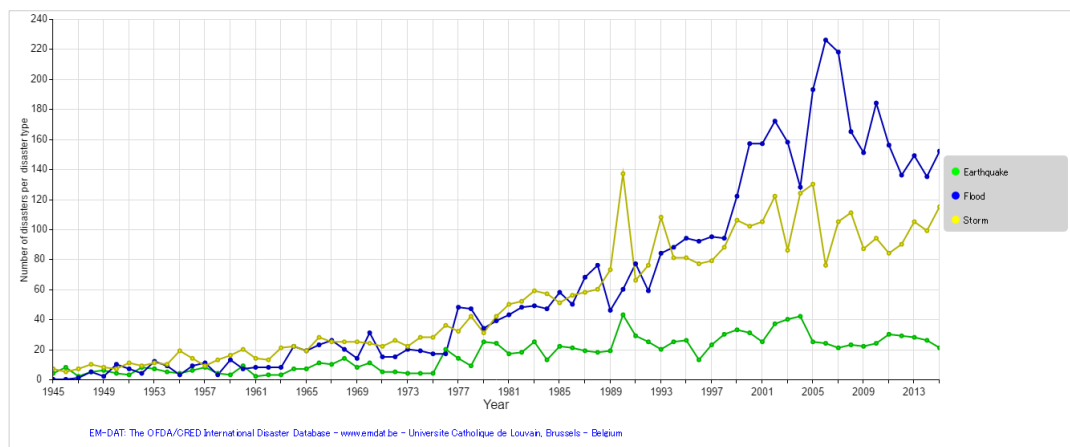


Figure 1.1-1 Frequency Trend of Natural Hazards 1945-2015¹

In response to such changes in the natural environment, an increase in natural disasters is observed on a global scale, but the death toll and the economic loss show the different tendency. The data of natural disaster death toll has been decreasing, whereas economic loss has continuously increased due to the meteorological natural hazards in particular (Figure 1.1-2 and 1.1-3).

¹ Source: Based on EM-DAT data <http://www.emdat.be/datab>

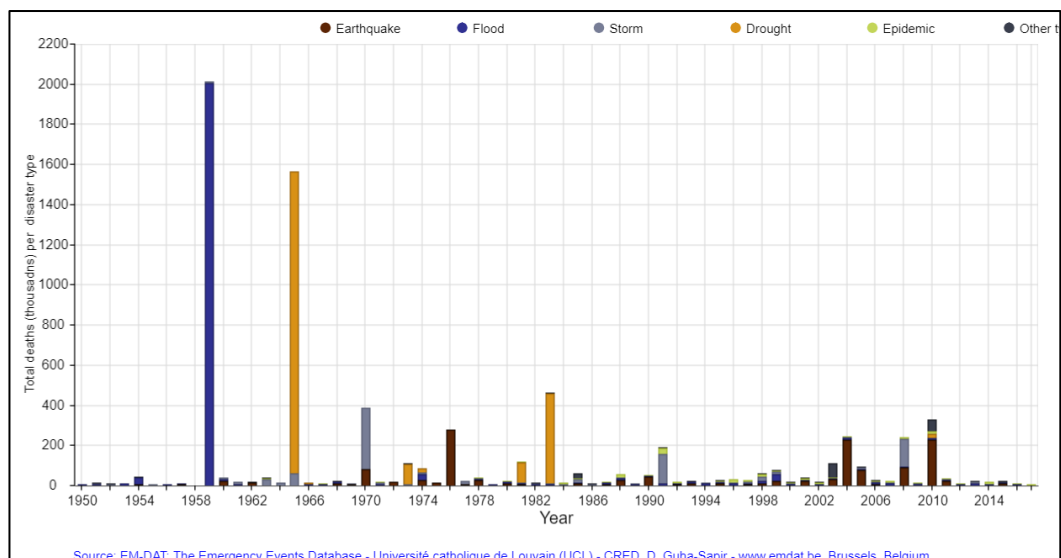


Figure 1.1-2 Disaster Death Toll in 1950-2016²

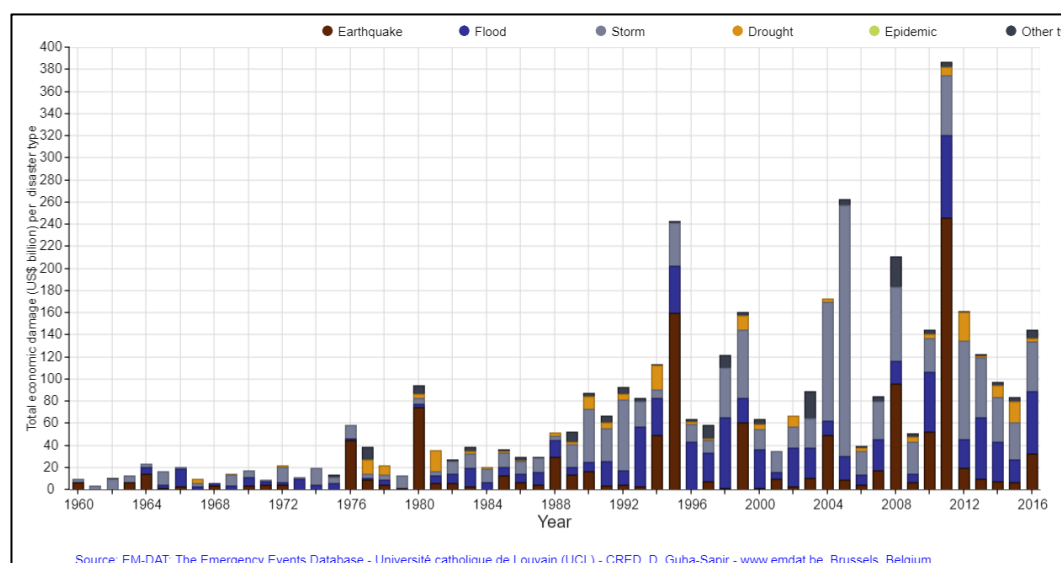


Figure 1.1-3 Total Economic Loss (US\$ billion) in 1945-2015³

The distribution of the death toll and economic loss are opposite trend that nearly 70 % of the mortality has been observed in low and lower middle income countries, while more than 80 % of economic loss has been attributed from high and higher middle income countries (Figure 1.1-4 and

² Source: Based on EM-DAT Data <http://www.emdat.be/datab>

³ Source: Based on EM-DAT Data <http://www.emdat.be/datab>

1.1-5). These data show that disaster impacts are not equally distributed in the world, and the lower income countries seem more vulnerable in terms of the threats to human lives.

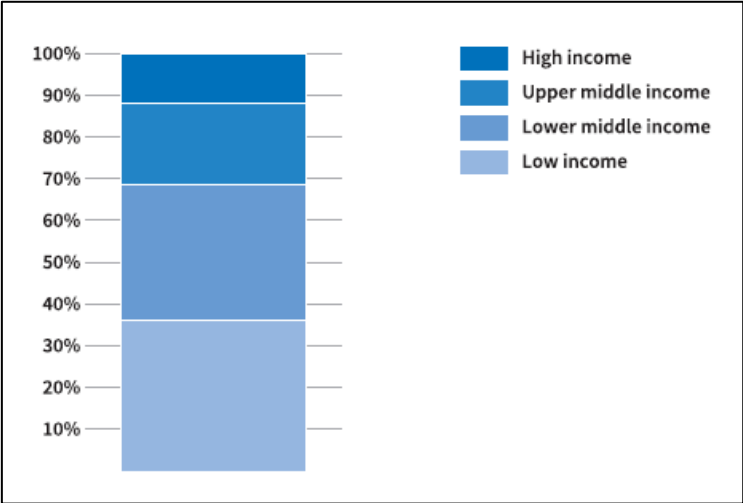


Figure 1.1-4 Morality by Income Group in 1990-2013⁴

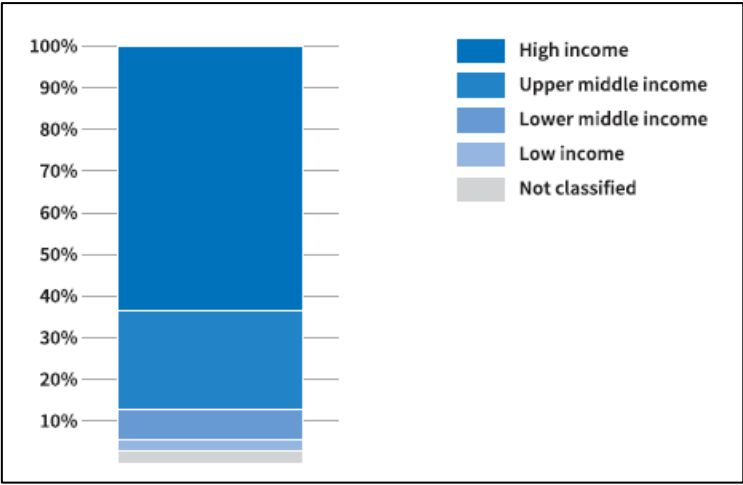


Figure 1.1-5 Economic Loss by Income Group in 1990-2013⁵

1.1.2 Issues of Recovery

Along with the incremental trend of natural disasters, restoring of population has become a

⁴ UNISDR, (2015b), p.45

⁵ UNISDR, (2015b), p.47

major issue due to the dispersal of the disaster victims in post-disaster phase. In particular, Hurricane Katrina (2005), which caused the greatest economic loss in the history of the United State (hereafter U.S.), did not recover the population especially lower income of African American residents (Fussell et al., 2014). As inequality and inequity for marginalized populations in New Orleans were reported as a cause of out-migrate from the impacted area due to the housing recovery policies (Graham, 2011; Arena, 2012), repopulation for the vulnerable has been a cross-cutting issue of disaster recovery and human mobility.

1.2 Literature Review on Disaster Recovery

In this section, past literature and related research are reviewed for a systematic understanding of issues of disaster recovery. Table 1.2-1 shows the domestic and global previous studies on recovery. The findings from literature can be summarized into the following four points.

1.2.1 Recovery is the Process of Bouncing Back and Transformation

Smith & Wenger (2007, p.237) defined recovery as “the differential process of restoring, rebuilding, and reshaping” and sees recovery as a process leading to it rather than setting or achieving goals. Similarly, Oyane (2007) noted that restoration and recovery are different because recovery aims at more state than before, hence meaning of “better ” would be varied among disaster survivors.

1.2.2 Regionality and Speciality

Regionality and speciality are also related to the above definition of recovery, and it is considered that recovery from a disaster does not necessarily follow the same path but goes through different processes. Onoda et al. (2015) described the change in the recovery plans formulation process after the Great East Japan Earthquake in different municipalities, and the results show the multiple

pathways of recovery which being expressed regional specialties. Also, Watanabe (1983) pointed out that the second failure of Charles A. Peard's visit to Japan for the Great Kanto Earthquake Recovery planning was due to the result of disregarding the regional nature of the recovery and reconstruction.

1.2.3 Recovery on Participatory Approach

Ando (2004) addressed a lesson from the experience of recovery after the Great Hanshin Awaji Earthquake that the existence of a “Community Development Council” prior to the earthquake created a smooth consensus building for the community recovery. In the case of the Great East Japan Earthquake, it was reported that the former town development organization expanded further after the recovery, and functioned as a bridge between the local government and the residents. Similarly, Olshansky & Chang (2009) pointed out the conflict with the speed of recovery while explaining the importance of community participation, and showed the difficulty of grasping the overall picture of the recovery and reconstruction from the perspective of residents. On the other hand, Coetzee & Niekerk (2012) showed that the transition of disaster management in the 20th century showed that the role of the government increased while emergency response was originally initiated by the residents in the history. It implies that institutional development has replaced the role of citizens in the long history of disaster risk reduction. This corresponds to the case where the victims were rescued by neighboring residents during the Great Hanshin Awaji Earthquake due to the lack of public emergency rescue. In view of the above changes, disaster risk reduction with the participatory approach by residents has been revived and need to revisit the roots of disappearing citizens’ participation and ownership.

1.24 Pre-examination of Recovery Strategies

Considering natural disasters as an uncontrollable phenomena, the idea of pre-disaster recovery planning (hereafter PDRP) was invented around the time of the Great Hanshin Awaji Earthquake. PDRP based on the assumption that damage is not completely prevented, but that damage and destruction should be smoothly restored as soon as possible. Nakabayashi (1999, pp143-144), defined PDRP that “Think about the planned concept of urban recovery plan and the formulation method based on it in advance, prepare, share, and practice”. In addition, Ichiko (2016, p54) noted, “In order to form a main body that responds swiftly (Resilient) to the recovery of life after a major disaster that requires a long period of time, recovery, and reconstruction of the town, "Proceeding with specific multiple disaster prevention community development from the front", suggesting the possibility of community development at the local level as well as the city level. It is explained that disaster prevention city planning and disaster prevention town development based on voluntary participation of residents in advance will be possible. Furthermore, Sasaki (2018) indicated two mixed concepts: “recovery preparation” that contributes to smooth procedures and system operation after the disaster, and “promotion of disaster mitigation” that minimize the local vulnerabilities prior to the potential disasters. Based on the above, it can be said that pre-examination of recovery avoid “forgetting disasters”, and the PDRP ideally enhances embodiment of a recovery activities from peacetime.

Table 1.2-1 Literature Review on Disaster Recovery

Category	Japan	Oversea
Concept of Recovery	Oyane, 2007	Smith & Wenger, 2006; Philips, 2014; Davis & Alexander, 2015
Recovery and Resilience	Ito et al., 1980; Maki, 2014	Cutter, et al, 2008, 2010
Recovery Planning	Koshiyama & Murosaki, 1999; Maki, et al., 2008; Ota, et al, 2010; Onoda, et al., 2015	
Recovery and Urban Planning	Shiozaki, 1998; Committee for the Hanshin-Awaji Earthquake, 1999; Ando, 2004; Sasaki, 2015	Smith, 2011
Laws and Acts on Recovery	Ikuta, 2013; Okamoto, 2014; Sasaki, 2016	Schwab, 1998; 2014; Mileti, 1999
Community and Recovery	Tamura, et al., 1999	Rubin, 1985; Olshansky, et. al., 2014
Relocations to Safer/Higher Place	Shirotani, 1961; Murosaki & Ohnishi, 1989; Miyasada, 2012; Meno, 2013; Iuchi, 2014	Maeda et al., 2010, 2011; Anuradha, et al., 2014, 2017
Emergency Response and Recovery	Mitsui, 2007, Miyake, et al., 2016	Koike, 2002; Kawasaki, et al., 2012; Schwab, 2014
Concept of PDRP	Nakabayashi, 1999	Haas, et al, 1977, Florida State, 2010; IRP, 2011
Implementation of PDRP	Aiba, 2004; Kato, et al., 2011; Ichiko, et al., 2012, 2016; Iwaka, 2014	Municipalities in Florida State, 2008, 2010
Evaluation of PDRP		Berke, et al., 2014
PDRP Guideline	Tokyo Metropolitan, 1998; 2016;	FEMA, 2016; 2017

(Source: Author)

1.3 Scope of the Research

1.3.1 Human Mobility and Vulnerability

From the above, recovery strategies can be taken from peacetime as “promoting disaster mitigation”, however, the current PDRP has an assumption that population in impacted area could recover its population as the same as before in terms of quantity and not thinking qualitative changes. Planning of PDRP based on the communities have sought smooth and quick recovery, though there is no reliable estimations of repopulation. As observed above, disaster impacted area lost their population and difficult to achieve fully restore the population nowadays due to the migration and dispersal of disaster survivors. For this reason, research on human mobility after disasters is a critical issue for

considering recovery strategies before disasters strike.

Foresight (2011) explains disaster risk / climate change risk and human movement in terms of three concepts: *mobility*, *immobility*, and *trapped populations*. Immobility refers to people who stay on their own will, while trapped populations refers to those who want to move but still remain (Foresight, 2011). Foresight (2011) and Black et al. (2013) use Figure 1.3-1 to argue that there is a negative correlation between the ability to move and vulnerability because low resourceful households has less affordability to move, and vice versa. Adams (2016) also points out that there is a trade-off between safety and resources (or income), and households that can move to safe places by moving and those that remain due to lack of resources. Residents are forced to move when they reach the limits of resources and the limits of habitable land due to the risks of climate change and rising disaster costs (Black et al., 2013). As Adams (2016) showed that safety and resources are in a trade-off relationship, there may be households left behind in this pressure.

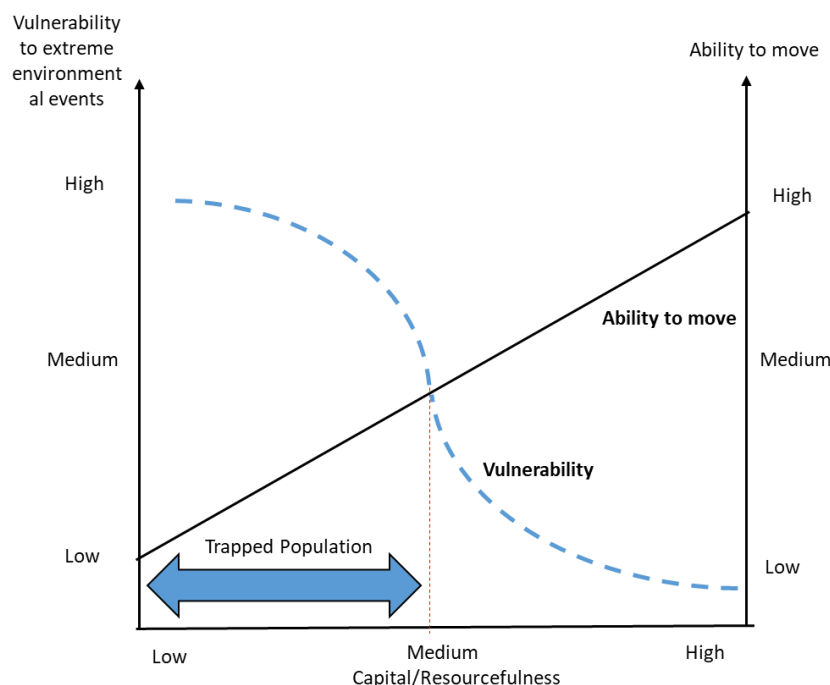


Figure 1.3-1 Vulnerability and Ability to Move
(Source: Foresight, 2011)

There might be something trade-off relation between human mobility and vulnerability, though two critiques should be raised. The schematic concept of Figure 1.3-1 cannot explain the reason why the wealthy lives in coastal areas with high flood risk, and the phenomenon that the poor repeats moving while changing jobs. Figure 1.3-1 indicates those who have high mobile ability are lower vulnerability because of their resourcefulness, but the wealthy often select their housing at the coastal area or mountainous view where risks of landslides are expected. One of assumption of this paper is that the wealthy, as high mobile ability, could change their living places whether there are risks or not. Reversely, the poor is considered as lower mobile ability and high vulnerable generally, but the Figure 1.3-1 is not able to describe the meaning of repeating migration. Furthermore, the Figure has not segregated capitals and resources. It is unclear that the capitals limits only financial one or including other capitals and natural resources.

1.3.2 Disaster Risk as Social Product

Another perspective of this research is examining social roots of the risk and its intervention. Tierney (2014) clearly indicates that disaster impacts are embedded in the society, and the origins of disasters stemmed from “ordinary everyday working of society itself” (Tierney, 2014, p.5). Kato et al. (2013) also argue that the natural disasters are accelerating depopulation in impacted area in which has been pre-existing trends in rural area of Japan. It makes sense as societal inequality is visually appeared during and post-disaster phase as mentioned above, the poor seems suffering more than the wealthy. One of fundamental questions on Tierney’s argument is, does it apply to any type of societies such as indigenous society?

1.3.3 Natural Resource and Indigenous Risk Avoidance and Research Question

In Fig.1.3-1, capitals and resources are not clearly distinguished, and what kind of capitals and

resources are related to movement and vulnerability is not specifically shown. Suga (2005) defines a community that is a natural substance itself as a living material, is homogeneous and has an appropriate size, as an “indigenous society”. "Indigenous Risk Avoidance" in indigenous society means collective actions which minimizing the risks shared within that society. This indigenous risk avoidance is far from modern urban society risk. Hedging risks by insurance, risk management by national institutional design as well as individual risk management are the major characteristics in urban society, whereas risk awareness based on the locality, traditional risk management by precautionary principle, and safety-net mechanism through landlord and tenant relationship (Suga, 2005). A core of indigenous risk avoidance is the closed membership which can be realized by low mobility of community members in order to maintain indigenous society. If it is, does the character of indigenous risk avoidance lose by human mobility? Legislation for disaster risk reduction (hereafter DRR) or supporting system on recovery phases would construct to help victims and minimize the impacts for them through the history of natural disasters. What if the disaster survivors migrate somewhere else, how the policies and plans could support for them? Or if there is no such legislations and plans for DRR likewise indigenous society, how disaster survivors are dealing with disaster recovery? In summary of the scope of research, this research tries to answer to those three questions: Who are the most vulnerable in the era of mobility; what are we losing by mobility; and are there trade-off relations between human mobility and capital/resource in recovery phase?

1.4 Approach of the Research

1.4.1 Structure and Agent Model

In this research, the analysis is divided into Structure and Agent. The *Structure and Agent Model* is an approach that analyzes social characteristics separately mainly used in sociology and planning theory. The model shows differences in subjects in the same structure, or differences in subjects in

different structures. As a research of Gibson et al. (2016) separated structure and agent as mutual influence actors, Allmendinger (2016) addresses the importance of the segregation nevertheless the discussion of dualism of structure and agent⁶. It is because planning theory is always requested to fill the gap between theory and practice, and the segregation of structure and agent is functioning as a mirror of plan and implementation. As Allmendinger (2016, p.23) indicates about the model that “to what extent are individuals (agents) autonomous in their thoughts and actions and how much does society (structure) influence them”, mutual influence as a separated concept has a meaningful observation. The statement contains the definition of structure and agent in use of planning theory that structure is collective actions of individual actors as well as accumulations of materials influencing individuals, while agent is an individual decision making as an autonomous actor. In this study, policies and planning on DRR is considered as *structure*, and the households in the disaster impacted area is regarded as *Agent*.

1.4.2 Multiple-Case Study

This research employs a multiple-case study as an approach. Multiple-case study is a form of four types of case studies; holistic single-case study, holistic multiple-case study, embedded single case study, and embedded multiple-case study (Yin, 2018). Holistic single-case study deals with single subject and embedded case study focuses on specific subunits in a subject, while the concept of multiple-case study is replication through the more than two case examinations (Yin, 2018). Yin (2018, p.55) illustrates two types of replication; “(a) predict similar results (a literal replication) or (b) predict contrasting results but for anticipatable reasons (a theoretical replication)”.

For example, Comerio (2014), as an international comparative study, classifies the types of

⁶ Allmendinger (2016) introduced the fusion of structuralism and intentionalism by Anthony Giddens. The fusion intends to dualism of structure and agent in order to look at the interrelationship. Although the main concept of the fusion is “undistinguishable from the actions within them” Allmendinger (2016, 25), the concept cannot explain the different actions by the agents in the same structure.

housing recovery based on government interventions and community participation (Figure 1.4-1). She argues the importance of the balance between community participation and policy intervention in developed and developing countries as an embedded multiple-case study. Johnson and Olshansky (2016) also show the characteristics and common points (similar results) of six countries through an international comparison of disaster recovery. These past literatures imply that embedded multiple-case study can extract similar results and contrasting (dissimilarity), as therefore, this approach is an appropriate method for this study.

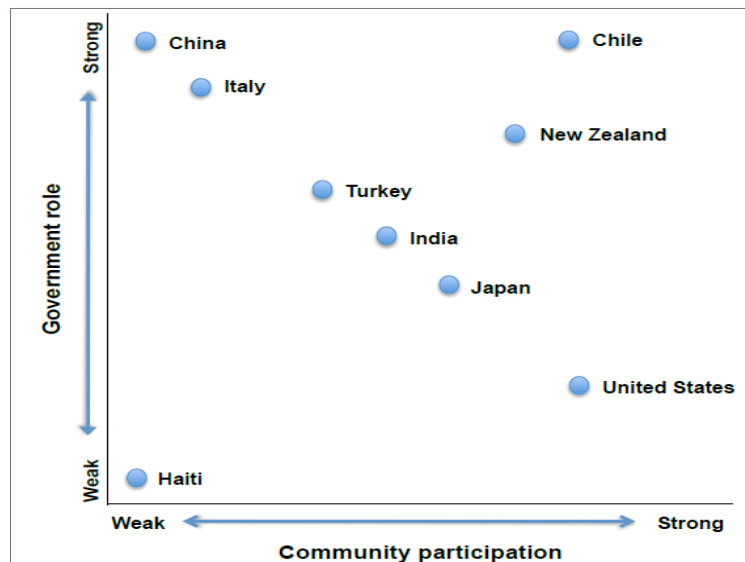


Figure 1.4-1 Comparison of Recovery Management Approaches
(Source: Comerio, 2014)

1.5 Research Framework and Methodology

1.5.1 Selection of the Case Study and its Framework

As Yin (2018) cautions that the selection of cases is required careful considerations due to the more than doubled works and resources, this study picked up extreme different cases but sharing similar natural phenomena as a common platform. In this study, Hinthada, Ayeyarwady Region, Myanmar is selected as an area with little DRR policy intervention, and the State of Florida in U.S., where

equipped DRR policies are nominated as a multiple-case study. Both area has been suffered from metrological natural hazards such as floods, typhoon (cyclone or hurricane as the same natural phenomena but different name). These two extreme different cases are picked up because of the structure and agent model. The flood-prone area in Myanmar is selected because less influence of structure (DRR legislation in this study) needs to be examined to compare the functions of well-developed legislations and vice versa. Figure 1.5-1 shows the framework of this research. Based on the Comerio's comparative analysis and structure and agent model, the framework has two dimensions that x-axis shows the agent mobility and y-axis structure.

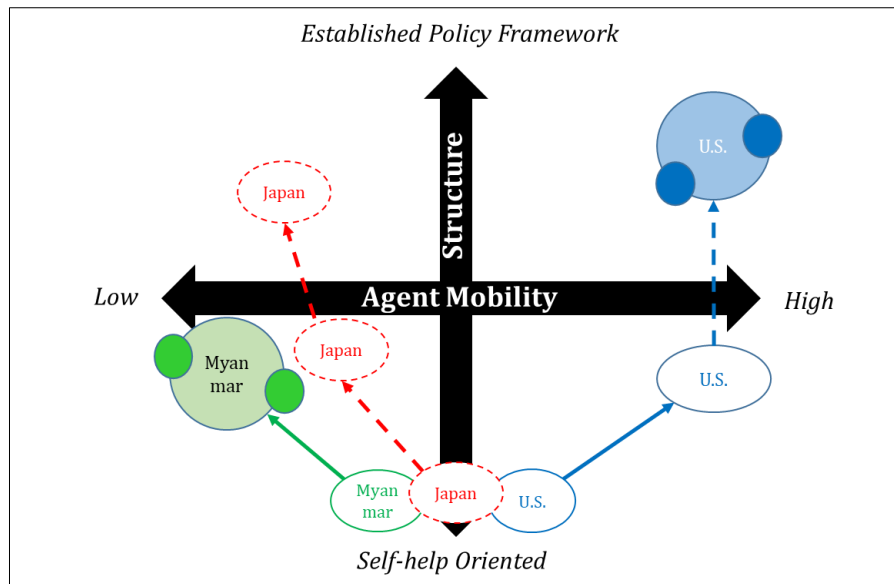


Figure 1.5-1 Framework of the Research
(Source: Author)

1.5.2 Methodology of the Research

For the agent analysis, questionnaire survey is administrated at household level in both countries in order to look at the reaction and strategies of agents. The questionnaire survey in Myanmar was translated from English to Burmese and worked with a translator, whereas English-Spanish translation and a translator was employed in specific community in Florida, U.S. The details of the methodologies are described in each chapter. For the structure analysis, first, overview of the

legislation for DRR is studied, then semi-structured interviews were administrated to be complemented the data.

1.6 Research Objective

Based on these research questions and the framework, the overall goal of this study is to describe plurality of disaster recoveries in age of mobility, and to extract what we are losing by mobility and immobility. In short, this study examines trade-off relationship between mobility of disaster survivors and their recovery strategies. To achieve this goal, the classified objectives are following;

Objective i: To identify how the development of legislation for DRR policy contributed to recovery,

Objective ii: To extract agent reactions and their recovery strategies in area where there is little government policy intervention,

Objective iii. To extract agent reactions and their recovery strategies in area where advanced government policy intervention with high social mobility recovery

Summarized the findings in each objective, similarity and dissimilarity between the two cases are discussed as an outcome of the multiple-case study. Although this dissertation limits the objectives up to the above, the scope of this research could go beyond.

1.7 Significance of the Research and Beyond the Scope

This study aims to contribute to basic knowledge about intersection with human mobility and disaster recovery. Primary target readers would be academicians and practitioners in Myanmar and U.S., but the expected outcome will be benefit for readers in Japan because this paper intends to show the plurality of recoveries. In particular, knowledge extracted from extremely different cases

can give us a relative perspective to Japan and show the viewpoints for policy interventions. Therefore, this study has the significance of providing a framework of variety of disaster recoveries.

This research has potential to expand its scope to describe a conceptual model for the human mobility and disaster recovery. This dissertation focuses only on two extremely different cases in the world, though additional neutral cases would enrich the variety of human mobility. For example, cases such as fishery communities, farmers, and part-time famers in Japan might show different mobility. Those next steps will be discussed at the conclusion chapter.

1.8 Structure of the Dissertation

The structure of the entire doctoral dissertation is shown in Figure 1.8-1. Chapter 2 studies the evolution of legislation for DRR in Japan and U.S. where are examples of stepwise development of the legislations. This is an overview of the structure analysis at the global level including ASEAN countries. Chapter 3, as a first agent analysis of less-structured country, is a case study in flood-prone area in rural Myanmar. Then, chapter 4 is a structure analysis in the State of Florida, U.S. as an example of a good practice of recovery planning and programs. Following Chapter 5 is an agent analysis in Hillsborough County, Florida to show the contrast with the case in Myanmar. Overall discussion is summarized in Chapter 6 to extract the above lessons of chapters and to examine the similarity and dissimilarity of both cases. Inputs to potential policy intervention based on the overall discussion is included in the chapter. At last, chapter 7 concludes this study with the way forward. Chapter 2, 3, and 4 have been published on journals in Japan and international one. Those chapters written in Japanese are translated and modified for this dissertation.

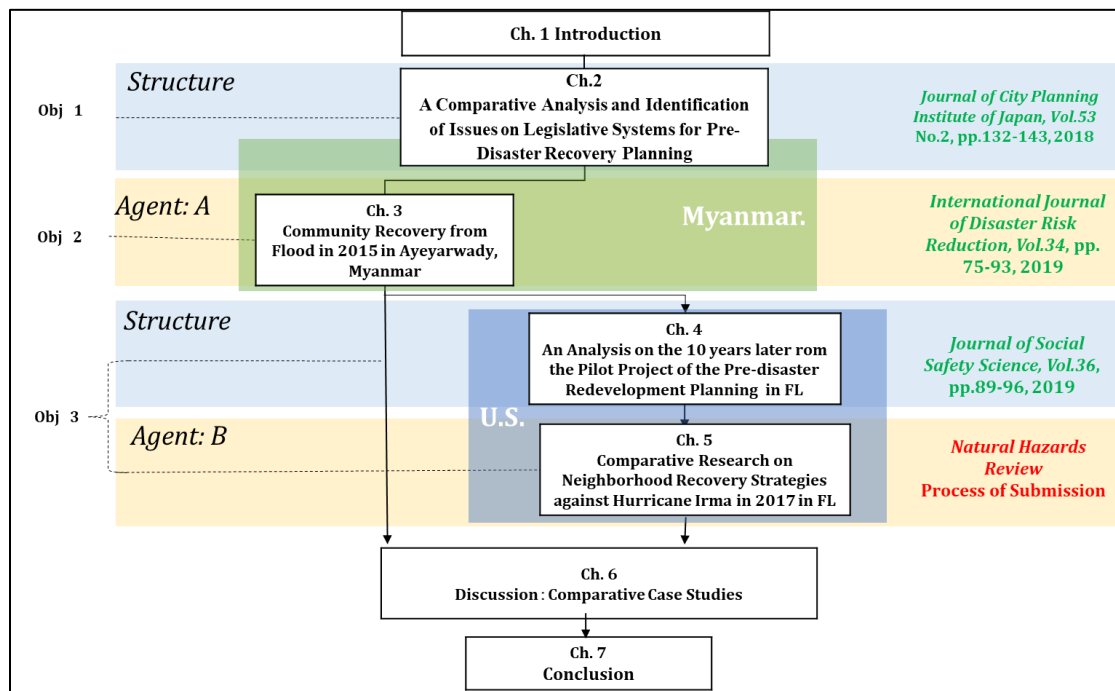


Figure 1.8-1 Structure of the Dissertation
(Author)

Reference

- Adams, H. (2016). Why populations persist: mobility, place attachment and climate change. *Population Environment*, 37, 429-448.
- Allmendinger, P. (2017). *Planning theory, Planning, Environment, Cities* (3rd Ed.). London: Red Globe Press.
- Ando, M. (2004). *Hanshin Awaji daishinsai fukkou toshi keikaku jigyou machi dukuri*. [Disaster Recovery Planning and Its Project on Hanshin Awaji Great Earthquake]. [in Japanese]. Tokyo: Gakugei-Syuppan.
- Arena, J. (2102). *Driven from New Orleans: How nonprofits betray public housing and promote privatization*. Minneapolis, MN: University of Minnesota Press.
- Black, R., Amell, N.W., Adger, W.N., Thomas, D., & Geddes, A. (2013). Migration, immobility and displacement outcomes following extreme events. *Environmental Science & Policy*, Special Issue 27, 32-43.
- Coetzee, C., & Van Niekerk, D. (2012). Tracking the evolution of the disaster management cycle: A general system theory approach. *Journal of Disaster Risk Studies*, 4(1), Art. #54, 9 pages.
- Comerio, M. (2014). Disaster recovery and community renewal: Housing approaches. *Journal of Policy Development and Research*, 16, 51.-68.
- Davis, I., & Alexander, D. (2015). *Recovery from disasters*. New York: Routledge.
- Foresight. (2011). *Migration and global environmental change: Future challenges and opportunities. Final Project Report*. London: Government Office of Science.
- Fussell, E., Curtis, K.J., & DeWaard, J. (2014). Recovery migration to the city of New Orleans after Hurricane Katrina: A migration systems approach. *Population Environment*, 35(3), 305-322.
- George, A. L., & Bennett, A. (2005). *Case studies and theory development in the social science*. Cambridge, MA: MIT Press.

- Gibson, D.T., Pelling, M., Ghosh, A., Matyas, D., Siddiqi, A., Solecki, W., Johnson, L., Kenney, C., Johnston, D., & Plessis, D.R. (2016). Pathways for transformation: disaster risk management to enhance resilience to extreme events. *Journal of Extreme Events*, 3(1), 1–23.
- Graham, L. (2012). Razing Lafitte-Defending public housing from a hostile State. *Journal of American Planning Association*, 78(4), 467-480.
- Ichiko, T. (2016). Post Higashi nihon daishinsai no bousai gensai machi dukuri [Chronicles about pre-disaster planning for post-disaster recovery in Tokyo]. [in Japanese]. *The Japanese Journal of Real Estate Sciences*, 29(4), 54-60.
- Johnson, L., and Olshansky, R. (2016). *After great disasters: How six countries managed community recovery*. Cambridge, MA: Lincoln Institute of Land Policy.
- Kato, T., Bhattacharya, Y., Sugata, H., and Otagiri, R. (2013). The six principles of recovery: A guideline for preparing for future disaster recoveries. *Journal of Disaster Research*, 8, special, 737-745.
- Nakabayashi, K. (1999). Toshi no jishihigai ni taisuru jizenfukkoukeikaku no kousatu –Tokyo to no shinsaifukkouennryaku to jizen jyunbi no kangaekata wo jireini [Study on urban pre-disaster recovery planning against earthquakes: An example of recovery strategy in Tokyo Metropolitan]. [in Japanese], *Comprehensive Urban Studies*, 68, 141-164.
- Olshansky, R. and Chang, S. (2009). Planning for disaster recovery-Emerging research needs and challenges. *Progress in Planning*, 72(4), 200-209.
- Onoda, Y., Kato, Y., and Tsukuda, H. (2015). Saigai fukkou jigyou niokeru keikaku jissou to jichitai no soshiki taisei –Higashi nihon daishinsai niokeru Miyagi ken no fukkou jigyou wo taisyou toshite- [Implementation of recovery plan and organization structure of municipalities. –On the reconstruction procedures in Miyagi prefecture from the Great East Japan Earthquake-]. [in Japanese], *Journal of Architecture and Planning*, 80 (717), 2523-2531.
- Sasaki, S. (2018). Jizen fukkou wo susumeru tameno seidoteki teian [A proposal for institutional promotion for Pre-disaster recovery planning]. In Hyogo Earthquake Memorial 21st Century Research Institute (Eds.), *Report on Grand Design of Pre-disaster Recovery Planning for Nankai Trough Earthquake.*, pp. 105-108.. Kobe: Hyogo Earthquake Memorial 21st Century Research Institute.
- Smith, P. G., and Wenger, D. 2006. Sustainable disaster recovery: operationalizing an existing agenda. In Rodriguez, H., Quarantelli, L. E., and Dynes, R. R. (eds.), *Handbook of disaster research.*, pp.234-257. New York: Springer.
- Suga, Y. 2005. Zaichi-shakai ni okeru shigen wo meguru anzen-kanri –Kako kara mirai he mukete- [Safety management related with resources in indigenous society –From past to future-]. In Matsunaga, S. (Eds.) *Kankyo –Anzen toiu kachi wa-*. [Environment –Value of Safety-], pp.69-100. [in Japanese]. Tokyo: Toshindo Publishing.
- Tiemey, K. (2014). *The social roots of risk: Producing disasters, promoting resilience*. California: Stanford University Press.
- UNISDR. (2015a). *Sendai framework for disaster risk reduction 2015-2030*. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction (UNISDR)
- UNISDR. (2015b). *Making development sustainable: The future of disaster risk management. Global assessment report on disaster risk reduction*. Geneva, Switzerland: UNISDR.
- Yin, R.K. (2018). *Case study research and applications: Design and methods*. (6th Ed.). California: SAGA Publications, Inc.

Chapter.2

A Comparative Analysis and Identification of Issues on Legislative Systems for Pre-Disaster Recovery Planning in Japan and U.S.

This chapter is translated and modified from a published paper
on the *Journal of the City Planning Institute of Japan*, Vol.53, No.2, pp132-143

2.1 Introduction and Research Objective

With the recent increase in natural disasters, interest in disaster recovery is increasing. Sendai Framework for Disaster Risk Reduction 2015-2030 was formulated at the 3rd United Nations World Conference on Disaster Risk Reduction held in Sendai in 2015 (UNISDR, 2015). In Japan, in order to respond to repeated natural disasters, a pre-disaster recovery plan (hereafter PDRP) which preparing recovery plans before the disaster occurs has been proposed (Ichiko et al. 2016; Kim et al., 2017).

As a past literature of PDRP in Japan, Nakabayashi (1999) defined PDRP as pre-examination of a methodology for (1) whether quick decision-making on urban recovery or a plan with time by participation of residents, (2) a master plan for the post-disaster phase in which being prepared prior to disasters, and (3) pre-preparation to discover and complement vulnerabilities in recovery-phase. In addition, Ichiko et al. (2012) conducted drills for PDRP with participation by residents, and reported the public-private collaboration process in which the government revised the manual based on the training, and the practice of community development outside the densely populated areas of wooden houses. In addition, Kato et al. (2011) studied multiple scenarios of recoveries and urban reconstruction using a workshop method that specifically imagined recovery and reconstruction phases, and attempted to extract issues in line with regional characteristics. In addition, Iwaka et al. (2014) showed that PDRP benefited to reorganize local community-based organizations and re-discovering local resources in aging and population decline areas.

On the other hand, when looking at PDRP from a global perspective, the progress and development of the PDRP in the United States (hereafter U.S.) is obvious. In the U.S., there was little progress in research on recovery prior to the 1970s, though Haas et al. (1977) proposed that planning in pre-disaster phase enhanced emergency response in terms of the quick delivery. This is thought to be the beginning of PDRP in the U.S. In the second U.S. natural disaster assessment

edited by Mileti (1999), which touched on the importance of Pre-event Planning, a long-term perspective was needed to consider sustainable and reduced natural disaster risks. It is also suggested that the PDRP can be implemented by the participation of local communities and complementary support from outside, and the recovery to increase the sustainability will be possible. In addition, as a study on the evaluation of PDRP, Burke et al. (2014) conducted a survey of 87 local governments in eight states in the southeastern U.S. that developed PDRP. The conclusion points out that the PDRP in U.S. has a low proportion of scientific-based plans and that the participation of residents is small, but it is only an evaluation of the plan itself and it was not an evaluation or verification of the implementation. The American Planning Association (hereafter APA) published a comprehensive research report on recovery planning (Schwab, 1998), and in the 2014 revision, detailed proposals were made for pre-disaster recovery planning (Schwab, 2014). In particular, it suggests the importance of cooperation that can be utilized in the event of a disaster, such as establishing consensus by participation of residents from the planning stage before the disaster and securing multiple information distribution.

Although natural disasters in Europe have been considered to be relatively rare, the death toll from natural disasters between 2002 and 2015 was about 80,000, and the damage amounted to about 100 billion Euros⁷. In September 2015, the establishment of the Disaster Risk Management Knowledge Center was adopted at the joint meeting of the European Commission Joint Research Center and the European Political Strategy Center in Brussels, Belgium (Joint Research Centre, 2015). The center aims to promote Sendai Framework, administrate its action plans, and to implement the framework in EU (European Commission, 2016). The action plan included the protection of cultural heritage, the improvement of emergency response, the strengthening of the

⁷ European Commission web page. New knowledge centre to help the EU minimize risk of disasters. Retrieved April 11, 2017, from <https://ec.europa.eu/jrc/en/news/new-knowledge-centre-help-eu-minimise-risk-disasters>

response capability of the basic local government, the improvement of early warning capability, and the implementation of assessments during the recovery period⁸. On the other hand, the perspectives of long-term recovery and pre-reconstruction plans have not been adopted in the action plan at this stage.

In addition, discussions on PDRP have just begun in the Association of Southeast Asian Nations (ASEAN), where natural disasters occur frequently. In the world ranking on climate-related disasters induced by climate change announced in 2017, five countries from ASEAN entered the top ten countries, and Myanmar ranked second, indicating the high vulnerability to natural disasters. The action plan of AADMER (ASEAN Agreement on Disaster Management and Emergency Response), a joint disaster prevention framework, was formulated, and the AADMER Work Program 2016-2020 came into effect as a 5-year disaster prevention framework. Recovery was positioned as one of the eight objectives of this program, and PDRP was shown as one of its action goal (AADMER, 2016). However, at present, no concrete progress or research results have been found.

As mentioned above, in order to respond to the increase and intensification of natural disasters, attention has been paid to advance recovery plans, despite the fact that various methods of participation and proposals for sustainable recovery have been made, actions in the global field are limited. Similarly, in Japan, the PDRP has been formulated in Tokyo, where there are concerns about the earthquake in the Tokyo metropolitan area, and Fuji City, Shizuoka Prefecture, where the Nankai Trough earthquake is concerned. There are currently no studies that have intensively organized the knowledge on PDRP research in Japan as well as other countries to identify common issues. Therefore, in order to extract the current status and issues of PDRP in Japan, learning lessons

⁸ European Commission. 2016. pp. 24 – 26, European Commission.

from the U.S. where PDRP is progressing will be required⁹. Therefore, this paper aims at organizing the basic knowledge of the PDRP from a global perspective, and its objective following two points.

- i. To clarify the transition of the disaster prevention policy system and how PDRP has evolved in Japan and the U.S,
- ii. And to extract the characteristics and common issues of each country (or region) regarding the PDRP.

There are various issues such as housing, infrastructure development, land use planning, etc. for natural disaster recovery, but this paper focuses on the recovery system.

2.2 Methodology

In this paper, in order to systematically organize the PDRP in Japan and the U.S., i) the secondary materials such as government agency reports are collected, and ii) authors conducted interviewed with the PDRP pilot project committee members in the State of Florida, the Florida Crisis Management Bureau, the Volunteer Florida, which is a practical organization, and FEMA¹⁰.

2.3 Japan: Transition of the Legislation for Disaster Risk Reduction and the Evolution of PDRP

2.3.1 Kobe Earthquake and PDRP

In Japan, pre-disaster countermeasures were investigated in 1986 before the Great Hanshin

⁹ Examples outside of the United States include Pre-event Recovery Planning that had been implemented before the Christchurch earthquake in 2010 and 2011. Although a method for formulating a PDRP specialized in land use planning was proposed (Becker et al, 2008), adaptation to the Christchurch earthquake was limited, such as temporary building restrictions, temporary housing zoning, and priority setting for infrastructure renovation. It is evaluated that it contributed to the subsequent recovery plan formulation (Saunders & Becker, 2015). Similarly, the “100 Resilient Cities” by the Rockefeller Foundation is being promoted as an implementation framework for the PDRP in the U.S. “100 Resilient Cities” is an initiative in which designated cities around the world pursue resilience in a way that matches their regional characteristics and regional issues. Specifically, Seattle City, where earthquake damage is predicted, formulated the Post-Disaster Recovery Plan Framework in 2013 to identify the concept, issues, and outline of the plan (City of Seattle, 2013). Although there are the above-mentioned cases related to the PDRP, in this paper, the analysis is limited to the plans of the federal, state and basic local governments in the United States.

¹⁰ FEMA was established by integrating six organizations (Federal Insurance Bureau, National Fire Department, National Weather Service and Community Preparation Program, Federal Reserve Agency, Ministry of Housing and Urban Development-Federal Disaster Support Agency, Ministry of Defense-National Defense Agency)(Okamura, 2012).

Earthquake by the Construction Agency Urban Bureau¹¹, and this is considered to be the beginning of the concept of the PDRP in public materials. On October 30, 1997, two years and nine months after the Great Hanshin Earthquake, a series of symposiums “Vision for Pre-Urban Recovery Plan” were held by the Architectural Institute of Japan and the Hyogoken Nanbu Earthquake Special Research Committee. The speakers discussed viewpoints and proposals related to PDRP, and showed the pre-arranging community-based organizations, the preparation of manuals for PDRP, the start of pre-reconstruction research by the National Land Agency (Kokudo-cho in Japanese), and the formulation of the first recovery and reconstruction manual by the Tokyo Metropolitan Government. There are many contents that have been realized from the proposals of this research committee.

One of the realizations is the National Land Agency survey. A total of six reports have been published starting in 1998, “Report on the Pre-Recovery Plan for Tokai Earthquake.” until 2010. Significant changes have occurred within this volumes of the reports. The report published in 1999 is entitled “Survey Report on a Recovery Preparation plan for Earthquakes in South Kanto region” and uses the term “Recovery Preparation Plan” rather than “Pre-disaster Recovery Plan (PDRP)”. This change in concept is described in “Recovery Preparation Plan Verification Survey Report from Tokai Earthquake” published in 2000. The report noted that “Such ‘Recovery Preparation Plan’ has been treated as ‘Pre-disaster Recovery Plan’ in order to make it easier to understand, and it will be used from 1998” (Disaster Prevention Bureau, National Land Agency, 1998). It means that the plan is rephrased as a “recovery preparation plan” in order to prevent the confusion of the concept. The change of the plan title indicates that main stakeholder on PDRP has been government officers rather than citizens and community-based organizations.

The switching from PDRP to recovery preparation plan is also used from the viewpoint of city

¹¹ Nakabayashi, 1999, p.1

planning. Mitsui (2007) pointed out that the principles of the recovery plan are speed, damage resistance, and rationalization of land use which are lessons from the Kobe Earthquake. Building restrictions just after the disasters (Article 84 of the Building Code in Japan), and an agreement among citizens are necessary condition, and both rapidness and dialogue like the Two-step Planning¹² method in the case of Kobe were successful. Similarly, Ando (2004) pointed out that the city's flexible and diverse urban planning was a revival that would not lead to drought, attributed to residents' participation in community development from normal times and the intermediation of experts between the government and residents. In response to this trend, research has been scattered in the recovery of towns that involve residents, but no concrete legal development has been made. From the above, it can be seen that the importance of resident-centered recovery was pointed out in the Great Hanshin Awaji Earthquake, but that the pre-recovery plan was not yet sublimated to the system, and was just prepared for recovery by the government.

2.3.2 The Great East Japan Earthquake and Tsunami, and Promotion of Pre-disaster Mitigation

In the Great East Japan Earthquake that occurred in 2011, many legal systems were changed, and the recovery process had a great impact. Ikuta (2013) points out the underestimation of disaster prevention due to the emphasis on emergency countermeasures and the lack of legislation in disaster recovery as a structural issue of the current Disaster Countermeasure Basic Act. The Basic Act on Disaster Prevention focuses on items that specify the role of the government, such as disaster prevention organizations (Chapter 2), disaster prevention plans (Chapter 3), and disaster emergency countermeasures (Chapter 5). It is because the act notes that “recovery related to natural disasters

¹² Two-step planning is the divided process that first recovery plan was submitted by formal one on two months later from the event, and then second step was a participatory approach by residents' direct involvement (Shiozaki, 1998).

should be done at the responsibility of the affected side”¹³. As a result, disaster prevention was limited to those essential to the implementation of emergency measures under the Basic Act, and there was no chapter on recovery and was not defined¹⁴. In response to this issue, a law on recovery from large-scale disasters (Large-scale Disaster Recovery Act) was enacted in 2013. What should be specified in particular is based on the lessons which is the bottom-up approach extracting the experiences through the Great East Japan Earthquake. The *Community Disaster Management Plan* (Neighborhood level) system was born from this problem awareness. With the revision of the Basic Act on June 21, 2013, the *Community Disaster Management Plan* is located at the bottom of the *Disaster Management Basic Plan* (National level) and *Local Disaster Management Plan* (prefecture and municipality level)¹⁵.

In Japan, efforts are being made specifically for earthquake countermeasures against the backdrop of a shrinking society. In the Tokyo Metropolitan Government, which is particularly concerned about direct earthquakes, the “Disaster Prevention City Development Promotion Plan” was revised in 2016 (Tokyo Metropolitan Government Bureau of Urban Development, 2016), and the risk of collapse and fire spread in densely populated areas due to a decline in the desire to rebuild old wooden houses due to aging. As a precaution, risk reduction is promoted by increasing the fire spread zone and non-combustible area. This has a stronger meaning of “promotion of disaster mitigation” than the above-mentioned “preparation for recovery”, assuming that damage is minimized in advance by assuming damage. Based on these backgrounds, Sasaki (2017) positioned the PDRP as the dual concept of “recovery preparation plan” and “disaster mitigation promotion plan”, and they function complimentary. This duality in PDRP is based on Kato (2017) “recovery

¹³ Ikuta (2013), p.12

¹⁴ At the amendment the Basic Act in 2013, designation of evacuation centers and shelters, preparation of the list for person requiring disaster evacuation assistance were added.

¹⁵ It is stated in Article 42-2 of the Disaster Countermeasures Basic Act that “the residents of the community can jointly propose to the *Community Disaster Management Council* to establish a *Community Disaster Management Plan* in the *Local Disaster Management Plan*”. The position is based on the independence of local residents rather than obligations.

preparation” and “promotion / addition of disaster mitigation” that minimizes damage without waiting for a disaster. Those consensus on the core part of the PDRP concept is converging¹⁶. It can be said that recovery based on this bottom-up disaster reduction promotion plan is the characteristic of PDRP in Japan. Table 2.3-1 shows the transition of a series of DRR policy systems related to recovery.

However, the current Japanese PDRP is limited to earthquake and tsunami, and measures for meteorological disasters such as typhoons, floods and storm surges are not implemented at the same level. The Tochigi, Shizuoka, Saitama, and Mie Prefecture pre-recovery plan formulated after 2012 have strong pre-recovery elements that indicate the procedures after the disaster, and are designed for earthquakes. According to the Ministry of Land, Infrastructure, Transport and Tourism (hereafter MLIT) (2015), “Disaster prevention and mitigation in response to a new stage”, an hourly rainfall increase (1.4 times) due to abnormal weather, 4 m in the Koto Delta, Tokyo (in the past 100 years). Pointed out concerns about more serious damage due to the increased vulnerability of the land and the impact of climate change, such as expanding the use of underground space (MLIT, 2015). For this reason, the MLIT is currently undertaking measures for inundation of underground spaces and promoting the timeline¹⁷, but PDRP for meteorological disasters have not yet been studied. Considering the frequency of typhoons and floods and the area where damage is expected, research on the PDRP related to meteorological disasters is required to expand. In addition, the legal development related to PDRP has not reached, and it is desirable to develop the law with relevance to other plans (Figure 2.3-1).

¹⁶ This duality is used in the same way, although each expression is different. Murosaki (2017) expresses “Pre-recovery as risk management before pre-recovery as crisis management”, and Nakabayashi (2017) pre-practices from preparation for remedial measures while overlooking the efforts in Tokyo. This shows the concept of “active proactive recovery” including reconstruction. Both suggest the importance of prior activities that are not limited to planning but are not waiting for disasters.

¹⁷ Timeline (preliminary disaster prevention action plan) is defined as “planning disaster prevention actions and implementing entities in time series, assuming natural disasters to be foreseen” (MLIT, 2016), 120 hours (5 days) before the typhoon landing. The action of each subject is started and the action is planned to be completed in 0 hours. Hurricane Sandy, which occurred in 2012, is highly regarded as a timeline implementation in New York City has been effective in reducing disasters (MLIT, 2013). The timeline is effective for natural phenomena with course predictions and lead times based on scientific grounds such as typhoons, but it is difficult to adapt to sudden disasters such as earthquakes that are difficult to predict. A response program for external events is required, but it can be positioned as a first-aid response that leads to a single recovery preparation.

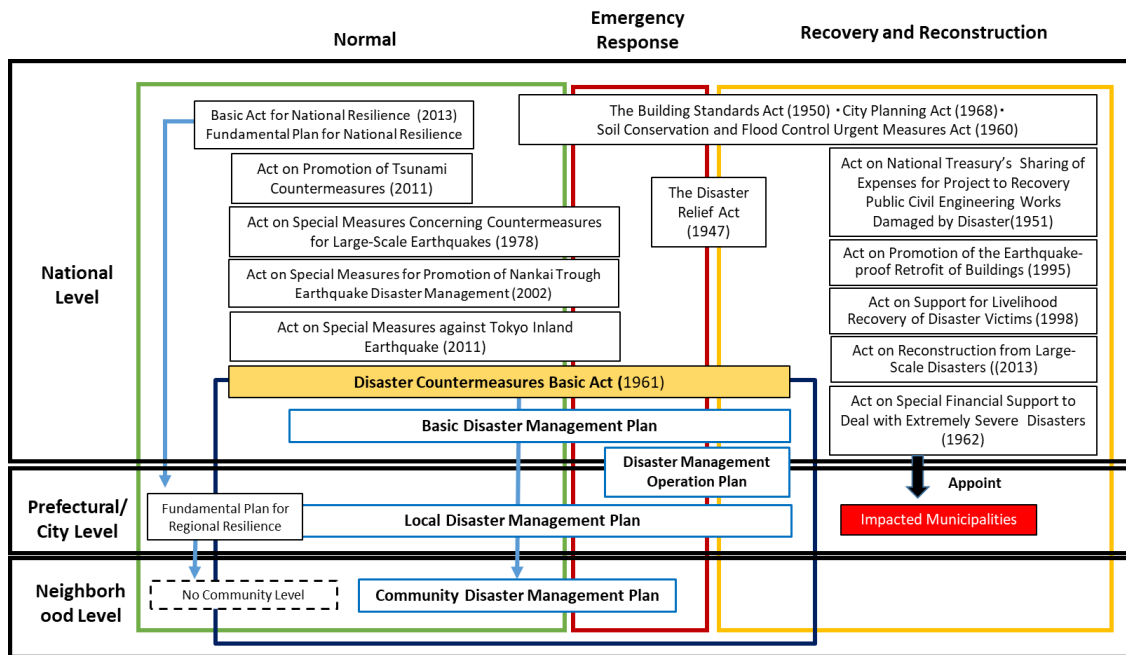


Figure 2.3-1 Legislative Structure for Disaster Risk Reduction in Japan
(As of April, 2017)
(Source: Author based on the reference¹⁸)

¹⁸ Okamura, 2012; Ikuta, 2013; Maki, 2014; Unjyo, 2014; The Cabinet Office in Japan, 2014

Table 2.3-1 Transition of Legislative Structure for DRR in Japan

	Major Disasters*	Laws, Acts, Policies	Related with PDRP or Recovery Planning
1945~ 1954	Typhoon Makurazaki, Nankai Earthquake, Cathleen Typhoon, Fukui Earthquake	The Disaster Relief Act, The Flood Control Act	
1955~ 1964	Typhoon Ise, Niigata Earthquake	The Building Standard Act, Disaster Countermeasures Basic Act, Act on Special Financial Support to Deal with Extremely Severe Disasters	Start Central Disaster Management Council and Disaster Management Basic Plan
1965~ 1974			Established National Land Agency
1975~ 1985		Act on Special Measures Concerning Countermeasures for Large-Scale Earthquakes, Amendment of Order for Enforcement of the Building Standard Law	
1986~ 1994			PDRP is discussed in the 「Report on Guideline of Urban Recovery」 ¹⁹
1995	Hanshin Awaji Earthquake	Act on Special Measures for Earthquake Disaster Countermeasures	Prof. Murosaki pointed out the importance of Pre-disaster Recovery Planning during the process of the recovery from earthquake
1996			「Report on Examination of Recovery Countermeasures in 1996」 (Ministry of Land, Infrastructure, Disaster prevention Bureau) 「Urban Recovery Manual in Tokyo」 (Tokyo Metropolitan)
1997			Symposium for PDRP in Architectural Institute of Japan
1998		Act on Support for Livelihood Recovery of Disaster Victims	「Guideline on Urban Disaster Recovery in Osaka」 (Osaka Pref.) 「Report on Pre-disaster Recovery planning from expected Tokai Earthquake」 (Ministry of Land, Infrastructure, Disaster prevention Bureau) 「Life Recovery Manual in Tokyo」 (Tokyo Metropolitan)
1999			「Report on Recovery Preparation against Southern Kanto Direct Earthquake」 (Ministry of Land, Infrastructure, Disaster prevention Bureau) 「Housing Recovery Plan in Fuji」 (Shizuoka Pref.)
2004	Chuetsu Earthquake		
2005			「Report on the Promotion of Recovery Preparation Planning」 (Cabinet Office in Japan)
2007		Act for Densely Inhabited Areas Improvement for Disaster Mitigation	「Report on the Promotion of Recovery Preparation Planning」 (Cabinet Office in Japan)
2009			「Report on the Promotion of Disaster Recovery Countermeasures for Municipalities」 (Cabinet Office in Japan)
2010			「Report on the Promotion of Pre-disaster Recovery Preparation Planning for Municipalities」 (Cabinet Office in Japan)
2011	The Great East Japan Earthquake and Tsunami	Act on Promotion of Tsunami Countermeasures, Act on Development of Areas Resilient to Tsunami Disasters	
2012			「Urban Recovery Guideline in Tochigi」 (Tochigi Pref.)

¹⁹ Nakabayashi, 1999, p.141, *Comprehensive Urban Studies*

2013	Act on Reconstruction from Large-Scale Disasters, Act on Special Measures against Tokyo Inland Earthquake,
2014	「National Resilience Basic Plan」
2015	「Pre-disaster Recovery Action Plan」 (Shizuoka Pref.) 「Guideline on Urban Recovery in Saitama」 (Saitama Pref.) 「Guidance on Recovery in Mie」 (Mie Pref.)
2016	Kumamoto Earthquake Revised 「Promotion of Urban DRR Plan」 (Tokyo Metropolitan)

(As of April, 2017)

(Source: Author based on the reference²⁰⁾)

2.4 U.S.: Transition of the Legislation for DRR and the Evolution of PDRP

2.4.1 Development of Emergency Response Systems (1950-1997)

Disaster Relief Act formulated in 1950²¹ was revised in 1966, 1970, and 1974 as repeated disaster countermeasures²². The functions were integrated into FEMA, which was founded in 1979. In the Robert T. Stafford Disaster Relief and Emergency Assistance Act (hereafter Stafford Act) established in 1988, FEMA takes the lead in disaster response through the President's federal large-scale disaster declaration or emergency declaration. A framework that enables the distribution and coordination of human resources in the United States, and in the Federal Response Plan formulated in 1992, Emergency Support Functions (ESF # 1-12) was established (Okamura, 2012).

The 12 emergency assistance functions are transportation, communication, public works, fire prevention, information and planning, disaster victim support, resource management, health and medical care, search and rescue, handling of dangerous goods, food, and energy. Based on the above legal system, FEMA responded as a central organization for natural disasters and incidents, but it was only limited as damage prevention (Maki, 2014).

²⁰ The Cabinet Office in Japan, 2014

²¹ For natural disaster response in the United States until 1950, a special legislation by the Diet was organized for each disaster and a recovery budget was formulated, but the Disaster Relief Act was formulated as a response to the inefficiency (FEMA, 2010). Based on this legal system, emergency response support by the provincial government by the presidential decree without going through the Diet, and support requests from the governor to the federal government were made possible (Linday & Muray, 2011). However, because the program based on this law was limited to emergency response, the 1966 law revision was improved so that disaster loans could be adapted to cope with recovery and reconstruction.

²² Schwab, 2015. P.195

2.4.2 Transition from Emergency Response to Mitigation (1997-2000)

Project Impact, which started in 1997, pointed out the importance of damage prevention through pre-disaster activities in view of the continuing expansion of recovery and reconstruction costs. Based on the project, the development of damage prevention plans was promoted, FEMA played as central role to involve local governments in the United States (FEMA, 1997). In addition, in the above-mentioned research report by the American Urban Planning Association, the importance of pre-damage mitigation plans by state / basic local governments has been proposed for not only to increase the budget for recovery, but also to cope with the risk expansion caused by the rapid population growth in the coastal areas²³. Based on these findings, in 2000, the project led to the Disaster Mitigation Act of 2000, a partial revision of the Stafford Act (McCarthy & Keegan, 2009). At this stage, the advancement of damage mitigation was started, but the contents related to the PDRP did not appear in the policy system and were limited to the academic suggestion by the second US natural disaster assessment mentioned above.

2.4.3 Transition from Mitigation to National Preparedness and Coordination in Federal Government (2001-2011)

FEMA became part of the Department of Homeland Security (hereafter DHS) established under the Homeland Security Act (2002) after the terrorist attacks on September 11, 2001. As a result, FEMA has been required to respond not only to natural disasters but also to human-induced security issues such as terrorisms. Based on the 2001 terrorist attacks, the National Preparedness (2003) formulated under the Bush administration and the National Response Plan (2004) were revised from the Federal Response Plan to embody the national preparation. The revised Emergency Support Function has two changes; from information and planning to emergency response (ESF #

²³ Schwab et al. 1998, pp.10-20, American Planning Association

5), from food to agriculture and natural environment (ESF # 11), and three additions (public safety and security as ESF # 13, long-term community recovery and disaster reduction as ESF # 14, and external relations as ESF # 15 (U.S. Department of Homeland Security, 2004). Especially, ESF#14 was added to the success story of FEMA based on the experience of supporting the recovery of a community that suffered tornado damage in 1997²⁴. Here, for the first time, the concept of recovery based on a long-term view appeared in the disaster prevention policy system, and since 2004, more than 180 local governments in 23 states have used the above support function (Olshansky & Johnson, 2014).

However, at the time of 2004, it was clearly stated that the recovery items related to economic issues in ESF # 14 were not covered because they were under the jurisdiction of the National Economic Committee and the Ministry of Finance²⁵, and no cross-sectoral measures were reached. Under this system, a delay in response was pointed out in Hurricane Katrina, which occurred in 2005, and FEMA malfunctions under DHS²⁶. Also, the above long-term community recovery and disaster reduction (ESF#14) was not used immediately because it did not match the timeline of other emergency assistance²⁷. Based on these reflections, the Post-Katrina Emergency Management Reform Act (2006) was formulated, and in 2008 the National Response Plan was revised again to the National Response Framework. Finally, FEMA has made it possible to centrally respond to natural disasters.

In addition, when consolidating authority between the federal governments, differences in grant application procedures with the Department of Housing and Urban Development (hereafter HUD) initiated in Hurricane Katrina, delays in grants due to duplication of federal agencies. The need for

²⁴ Schwab et al. 2015, pp.68 American Planning Association

²⁵ U.S. Department of Homeland Security. 2004. P.243, U.S. Department of Homeland Security.

²⁶ Okamura, 2012, p.9, Research and Legislative Reference Bureau.

²⁷ Schwab, 2015, p. 68, American Planning Association

integrated coordination within the federal government was arise to overcome the duplications²⁸. For this reason, U.S. has been developing a framework that makes recovery independent of the national response framework since 2009. At this stage, FEMA has succeeded in returning its authority to natural disasters, comprehensive and long-term perspectives, and long-term recovery policies. However, the reorganization of the vertical structure and the independence of recovery measures from the national response framework remains as the next subject.

2.4.4 The Second National Preparedness and Pre-disaster Recovery Planning (2011-)

In light of the above-mentioned reflections that cannot escape from the vertically divided structure, the National Preparedness Goal was instructed again in the 2011 Presidential Policy Directive-8 under the Obama administration. Based on the construction of the hierarchical policy system of the National Preparedness System and the National Preparedness Frameworks, a comprehensive response (Whole Community) was shown (U.S. Department of Homeland Security, 2011). The National Preparedness Framework is a series of action frameworks corresponding to the five missions indicated in the National Preparatory Goals (Prevention, Protection, Mitigation, Response, and Recovery) (U.S. Department of Homeland Security, 2016). The National Disaster Recovery Framework is based on a comprehensive planning perspective, such as revision of building standards related to safety from a medium- to long-term perspective, land use plan revision, etc. in order to carry out emergency response, recovery, and reconstruction continuously. In addition, with the establishment of this framework, the long-term community recovery (ESF # 14) in the ESF has shifted to the Recovery Support Functions (RSF) and ESF# 14 has been deleted from ESF. The RSF that serves as a guideline in the framework consists of six elements: community planning support, economic recovery support, health and welfare support, housing support, infrastructure

²⁸ Olshansky & Johnson, 2014, p.299, Routledge.

support, and natural and cultural support. In the community planning support, PDRP was positioned as an approach for recovery (FEMA, 2017a).

In the revision of the National Disaster Recovery Framework in 2016, eight basic principles were shown, one of which is PDRP. The eight basic principles are: support for individuals and families, leadership and community priorities, pre-recovery planning, collaborative partnership and inclusiveness, aggregation of execution, timeline and flexibility, resilience and sustainability, and psychological and emotional recovery (U.S. Department of Homeland Security, 2016). Based on the eight basic principles, “Whole Community Approach” is a slogan to involve various stakeholders such as federal, state, county and other governments and municipalities. Table 2.4-1 and Figure 2.4-1 show the transition of legislations for DRR in the United States.

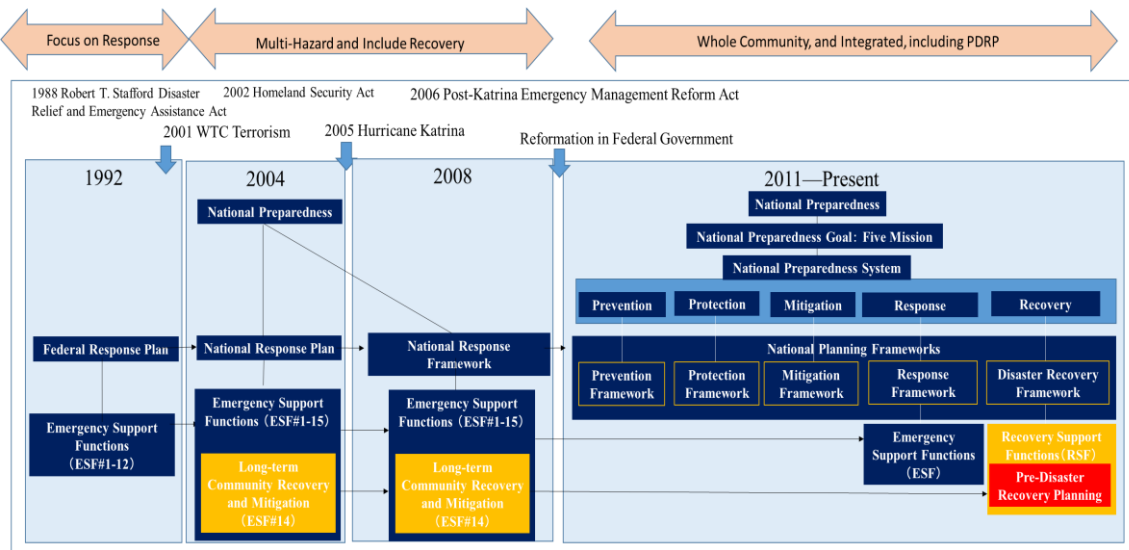


Figure 2.4-1 Transition of Legislation for Disaster Risk Reduction in U.S.
(Source: Author based on the reference²⁹)

²⁹ Okamura, 2012; Maki, 2014; Unjyo, 2014

Table 2.4-1 Transition of the Legislation for Disaster Risk Reduction in U.S.

Major Disasters, Incidents, and Terrorism in U.S.*		Laws, Acts, and Policies	Related PDRP or Recovery Planning
1979	Three Mile Island Accident	Established Federal Emergency Management Agency: FEMA	
1988, 1889	Loma Prieta Earthquake, Hurricane Hugo	Robert T. Stafford Disaster Relief and Emergency Assistance Act	
1992	Hurricane Andrew	Federal Response Plan Emergency Support Function	
1994	Northridge Earthquake	National Flood Insurance Reform Act	Los Angeles City: Recovery and Reconstruction Plan
1997		Promotion of mitigation through the Project Impact	
1998, 1999			Report of Post-disaster Recovery on American Planning Association
2000		Disaster Mitigation Act	
2001, 2002	September 11 Terrorism	Homeland Security Act Mitigation Planning	
2003, 2004	Hurricane Charley, Frances, Ivan	National Preparedness National Incident Management System National Response Plan	
2005	Hurricane Rita, Katrina, Wilma		
2006		Post-Katrina Emergency Management Reform Act	Florida State: Palm Beach County Post Disaster Redevelopment Plan
2008	Hurricane Gustav	National Response Framework Emergency Support Function	Florida State: Post-Disaster Redevelopment Plan City of Panama City, Florida
2010, 2011		National Preparedness National Preparedness Goal (National Preparedness System National Disaster Recovery Framework Recovery Support Functions	Florida State: Post-Disaster Redevelopment Planning-A Guide for Florida Communities, South Carolina State: Beaufort County 2011-2012 Disaster Recovery Plan
2012, 2013	Hurricane Sandy	National Planning Frameworks National Prevention Framework National Mitigation Framework National response Framework	North Carolina State: Emergency Operations Plan South Carolina State: Recovery Plan Virginia State, Fairfax County Pre-Disaster Recovery Plan
2014, 2015		National Protection Framework)	A Special Series of PDRP on Journal of American Planning Association City of Seattle: Disaster Recovery Framework Colorado State: Recovery Plan
2016	Hurricane Matthew		FEMA, Guideline of PDRP for States
2017	Hurricane Harvey, Irma, and Maria		FEMA, Guideline of PDRP for Municipalities

* Major disasters and incidents in this list means more than 100 mortality, or more than 100 million dollars economic loss

(Source: Author based on reference³⁰)

³⁰ Nichigai Associates, 2009; Kitahara et al., 2012; Schwab, 2015; FEMA, 2016

2.4.5 Expansion of Support Functions by FEMA

FEMA has announced two guidelines for the development of PDRP for State governments in 2016 (FEMA, 2016), and local municipalities such as counties and cities in 2017 (FEMA, 2017b). State governments are expected to play a role as logistical support, and because there are various disaster risks depending on the region, responses to multi-hazards have been established³¹. On the other hand, emphasis is placed on the local government, and it is consistent with the comprehensive plan and other plans, has a target orientation that clearly specifies the goals and due dates. It is clearly stated that there is expandability that extends from recovery at neighborhood level to the local government level, and the recovery process and disaster mitigation activities are linked³². Both guidelines include the knowledge of the APA everywhere, and academic contributions to policy can be seen.

As described above, in the United States, in order to respond to natural disasters and terrorism, the legal system was developed four times in 25 years, and PDRP was positioned as a way to embody that policy system. It can be seen that FEMA plays a role in the development, seeks different roles for the local government and the basic local government, and aims to create a plan that has a relationship that does not cause conflict with other plans. Next, we will examine how PDRP has been put into practice in the United States in order to identify issues.

2.5 Implementation of Pre-disaster Recovery Planning in U.S.

2.5.1 PDRP Projects and its Evolution in U.S.

In the middle of the 1980s, the PDRP was under construction during the Loma Preta earthquake in 1989, and the Northridge earthquake in 1994 (Los Angeles earthquake), resulting in enormous

³¹ FEMA, 2016, pp.9-10, FEMA.

³² FEMA, 2017, pp.11-19, FEMA.

damage including infrastructure destruction. The following year, the City of Los Angeles formulated the City of Los Angeles Recovery and Reconstruction Plan, clarified emergency response, recovery, and reconstruction procedures (City of Los Angeles Emergency Operations Organization, 1994). However, since no major natural disaster occurred in the latter half of the 1990s, this trend did not become a nationwide activities.

In San Francisco, California, where earthquake damage is a concern, the San Francisco City Planning Association led the 2006 pre-reconstruction plan and developed it as a series of projects as the SPUR's Resilient City Series. The project was divided into three stages (pre-disaster, emergency response, and post-disaster), and nine reports were published. The third part, *After the Disaster*, presents plans for reconstruction that speeds up the recovery of transportation facilities, and plans for pre- and post-activities that contribute to disaster mitigation.

The cases in Los Angeles and San Francisco are specialized in earthquake countermeasures, but there are also cases related to hurricanes (typhoons), which are weather-related natural hazards. In Florida, the Post-disaster Redevelopment Plan was formulated in 2010 as one of the state's comprehensive plans (Florida Department of Community Affairs, 2010). Twelve hurricanes landed between 2004 and 2005, seven of which were subject to the President's Disaster Declaration, causing serious economic damage as well as human damage, and the events let the state recognize the need for planning³³. In addition, in the social situation where it is required to escape from the recession caused by the Lehman Shock, private sectors in Florida States strongly seek appropriate responses to natural disasters in order to maintain customer attraction in the tourism industry represented by Disney Resort. With the development of the above state plan in 2010, it was obliged to prepare a PDRP for the coastal municipalities in the state of Florida.

³³ Florida Department of Community Affairs, 2010. P.1, Florida State.

2.5.2 PDRP Pilot Project in Florida State

In the pilot project for the PDRP in Florida, five coastal municipalities and one inland municipality were selected and developed (Table 2.5-2). The target area was determined mainly by hand-raising method, and five counties and one city were targeted. Table 2.5-2 summarizes the selection method, plan structure, and resident participation of each local government. The following sections show the details of the PDRP pilot project based on the interview survey (July 17-21, 2017) conducted in a form supplementing the secondary materials such as the minutes. Interviewers were the two members of pilot project committee (at that time), Florida Disaster Management Bureau (3 persons), Volunteer Florida Reconstruction (1 persons), Hillsborough County Crisis Management Division (1 person), and FEMA Recovery (1 person). The interview was conducted as an unstructured-interview method, and interviewee asked the process of the project, method, current issues, and future development of the pilot project. Polk County, an inland municipality, is excluded from this study because it was unable to obtain the minutes of PDRP as secondary materials.

Table 2.5-1 Summary of PDRP Pilot Project in Florida State

Municipality	Issues and Planning Method	Structure of the Plan	Citizens' Participation	Remarks
Manatee County	Land Use, Infrastructure and School,	Planning process, vulnerability assessment,	Discussed the importance of	Population: 322,833 (2010)
	Health, Implementation, Economic,	institutional capability assessment, objective	citizens' participation,	Along with Mexico Bay
	Dissemination, Welfare, Historical assets	and issues of PDRP, action plan,	though there was no	Major Disasters: Hurricane,
	and culture, Housing, Environment, based on the suggestions by consultant	implementation framework, communication planning, and finance	participants in the planning process	Flood, Storm Surge, and Tornado
Nassau County	Land Use, Infrastructure and School,	Vulnerability assessment, institutional	Discussed the importance of	Population: 73,314 (2010)
	Economic, Implementation, Historical	capability assessment, objective and issues	citizens' participation,	Along with Atlantic Ocean
	assets and culture, Housing, Environment,	of PDRP, action plan, communication	though there was no	Major Disasters: Hurricane,
	based on the suggestions by consultant	planning, and finance	participants in the planning process	Flood, Storm Surge, and Tornado
City of Panama City	Land Use, Infrastructure, Implementation,	Vulnerability assessment, institutional	Only one person as a	Population: 36,500 (2010)
	Economic, Housing, based on the	capability assessment, objective and issues	citizens participated in the	Along with Mexico Bay
	suggestions by planning committee	of PDRP, action plan, implementation	process	Major Disasters: Hurricane,
		framework, communication planning and education, and finance		Flood, Storm Surge, and Tornado

Hillsborough County	Land Use, Infrastructure, Health,	Objective and issues of PDRP,	Total six times workshop	Population: 1,229,226
	Economic, Housing, and Environment,	implementation framework,	have been implemented in	(2010)
		communication planning, and finance	order to disseminate the	Along with Mexico Bay
			contents and to have	Major Disasters: Hurricane,
			dialogues in schools,	Flood, Storm Surge, and
			university, library	Tornado
Sarasota County	Infrastructure, Health, Economic, Housing,	Vulnerability assessment, institutional	Unknown	Population: 379,448 (2010)
	Environment, and Safety	capability assessment, objective and issues		Along with Mexico Bay
		of PDRP, action plan, implementation		Major Disasters: Hurricane,
		framework, communication planning,		Flood, Storm Surge, and
		finance, and financial source of recovery		Tornado

(Source: Author based on the reference³⁴)

In each local government, the major disasters are formulated mainly for the response to typhoons and floods, which are weather-related disasters, and there are common issues such as housing, infrastructure, and economic recovery, while it can be seen that social welfare, natural environment, historical assets, and local culture has its own issues. In addition, there are local governments where consultants intervene in the selection method and show them in advance, and there are also local governments that have been examined by the committee method. Although there is no big difference in the plan composition in five municipalities, the action plan, the PDRPs function as communication plan, and the implementation plan with the financial plan. In addition, although residents' participation is not seen as a whole, Hillsborough County tried to communicate directly with residents through the implementation of workshops and other activities.

As a specific example, City of Panama City conducted vulnerability assessments in areas affected by flood damage, such as densely populated areas with poor households, aging rate identification, and housing stock assessments, and examining the priority of specific measures. In particular, the housing stock assessment classifies the building standards in Florida since March 2002 (from March 2002), 1994 to 2001, and before 1994. The houses built prior to 1994 were

³⁴ Panama City Planning and Land Use Services (2008); Hillsborough County (2010); the Nassau County Post Disaster Redevelopment Plan Executive Technical Committee. (2009); Manatee County. (2010); Sarasota County. (2015).

recognized as high risk due to the old building codes. As the buildings before 1994 accounted for about 83% of the city, it is clear that there are a lot of vulnerable houses in the city (Panama City Planning and Land Use Services, 2008), which is used as an outcome of the PDRP. Based on the above vulnerability assessment, there are vacant land selection and pre / post action plans. In order to map city-owned vacant lots and to consider setting up temporary housing in advance, divide the action plan in pre- and post-disaster phases, and formulate specific action plans such as items that can be activated in advance, implementation period, and identification of the partners.

As a result, with regard to housing, the city has decided to prepare for borrowing private companies (hotels), examine the location of temporary housing, and identify socially vulnerable people. As described above, in order to respond to the issues obtained by vulnerability assessment, the plan structure includes specific actions in chronological order, not only in terms of speeding up response after reconstruction, but also priority selection for disaster mitigation activities.

Also, as specific implementation examples, Hillsborough County identified 226 activities in pre-disaster phase and 169 post-disaster phase (Hillsborough County, 2010). The activities are divided 8 sections: 1) economy, 2) natural environment, 3) financial administration, 4) housing, 5) health and welfare, 6) infrastructure, 7) land use plan, and 8) education/communication activities. The activities contain the preparation for recovery such as selection of the recovery priority and determination of industrial waste accumulation area, including actions for mitigation in peace time such as evaluation of drainage function in urban areas and relocation plans for sewage treatment plants in flooded areas.

2.5.3 Seamless Transition from Pre-disaster phase to Recovery in Florida State

The Florida Crisis Management Department responds to hurricanes using the timeline, ESFs, and RSFs. As shown in Figure 2.4-1, FEMA's nationwide ESFs were # 1 to # 15, but Florida has added

three functions (# 16 to 18) and consists of 18 fields. The ESFs in Florida is the same as FEMA up to ESF # 14, but # 15 is Volunteers & Donations, # 16 is Law Enforcement & Security, # 17 is Animal and Agricultural Issues, and # 18 is Business, Industry, and Economic Stabilization. The RSF including the PDRP is positioned under ESF # 15 (Volunteers & Donation), and a non-profit organization (hereafter NPO) called Volunteer Florida, which is directly under the governor of the state, takes the coordinating role for recovery activities (Figure 2.5-1). In response to the setting of Level 2 (120 hours ago) where hurricane approach and landing are predicted, the heads of the related organizations are gathered. At Level 3, staff are mobilized to respond to the room allocated to each function, and information is available as needed. Responses are made in the command room which has rooms which designated for each ESF (Figure 2.5-2). This shows that a private organization including NPOs and NGOs has been built together with the government agencies to gather in this command room before the disaster hits. In this place, the groups are aiming for smooth development of priority issues after the disaster, which is targeted by the PDRP, in consideration of the state of the disaster.

In 2016, Hurricane Matthew, which caused damage in eastern Florida, started the process with the announcement of the state of emergency by the governor in view of the course of hurricanes in Category 5. From the start of operations on the timeline to the gathering of related organizations, wide-area evacuation based on the agreement between the cities announced in advance, and the activities for recovery such as rebuilding houses by distributing human resources managed by the Volunteer Florida was organized before the Hurricane Matthew hit. As described above, the organizational structure and facilities have been developed in anticipation of post-disaster recovery, reconstruction, and long-term reconstruction, and ESF and RSF are deployed on the timeline of the timeline. These operations are performed in conjunction with each other.



Figure 2.5-1 Emergency Operation Room for ESF#15
(Author)



Figure 2.5-2 Emergency Operation Room for ESF#6 &12
(Author)

2.5.4 The Present PDRP in U.S.

Hillsborough County, which is one of a participants of the PDRP pilot project in Florida, is currently planning to revise the PDRP. However, since there was no major natural disaster after the completion of PDRP, The review has not been carried out for disaster recovery. In addition, there is no plan for promotion in the State of Florida as a whole, and it depends solely on the judgment of each County (or city) government. As described above, the PDRP is positioned as a function of the disaster response framework rather than functioning comprehensively in hurricane disasters, and presents evidence that damage has been reduced by the plan. However, the state government and

county government crisis managers are evaluating the input that made it possible to recognize local risks through vulnerability assessment and securing the perspective of long-term recovery.

2.6 Legislation for Disaster Risk Reduction in ASEAN Countries

Table 2.6-1 shows the summary of the legislation for DRR in ASEAN 10 countries. As mentioned above, ASEAN countries are exposed to high natural hazards risk in the word, though there are diverse legislations for DRR are observed. Four countries out of ten have no experience of natural disasters which caused more than 100 mortality since 2000, whereas major disaster such as Indian Ocean Tsunami in 2004, Cyclone Nargis in 2008, Flood in 2011, and Typhoon Yolanda (international name, Haiyan) in 2013 impacted mainly in Indonesia, Myanmar, Philippines, and Thailand. Most of the ASEAN counties equipped act on disaster management and basic DRR plan, yet emergency response plan and recovery plan are limited. Also all of 10 countries have not developed PDRP as well. Interestingly, most of the acts and plans have been developed in 21st century to cope with intensified natural disasters. It is important to note that only Philippines and Myanmar have impacted natural disasters since structured DRR legislation establishment. The details of the recovery scheme on the Typhoon Yolanda in Philippines and Floods in Myanmar are examined.

Table 2.6-1 Legislative Structure for DRR in ASEAN Countries

World Risk	Natural Disaster Experience ³⁵	Disasters after enact the DRR Acts	Legislation for DRR				
			Act on Disaster Management	Emergency Response Plan	Basic DRR Plan	Recovery Plan	Related with Comprehensive Plan
Philippines (2)	Typhoon Haiyan in 2013	Typhoon Haiyan (2013)	Republic Act 10211(Disaster Risk Reduction & Management Act) (2009)	National Disaster Response Plan (2014)	The National Disaster Risk Reduction & Management Plan 2011 to 2028 (2012)	Yolanda Comprehensive Rehabilitation & Recovery Plan (2014)	Written on the Philippines Development Plan 2011-2016
Myanmar (43)	Cyclone Nargis in 2008	Flood in 2015	Natural Disaster Management Law (2013)	Emergency Response Preparedness Plan (2014)	Myanmar Action Plan on Disaster Risk Reduction (2012)	Planned by the World Bank	No works on National Sustainable Development Strategy for Myanmar (2009)
Indonesia (34)	Tsunami in 2004	None	Disaster Management Law (2012)	None	National Disaster Management Plan 2010-2014, 2015-2019	None	Written on the National Development Plan (RPJMN2005-2025)
Cambodia (9)	Flood in 2011	None	Law on Disaster Management (2015)	None	National Action Plan & Strategy on Disaster Risk Reduction 2014-2018	None but there is an assessment	Written on the National Strategic Development Plan 2014-2018
Thailand (90)	Tsunami in 2004, Flood in 2011	None	Disaster Prevention & Mitigation Act (2007)	None	National Disaster Prevention & Mitigation plan 2010-2014	None	Sector-wise Development Plans
Vietnam (18)	Typhoon in 2008	None	Law on Natural Disaster prevention & Control (2013)	None	National Strategy for Natural Disaster Prevention, Response & Mitigation to 2020	None	Written on the Viet Nam Development Strategy for 2011-2020
Brunei (12)	None	None	Disaster Management Order (2006)	National Standard Operating Procedures (2016)	Strategic National Action Plan for Disaster Risk Reduction 2012-2025 (2012)	None	One of Strategy on the Tenth National Development Plan (2012-2017)
Malaysia (88)	None	None	Policy & Mechanism in the Management of National Disaster & Relief in Malaysia (1997)	None	None, but there is "National slope master plan 2009-2023"	None	Written on the Eleventh Malaysia Plan 2016-2020
Lao (100)	None	None	None, but there is an act on fathering Committee	None	Strategic Plan on Disaster Risk Management in Lao PDR 2020, 2010, & action plan (2003-2005)	None	Written on the Five year National Socio-Economic Development Plan VIII (2016-2020)
Singapore (160)	None	None	None, but Civil Defense Act is function for DRR	None	None	None	No works on the Sustainable Singapore Blueprint 2015

(As of September, 2016)
(Source: Author)

³⁵ Disasters more than 100 mortality after 2000

2.6.1 Recovery Scheme for Typhoon Yolanda in Philippines

Legislative structure for DRR in Philippines has evolved in 2010 and 2011 with enacting Republic Act, Framework, and DRR management plan in 2011. Typhoon Yolanda hit the central region in Philippine in 2013, and recovery plans are formulated based on the above structure (Figure 2.6-1). As a first step of the planning, bottom-up approach was adopted. Impacted municipalities prepared each recovery plan, then it was summarized as a recovery plan at the national level, and the details of activities were categorized into implementation framework on March, 2015. Such mutual interaction is observed in recovery scheme in case of Typhoon Yolanda³⁶ and the legislative backbone has been developed before disaster occurred.

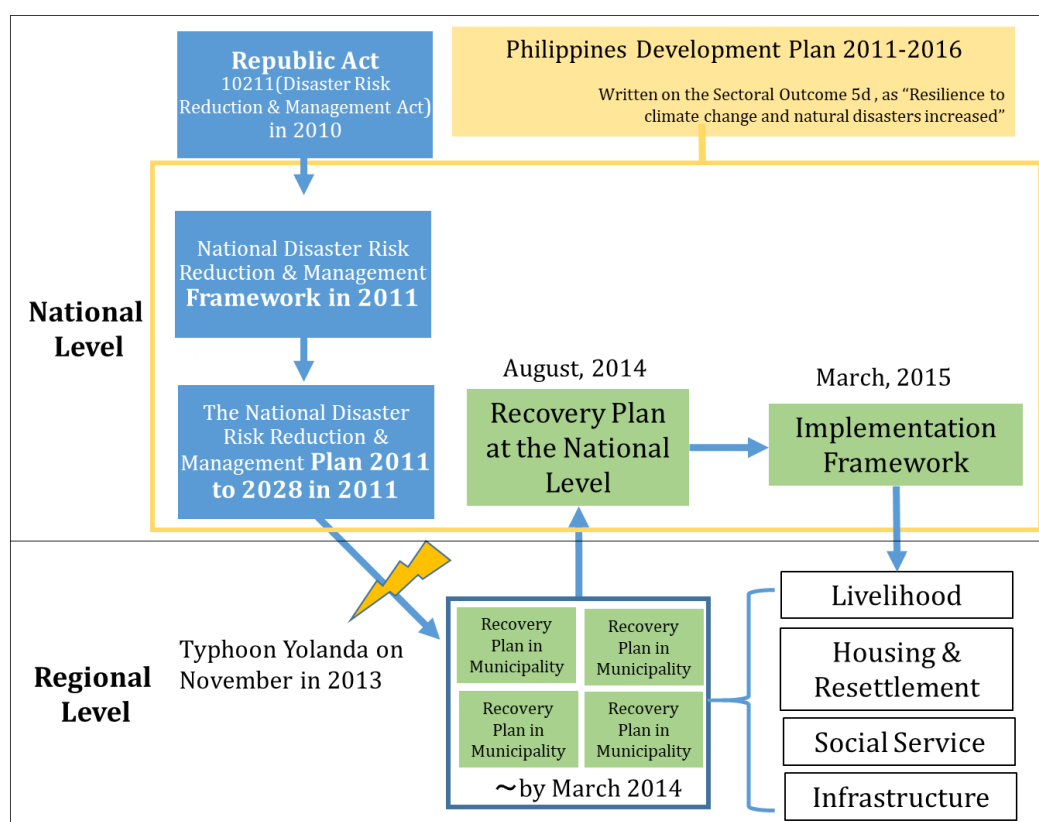


Figure 2.6-1 Recovery Planning Scheme for Typhoon Yolanda in Philippines
(Source: Author based on the Reference³⁷) (As of September, 2016)

³⁶ Yolanda Comprehensive Rehabilitation & Recovery Plan Philippine Statistic Authority <https://psa.gov.ph/content/population-region-viii-eastern-visayas-based-2015-census-population>

³⁷ Yolanda Comprehensive Rehabilitation & Recovery Plan

2.6.2 Recovery Scheme for Floods in Myanmar

A historical calamity, Cyclone Nargis in 2008, impacted with more than 138,000 mortality in Ayeyarwady Region. There was not acts and plans for DRR at the time. In 2012, “Myanmar Action Plan on disaster risk reduction was issued, and then “Myanmar Disaster Management Law” also enacted in 2013. As this backdrop, floods and landslides were occurred in 2015 induced by consecutive rains in northern part of Myanmar. Post-disaster needs assessment and recovery project were launched with initiative by the World Bank. However, there was not recovery plan at the time, and bottom-up approach which observed in Philippines was not realized at this event (Figure 2.6-2).

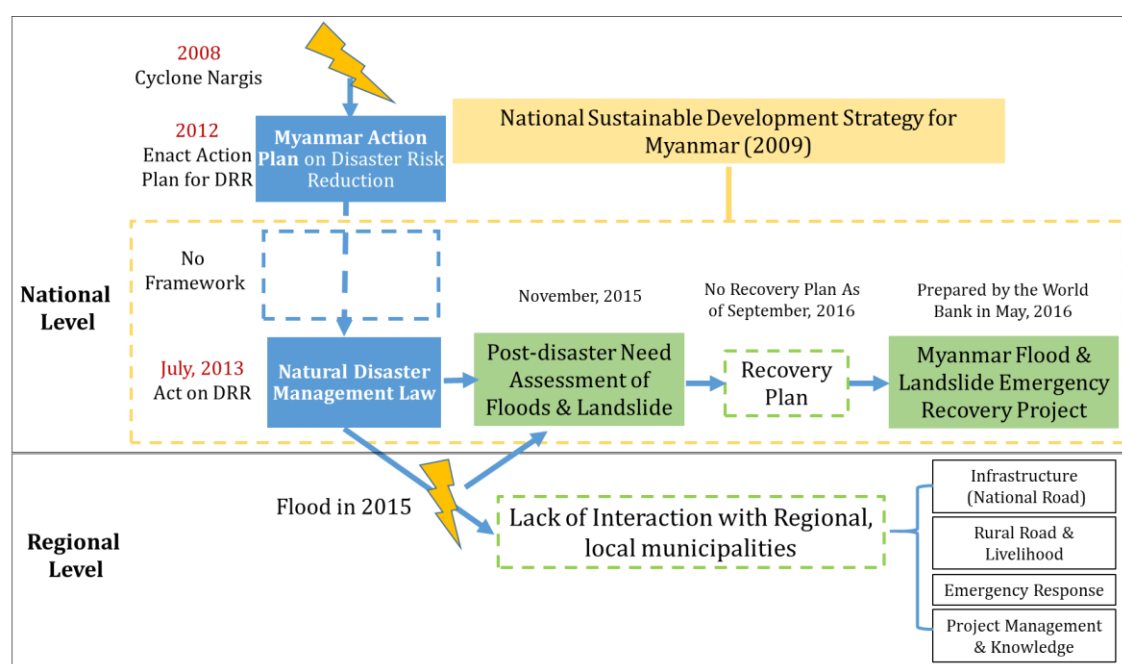


Figure 2.6-2 Recovery Planning Scheme for Floods and Landslides in Myanmar
(As of September, 2016)

(Source: Author based on the Reference³⁸)

This lack of interaction attributes from the issue of national scheme of DRR legislative structure.

³⁸ Yolanda Comprehensive Rehabilitation & Recovery Plan

Figure 2.6-3 describes the national legislative structure for DRR in Myanmar. Laws and acts are gradually developed at the national level from normal time to response, though recovery phase has not included yet as of 2016. Also, plans and acts in Township level (equivalent to city level) and village Tract (roughly equivalent to middle school district level in Japan) has not been implemented. As a result, bottom-up approach connecting to policy on national level was not expected at the time.

In sum, Philippine and Myanmar has disaster impacts since the national legislative structure for DRR has developed, but the recovery scheme are observed differently. The lack of bottom-up approach in Myanmar requires more research at local level in order to understand how impacted people by the flood response and recovery from the events.

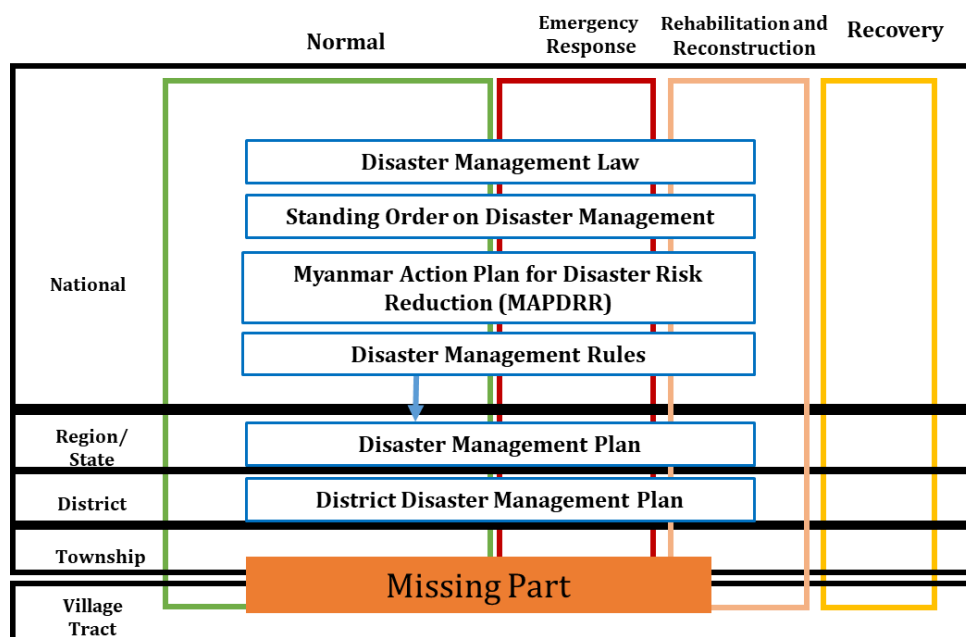


Figure 2.6-3 Legislative Structure for DRR in Myanmar
(As of September, 2016)
(Source: Author)

2.7 Summary

The findings and the present issues extracted from the PDRP of both countries are summarized in the following three points.

2.7.1 The Characteristics of PDRP in Japan and U.S.

The need for DRR has been discussed through various natural disasters and man-made disasters in Japan and the U.S., and PDRP has been developed by different approaches. In Japan, discussions on the PDRP started in the wake of the Great Hanshin Awaji Earthquake, and the plan specializing in earthquakes and tsunami was especially localized in areas that are expected to occur in the Tokyo metropolitan and Nankai Trough earthquakes. Furthermore, both concepts that “Recovery Preparation” and “Promotion of Disaster Mitigation” are demonstrating how vulnerability is reduced by the participation of residents.

On the other hand, in the transition of the DRR policy system in the United States, there have been four structural changes in at least 25 years, and PDRP is positioned as an embodiment in response to the “National Preparation” that is the trend of the entire United States. In Florida, the timeline was used to provide an organizational system that considered pre-disaster, emergency response, recovery, recovery, and long-term recovery prior to a hurricane approached. With the aim of seamless response from the pre-disaster to the post-disaster, a system was built in which the private sector and NPOs/NGOs respond together. In other words, the establishment of an institutional framework can encompass individual areas of activity, therefore, it can be understood that PDRP is not a plan that governs the whole, but a plan with partial functions in U.S.

2.7.2 Issue. I: Verification of the Usefulness of PDRP

A common issue for both countries is that the usefulness of PDRP has not been verified. While efforts related to the plan have progressed in various places, no studies have been presented in the world that have verified how the PDRP actually worked and how much damage was mitigated. Fortunately, the expected earthquakes directly under the Tokyo metropolitan area and the Nankai Trough earthquake have not occurred in Japan, and its usefulness cannot be verified. As mentioned

above, the usefulness verification of the PDRP in the local municipalities implementing the pilot project would be possible.

2.7.3 Issue. II: Versatility of PDRP for Metro-hydrological Natural Hazards

As mentioned above, PDRP was applied not only to pre-earthquake recovery but also to weather-related disasters in U.S. On the other hand, in Japan, there have been no more than 1,000 deaths due to weather-related disasters since the Typhoon Ise, and the legal policy system related to earthquake and tsunami has been mainly promoted. However, as evidenced by the above-mentioned “Disaster prevention and Mitigation in Response to New Stages” by the MLIT in order to respond to climate change, protect lives and property, and suppress economic damage, further research on PDRP on weather-related disasters is required. By turning our eyes from earthquake and tsunami to meteorological disasters, it can be an opportunity to expand the versatility of PDRP. Therefore, it can be said that the examination of PDRP for weather-related disasters in Japan is an important next issue in order to proceed with its development, and such approach would be useful in ASEAN countries.

Reference

- AADMER. (2016). *AADMER Work programme 2016-2020*. AADMER.
- Ando, M. (2004). *Hanshin Awaji daishinsai fukkou toshi keikaku jigyou machi dukuri* [Disaster Recovery Planning and Its Project on Hanshin Awaji Great Earthquake]. [in Japanese]. Gakugei-Syuppan: Tokyo.
- Becker, J., Saundres, W., Hopkins, L., Wright, K., & Kerr, J. (2008). *Pre-event recovery planning for land-use in New Zealand: An updated methodology*. GNS Science Report 2008/11.
- Berke, P., Cooper J., Aminto, M., Grabich, S., & Horney, J. (2014). Adaptive planning for disaster recovery and resiliency: An evaluation of 87 local recovery plans in eight states. *Journal of the American Planning Association*, 80(4), 310-323.
- Cabinet Office in Japan. (2014). *Heisei 26 nenban bousai hakusho* [White paper on disaster management in 2014]. [in Japanese]. Cabinet Office in Japan.
- City of Los Angeles Emergency Operations Organization. (1994). *Recovery and reconstruction plan*. Los Angeles City.
- City of Seattle. (2013). *Toward a resilient Seattle: Post-disaster recovery plan framework*. City of Seattle.

- European Commission. (2016). *Action plan on the Sendai Framework for disaster risk reduction 2015-2030-A disaster risk-informed approach for all EU policies*. European Commission.
- FEMA. (1997). *Project impact-Building a disaster resistant community*. FEMA.
- FEMA. (2010). *The federal emergency management agency: The federal emergency management agency publication I*. FEMA.
- FEMA. (2014). *The role of mitigation in reducing federal expenditures for disaster response*. FEMA.
- FEMA. (2016). *Pre-disaster recovery planning guide for state governments*. FEMA.
- FEMA. (2017a). *Recovery Support Functions*. Retrieved September 27, 2017, from <https://www.fema.gov/recovery-support-functions>
- FEMA. (2017b). *Pre-disaster recovery planning guide for local governments*. FEMA.
- FEMA. (2017c). *FY 2017 Pre-disaster mitigation (PDM) grant program fact sheet*. FEMA. Retrieved August 13, 2017, from https://www.fema.gov/media-library-data/1499868698311-25cdc5fcfb237df56a87da7cd7cc0717/PDM_FactSheet-for-FY_2017_508.pdf
- Florida Department of Community Affairs. (2010). *Post-disaster redevelopment planning-A guide for Florida communities*. Florida State.
- Florida Division of Emergency Management. (2017). *Emergency support functions*. Florida Disaster.org. Retrieved August 13, 2017, from <http://www.floridadisaster.org/EMTOOLS/esf.htm>
- Fuji City. (2016). *Fuji shi jizen toshi fukkou keikaku* [Fuji City Pre-disaster Recovery planning], [in Japanese], Retrieved April 11, 2017, from <http://www.city.fuji.shizuoka.jp/machi/c1201/fmervo0000012vzc-att/m20la000000csyp.pdf>
- Haas, J.E., Kates R. W. & Bowden, M.J. (Eds.). (1977). *Reconstruction following disaster*. Cambridge, Massachusetts: MIT Press.
- Hillsborough County (2010). *Post-disaster redevelopment plan documents*. Hillsborough County Emergency Management. Retrieved April 25, 2017, from <http://www.hillsboroughcounty.org/en/residents/public-safety/emergency-management/post-redevelopment-plan-documents>
- Ikuta, N. (2013). *Bosai hou* [Act on disaster risk reduction]. [in Japanese]. Tokyo: Shinzan-sya.
- Ichiko, T., Sanuki, R., Yoshikawa, J., & Nakabayashi, K. (2016). Daitoshi kougai no missyuu chiiki wo syutaisyo toshita jichitai jizen fukkou machidukuri no tenkai ni kansuru kenkyu –Tokyo Hachioji shi niokeru 10 nenkan no tenkai process kara- [A study of pre-disaster planning for post-disaster recovery targeted non-building-crowded area around Tokyo suburb –ten years development in Hachijo, Tokyo]. [in Japanese]. *Journal of City Planning Institute of Japan*, 51(3), 415-422
- Ichiko, T., Yoshikawa, J., & Nakabayashi, K. (2012). 2000 nenndai ni tenkaishita “shinsai machi dukuri kunren” no jissi tokusei to kunnren kouka no kousatu –post higashi nihon daishinsai ki no jizenfukkoutaisaku wo kanngaerutamenno kisoteki kensho [A study of chronicles and outcomes of community workshops for post-disaster recovery in Tokyo –Reviewing towards post-period for Tohoku-pacific Ocean Earthquake, [in Japanese]. *Journal of City Planning Institute of Japan*, 47(3), 877-882
- Iwaka, K., Ueduki, Y., Hama, D., & Yamanaka, R., (2014). Jizoku no ayabumareru chiiki deno jyuumin syutai niyoru jizen fukkou machi dukuri keikakuno ritsuan syodouki no kadai to taisaku [Problems and measures for formulation of preliminary reconstruction and urban development plan by residents in Minami Town, Pref. Tokushima]. [in Japanese], *Journal of Social Safety Science*, 22, 1-7
- Joint Research Centre. (2015). *Building a resilient Europe in a globalized world-Summary report*. European Commission.
- Kato, T., Nakamura, H., Sato, K., & Hiroi, Y. Mikeiken no fukkou jyoukyo ni taiou surutameno jizenn jyunbi: Fukko jyoukyou image training syuhou no kochiku –Saitama ken ni okeru torikumi- [A study on the imagination training for the situations of post-disaster urban reconstruction –Pre-disaster measurements for inexperienced situations of post-disaster recovery in the districts of Saitama]. [in Japanese]. *Journal of City Planning Institute of Japan*, 46(3), 913-918.

- Kato, T. (2017). Syuto chokka Jishin ni sonaeru-Jidai wo sakidorishita fukkou no jitsugen ni mukete-. [Preparation against earthquake in Tokyo Metropolitan-Realization of pre-disaster recovery-]. [in Japanese]. *Hyogo Earthquake Memorial 21st Century Research Institute*, 22, 29-35
- Kim, M., Maki, N., Hirata, T., Inaji, S., & Kishikawa, H. (2017). Chiiki no itonomi no keizoku ni tyakumoku shita jizennfukkoukeikaku sakutei syuhou no kouchiku –Wakayama ken Yura-cho Ena deno jyuumin sannkagata workshop wo tooshite [Challenges in realizing sustainable community development: Case study of pre-disaster recovery planning in Ena, Wakayama, Pref]. [in Japanese]. *Journal of Social Safety Science*, 30, 1-11.
- Kitahara, I., Matsuura, R., & Kimura, R. (2012). *Nihon rekishi saigai jiten* [Dictionary of Historical Disasters in Japan]. [in Japanese]. Tokyo: Yoshikwa-Kobunkan.
- Lingle, B. (2017). *Legacy of Harvey and Irma turns on FEMA's post-disaster response*. Brink News. September 15.
- Maki, N. (2014). Saigai hasseiji ni okeru kikitaiou system-Beikoku no jireini manabu- [Study of emergency management system in U.S.] [in Japanese]. *The Review of comparative Social Security Research*, 188, 4-14.
- Maki, N., & Hayashi, H. (2006). Hurricane Katrina no saigaitaiou to fukyuu/fukkou –Beikoku no kikikannri system wa dokoni kinou sitanoka [How emergency management system functioned for response and recovery to Hurricane Katrina in U.S.] [in Japanese]. *Journal of Disaster Research*, 25(2), 221-231.
- Manatee County. (2010). *Post-disaster redevelopment plan*. Manatee County. Retrieved April 25, 2017, from <http://www.mymanatee.org/home/government/departments/building-and-development-services/planning-zoning/comprehensive-planning-section/hazard-mitigation.html>
- McCarthy, X. F., and Keegan, N. (2009). *FEMA's pre-disaster mitigation program: Overview and issues*. Congressional Research Service. 7-5700.
- Murosaki, T. (2017). *Jizen fukkou de mezasu bekimono* [A goal of pre-disaster recovery]. [in Japanese]. *Hyogo Earthquake Memorial 21st Century Research Institute*, 22, 1-2.
- Working Group for Disaster Risk Reduction Behavior against water-related disasters. (2016). *Timeline “Bousai koudou keikaku” sakutei katuyou housihin* [Guideline for timeline “disaster risk behavior”] [in Japanese]. MILT.
- MILT and Survey Team by DRR Societies in Japan. (2013). *Beikoku Hurricane Sancy ni kansuru genchi chosa houkokusyo (Dainihan) –Senshinkokuno daitoshi wo hajimete osotta New York toshiken daisuigai karano kyokun* [Report of Hurricane Sandy (2nd Edition): Lesson form the urban Flood in New York as a First Impact in Major City in developed county.] [in Japanese]. MILT and Survey Team by DRR Societies in Japan: Tokyo.
- MILT. (2015). *Aratana stage ni taioushita bousai gensai no arikata* [New stage of disaster mitigation and risk reduction]. [in Japanese]. Retrieved October 17, 2017, from <http://www.mlit.go.jp/saigai/newstage.html>
- National Land Agency Disaster Prevention Bureau. (1998). *Tokai jishin tou karano fukkou jyunbi keikaku kensho tyousa houkokusyo* [Report on investigation of pre-disaster preparedness against Tokai earthquakes.] [in Japanese]. National Land Agency Disaster Prevention Bureau.
- Mitsui, Y. (2007). *Bousai gyousei to toshi dukuri –Jizen fukkou keikaku ron no kousou-* [Institution for disaster risk reduction and urban planning: Construction of Pre-disaster recovery planning]. Tokyo: Shizansya.
- Mileti, D.S. (1999). *Disasters by design: A reassessment of natural hazards in the United States*. Washington D.C.: Joseph Henry Press.
- Nakabayashi, K. (1999). Toshi no jishihigai ni taisuru jizenfukkoukeikaku no kousatu –tokyoto no shinsaifukkousennryaku to jizen jyunbi no kangaekata wo jireini [Study on urban pre-disaster recovery planning against earthquakes: An example of recovery strategy in Tokyo Metropolitan]. [in Japanese]. *Comprehensive Urban Studies*, 68, 141-164.
- Nakabayashi, K. (2017). *Jizenfukkou no rinen to senryaku* [A concept of pre-disaster recovery and its strategy]. [in Japanese]. *Hyogo Earthquake Memorial 21st Century Research Institute*, 22, 3-18.

- National Hurricane Center. (2017). *Tropical cyclone report hurricane Matthew* (AL142016). National Hurricane Center.
- Nichigai Associates. (2009). *Sekai saigai-shi jiten 1945-2009* [Dictionary world disaster history 1945-2009]. [in Japanese]. Tokyo: Nichigai Associates. Inc.
- Okamura, M. (2012). *Beikoku renbou kinnkyuu jitai kanricho (FEMA) to waga koku bousai taisai tonon hikakuron* [Comparative research on FEMA and legislation in Japan]. [in Japanese]. Research and Legislative Reference Bureau.
- Olshansky, B.R., and Johnson, A. L. (2014). The evolution of the federal role in supporting community recovery after U.S. disasters. *Journal of the American Planning Association*, 80(4), 293-304.
- Panama City Planning and Land Use services. (2008). *Post-disaster redevelopment plan city of Panama City, Florida*. City of Panama
- Sarasota County. (2015). *Post-disaster redevelopment plan*. Sarasota County.
- Saunders, W.S.A., and Becker, J. (2015). A discussion of resilience and sustainability: Land use planning recovery from the Canterbury earthquake sequence, New Zealand. *International Journal of Disaster Risk Reduction*. 14, 74-81.
- Sasaki, S. (2017). Jizenfukukou no gainen seiri to seidoka ni atattenokadai [Concept segregation of pre-disaster recovery planning and its challenges on institutionalize]. [in Japanese]. *Conference on Japan Society for Disaster Recovery and Revitalization in 2017*, fifth session.
- Schwab, C. J., Topping C. K., Eadie, D. C., Deyle, E. R., & Smith, A. R. (1998). Planning for post-disaster recovery and reconstruction. *American Planning Association*. PAS Report 483/484. Chicago: American Planning Association.
- Schwab, C. J. (2015). Planning for post-disaster recovery: Next generation. *American Planning Association*. PAS report 576. Chicago: American Planning Association.
- Shiozaki, Y. (1998). Hanshin Awaji daishinsai no fukukou toshikeikaku jigyou niokeru “2 dankai toshi keikaku kette houshiki no hyouka ni kansuru kenkyu [Evaluation of “Two-step planning determination procedure” in the recovery program of post-earthquake]. *Journal of City Planning Institute of Japan*, 33, 97-102.
- Smith, P. G., & Wenger, D. (2007). Sustainable disaster recovery: operationalizing an existing agenda. In Rodriguez, H., Quarantelli, L. E., and Dynes, R. R. (Eds.), *Handbook of disaster research*. New York: Springer.
- The Nassau County Post Disaster Redevelopment Plan Executive Technical Committee. (2009). *Nassau County post disaster redevelopment plan*. Nassau County.
- Tokyo Metropolitan Government Bureau of Urban development (2016). *Planning on Promotion of urban disaster risk reduction*, [in Japanese]. Tokyo Metropolitan Government.
- U.S. Department of Homeland Security. (2004). *National response plan*. Department of Homeland Security.
- U.S. Department of Homeland Security. (2011). *National preparedness system*. Department of Homeland Security. Retrieved February 27, 2018, from <https://www.fema.gov/pdf/prepared/npg.pdf>
- U.S. Department of Homeland Security. (2016). *Overview of the national planning frameworks*. Department of Homeland Security. Retrieved February 27, 2018, from https://www.fema.gov/media-library-data/146601628887963f68f6dced909f08cf8687deaa8e718/Overview_of_National_Planning_Frameworks.pdf
- U.S. Department of Homeland Security. (2016). *National disaster recovery framework*. U.S. Department of Homeland Security
- Unjyo, S. (2014). Beikoku no saigai taiou kikikanri ni kansuru chosa –Kokka jyunbi no tameno framework syu [Research emergency response and management in U.S. –Framework for national preparedness]. [in Japanese]. *Public Works Research Institute*, Vol.4289, Public Works Research Institute
- Volunteer Florida. (2017). *Annual report 2016*. Volunteer Florida.

Chapter.3

Adaptive Strategies and Transformation for Community Recovery: A Case Study of Villages in Hinthada, Ayeyarwady Region, Myanmar

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3.1 Introduction

3.1.1 Background

The countries belonging to the Association of Southeast Asia Nations (ASEAN) are exposed to high risks of hydro-meteorological natural hazards due to meteorological and geological factors. Kreft et al. (2017) point out that climate change risks have had an impact on this vulnerable region. This is especially true of Myanmar, which is ranked the second highest at-risk country in the world (Kreft et al., 2017). Most types of natural hazards are observed in the history of Myanmar, but Cyclone Nargis in 2008 was the worst disaster with more than 138,000 casualties including missing persons (Union of Myanmar et al., 2009). The shock was a critical wake-up call, prompting the evolution of a legislative framework on disaster risk reduction (Center for Excellence in Disaster Management & Humanitarian Assistance, 2017). Although the *Myanmar Action Plan for Disaster Risk Reduction* (2012, revised in 2017) and *Natural Disaster Management Law* (2013) have been enacted to deal with anticipating extreme weather events and climate change (Myanmar National Disaster Management Committee, 2017), implementation at local levels requires further steps.

In this paper, the theory of transformation, as an adaptive response and fundamental social-ecological system change, is examined with the relationship between structure and agent concept through an empirical, micro-level case study in Myanmar. Transformation is a term considered together with adaptation and resilience, especially in the academic field of climate change (Intergovernmental Panel on Climate Change, 2014). Consensus regarding resilience in disaster risk management is gradually converging into being process-oriented rather than outcome-oriented (Matyas & Pelling, 2015). If resilience is a dynamic process of returning to a stable equilibria or bouncing back to normalcy, the transitional phases that absorb external shocks need to be illustrated. The transition has been characterized as having three stages: resistance (maintaining the status quo), incremental adjustment, and transformation (Pelling, 2015). Incremental adjustment is defined as

“marginal changes in infrastructure, institution, and practices that foster flexibility and fulfil capacity while not directly threatening system integrity” (Pelling, 2015, 117). In other words, incremental adjustment holds unresolved problems or cumulative potential risks that are associated with “systematic vulnerability.”³⁹ Pelling et al. (2015) note that transformation is a “fundamental change to the functioning of [a] system,” and in this sense, disaster recovery has huge potential to reach new equilibria or to destabilize.

The reason for this paper, which intends to connect the theory of transformation and the structure-agent theory, is that the relationship between structure and agent has meaningful to identify gaps between theory and practice through a case study. Although Pelling et al. (2015) shows the “Adaptation Activity Space” as potential variables, practical study of transformation has still been limited due to the complexity of the independent variables. Transformation and Resilience on Urban Coasts (TRUC) conducted case studies in six cities (Kolkata, Lagos, London, New York, Shanghai, and Tokyo) to testify the concept of resilience, transition, and transformation on ground. Micro-level survey has potential as Birkmann et al. (2017) succeeded to illustrate agent analysis with perception of individual households by the household surveys in Lagos. However, the research could not reach to assessment of structure in the society.

To bridge the gap of theory and practice on the transformation, this research applies an inductive case study on self-dependent communities with fewer interventions by institutional regulations. As Gibson et al. (2016) points out that structure influences autonomous agent but individual may also become significant agents for transformation, looking at the relationship of structure and agent are critically important. A criticism on an inductive research is that a case study displays just only one perspective of a phenomenon, though its outcome will be a serious of “Building Block” (Gorge & Bennett, 2005). If a structure and agent model on transformation theory has complex variables,

³⁹ Pelling, 2015, p. 117

starting from the simplest case is a valuable approach. The case study has the potential to identify inherent human adaptability and transformability because historically indigenous people had to deal with natural hazards with few external interventions. Building codes, zoning, external humanitarian relief are developed in a few centuries, however, it may adversely and unintentionally effect on declining capability of self-recovery and self-survival skills. In order to identify a focal point to maximize the capability of agent and structural interventions, a case study in inherent condition is suggested.

This research aims to identify inherent human adaptability and transformability in fewer intervened communities. It does not intend to deal with stratification and inequality directly. These issues, especially housing recovery and reconstruction, are discussed according to stratified social classes in case of disasters and the recovery pathways (Oliver-Smith, 1990; Peacock, et al., 2014). Although spatial inequality in this regard differentiates the consequences among local communities, this research specifies their adaptability in built environment over a century. Therefore, communities with fewer interventions were selected from rural areas of Myanmar. Thus, this research intends to rediscover the strategies of human adaptation to natural phenomena in an age of climate change. To examine this, this study aims to 1) understand how villagers adapt their lifestyle in flood-prone areas, and 2) identify adaptive and mitigation strategies for recovery against flooding and inundation in villages divided by dykes. This research has the potential to show that forced out-migration from a flood-prone area is not the only way to adapt, and new vulnerabilities in the future which caused by “maladaptation” needs to be identified.

3.1.2 Development of Hinthada Township and its Impact from the Flood in 2015

3.1.2.1 Historical Development of the Region

Hinthada Township, in the Ayeyarwady Region, has been one of the severely flood-affected

municipalities historically. As the Township had considerable wasteland from the annual flooding, earthen dykes were constructed during the British colonial period since 1867 (Morrison, 1910). The dykes have been contributing to the protection of the urban area in Hinthada and transforming wetland into agricultural land over the generations. The yield of the paddy rice was dramatically increased as the colonial government planned for the expansion of exports that resulted from the opening of the Suez Canal in 1869 (Morrison, 1910).

An official report on the settlement operations in 1883–84 published by the British colonial government noted, “These embankments protect 75,377.63 acres of the land now cultivated” (India Office Record, 1886, 2). Not only were yields impacted but also the dyke construction divided one village and half of them has been remained in flood prone-area since then. Figure 3.1-1 shows the map published in 1886 in Hinthada (Henzada at the time), which clearly indicates Tract IV as flooded land, along with the dykes (India Office Record, 1886). A revised report five years later described the protected site where “the people live in a condition of decided comfort” whereas people living in “the flooded portion” were considered to be living poorly in less substantial houses (India Office Record, 1901, 11). It is true that the dyke construction benefits the vast amount of cultivated land for the protected area, although it entails asymmetrical consequences: one is greater yields, and the other is annual floods for a long period on the unprotected side.

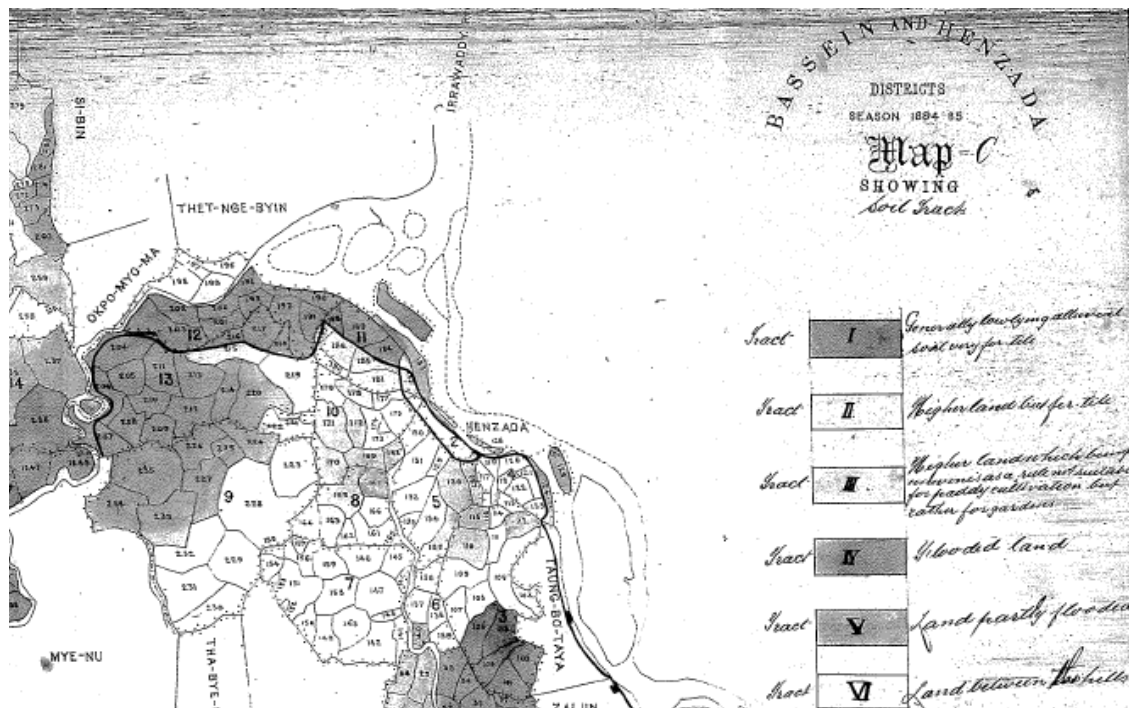


Figure 3.1-1 Land Use Map in the Early 1880s in Hinthada
(Sourced from the India Office Record, 1886)

Although the dyke has functioned as a protection measure in the Region, the fracture of the dyke is a critical issue. For example, 0.5 miles of the dyke were broken in 1997 due to severe flood; as a result, 183 villages were affected and 8,746 houses were flooded by the fracture (The Utilization of Water Resources and Irrigation Department, Myanmar, 2018). The water reached to above floor level and some bamboo houses were washed away. The debris inflow degraded farmlands and inundation water remained as a lake. The dyke management has been highly prioritized to protect human being and their livelihoods.

3.1.2.2 Severe Flood in 2015

Severe floods and landslides induced by a cyclone hit an extensive area of Myanmar in July and August 2015. They resulted in 172 fatalities, 1.69 million people displaced, and 1.93 trillion Kyat

(equivalent to USD1.49 billion⁴⁰) of economic impact over ten states/regions (Government of the Republic of the Union of Myanmar, 2016). Based on the Post-Disaster Needs Assessment, published in November, and the national recovery framework and plan of September 2016, loss and damage in the housing and agricultural sectors were the highest of all sectors (48.35 % of the total cost). Table 3.1-1 shows the top five types of damage and loss from the floods and landslides in 2015 in the state/regions of Myanmar. Ayeyarwady Region shows a higher population displacement, number of flood-affected houses, and amounts of destroyed farmland, although the number of totally damaged houses was relatively low. This implies that the flood in the Ayeyarwady Delta Region was a slow-onset prolonged inundation rather than a flash flood.

Table 3.1-1 Impact of Floods and Landslides in 2015 in Myanmar

Region	People displaced by floods	Totally damaged houses	Flood-affected houses	Destroyed farmland (acres)	Impacted population (%)
Rakhine	109,707	14,130	128,407	217,246	35.25
Chin	17,924	2,951	3,978	7,867	25.14
Sagaing	473,365	1,982	87,976	121,409	11.32
Ayeyarwady	498,759	1,251	109,416	209,971	10.05
Magway	303,694	414	64,560	65,858	8.01

(Derived from Government of Republic of the Union of Myanmar, 2016)

Even though villagers on the unprotected area are used to annual monsoon floods and inundation, the severe floods in 2015 were a challenge to survive given two months with more than two meters of inundation water. In contrast, the villages located inside of the dyke were protected, with the dykes. This illustrates the clear contrast in and outside of the dykes. It raises a fundamental question: why do people living on the unprotected side not relocate or migrate to a safer place? If villagers are willing to stay in their ancestral lands, how do they adapt or transform their living style, in terms of housing, livelihood, and collective community activities, without relocation or forced

⁴⁰ The Government of the Union of Myanmar, 2016, sets the exchange rate. USD 1: Myanmar Kyat 1.287.40

migration after more than a century of recurrent flood and metro-geological conditions?

Figure 3.1-1 describes the schematic outlines of this research. According to the transformation theory, inside of the dyke is considered as resistance; incremental adjustment while in the unprotected area, forced transformation is due to the dyke's construction. Thus, this paper intends to identify not only adaptive strategies on the unprotected side, but to ascertain the systematic vulnerability of the protected side, as potential risks of floods are due to the dyke's fractures.

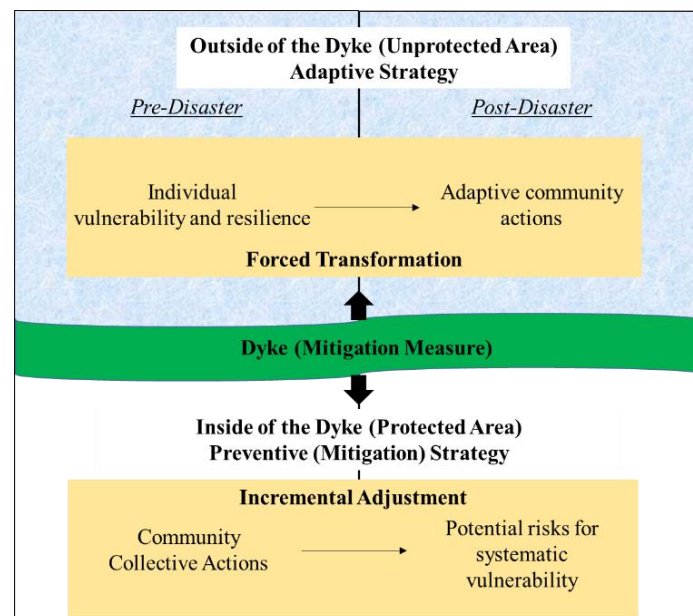


Figure 3.1-2 Schematic Outlines of the Case Study
(Author)

3.2 Research Field

The research was conducted in Leik Chaung Village Tract, Hinthada Township, in the Ayeyarwady Region. Hinthada Township is located approximately 124.6 km (77.4 miles) northwest from Yangon, the capital of Myanmar. The Township holds 93 village tracts each containing 3–21 villages depending on the size. Leik Chaung Village Tract, located across the dykes, is approximately 12 km (7.5 miles) northwest from the center of the Township. One stream, Daga

River on the unprotected area from the Irrawaddy River, was checked due to the dyke construction.⁴¹ The river was remained as channels, which absorb rainwater in mild climate. The channels and scattered oxbow lakes play an awareness role for villagers to start preparations for the flooding and inundation in monsoon seasons (Figures 3.2-1). In the monsoon seasons, boats are the main means of transportation outside of the dykes as roads are inaccessible by automobiles and bikes.

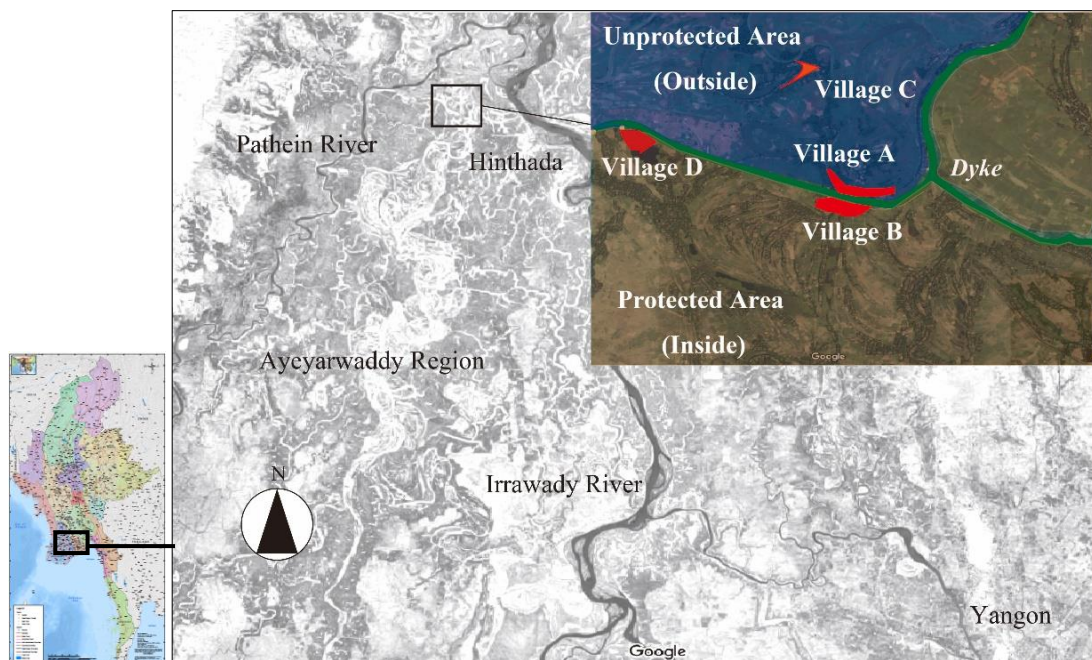


Figure 3.2-1 Map of the Research Field in Leik Chaung Village Tract, Hinthada Township
(Source: Author and the reference⁴²)

The Village Tract consists of 12 villages, of which four were selected for the case study: two were nominated from villages divided by the dyke's construction (village A is located on the unprotected side and B on the other side). Two more villages were added from both sides of the dyke (village C is representative of the unprotected area, while village D lies in the protected area). The demography and location of the research area are shown in Table 3.2-1.

⁴¹ Morrison, (1910), pp. 10–11

⁴² National Map derived from Myanmar Information Management Unit

Table 3.2-1 Demography of the Research Field

Village	# of Households	Population	Location
A: Leik Chaung East	146	575	Outside: Unprotected
B: Leik Chaung West	126	572	Inside: Protected
C: Na Be Kone	98	415	Outside: Unprotected
D: Daw Na Kone	57	296	Inside: Protected

(Source: Author based on the semi-structure interview)

3.2.1 Leik Chaung East Village

Leik Chaung East Village locates outside of the dyke (unprotected side) where 146 households (575 people) are living. The village was divided by the dyke construction and Leik Chaung West had been another part of the former village (Figure 3.2-4). Major source of income are beans, paddy rice, and mat-making, but occupations are diverse than Na Be Kone village because of the accessibility to the city central of Hinthada. The village has been impacted annual flood, especially flood in 2015 reached up to 1.75 meters. Figure 3.2-2 shows the elementary school locates in the village during dry season and 3.2-3 shows the same location during flood in 2015.



Figure 3.2-2 School in Leik Chaung East Village during Dry Season
(Source: Author)



Figure 3.2-3 School in Leik Chaung East Village during Flood Season
(Source: Principal of the School in Leik Chaung East Village)

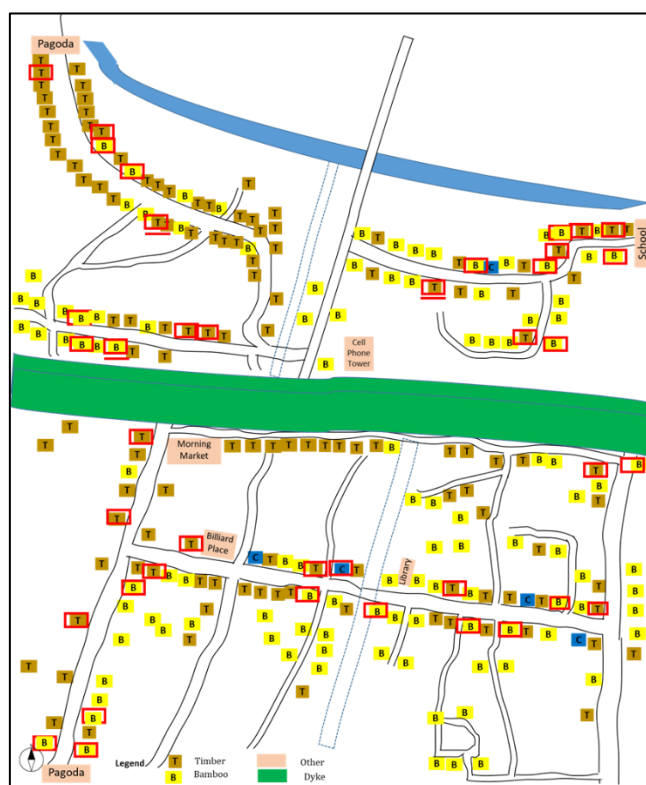


Figure 3.2-4 Map of Leik Chaung East and West Village⁴³
(Author)

3.2.2 Leik Chaung West Village

Leik Chaung West Village is a central village of Leik Chaung Village Tract because of the dyke

⁴³ 'T' indicates a house made by timber and 'B' indicates bamboo. Red indications are respondents to the survey.

protection, accessibility to the city, and a large pagoda which locates in the village. As a result, a warehouse will be constructed in the village. Major source of income are paddy rice and betel vines, but occupations are diverse too. The village has no experience of dyke destruction more than 40 years, and the dyke could maintain its function during flood in 2015.

3.2.3 Na Be Kone Village

Na Be Kone Village locates unprotected side far from Leik Chaung Villages about 20 minutes by motor bike (Figure 3.2-5). Roughly 2.0 meters of inundation water remained more than 2 months during flood in 2015. Even though the village was severely impacted by flood, there was no mortality but suffered from resources such as water, food, and daily supplements. The village was out of the list of UN damage assessment, as a result, villagers had to survive by themselves at the time.

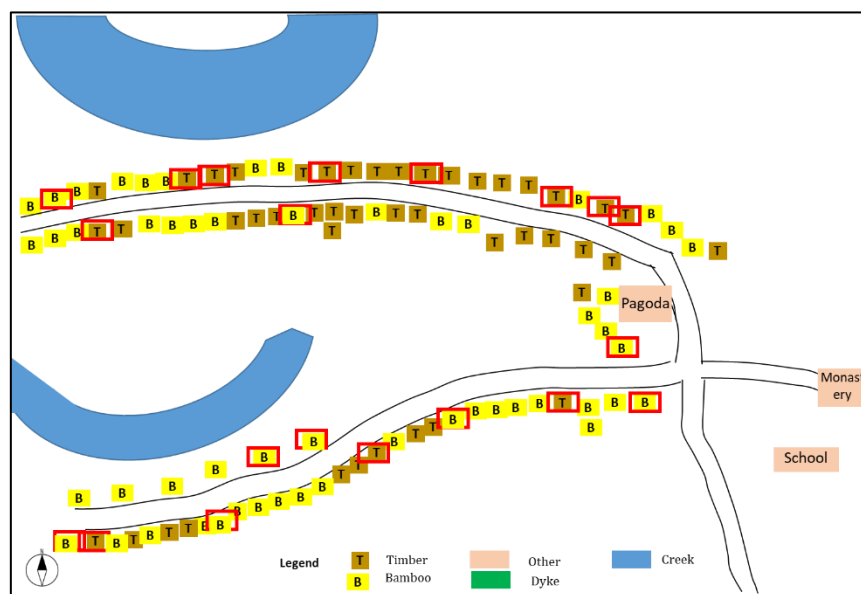


Figure 3.2-5 Map of Na Be Kone Village
(Author)

3.2.4 Daw Na Kone Village

Daw Na Kone Village locates along with the dyke (protected side) western part in Leik Chaung

Village Tract. Although there was no impact of the flood in 2015, the dyke was broken in the flood in 1997. The small pond locates north eastern area in the village was created due to the flood (Figure 3.2-6). The village had been developed by immigrants as a manpower for the dyke construction from India before World War II, but they went their country just after the Independence of the county in 1948⁴⁴. Major source of income are paddy rice and there is no work of mat-making and beans in the village.

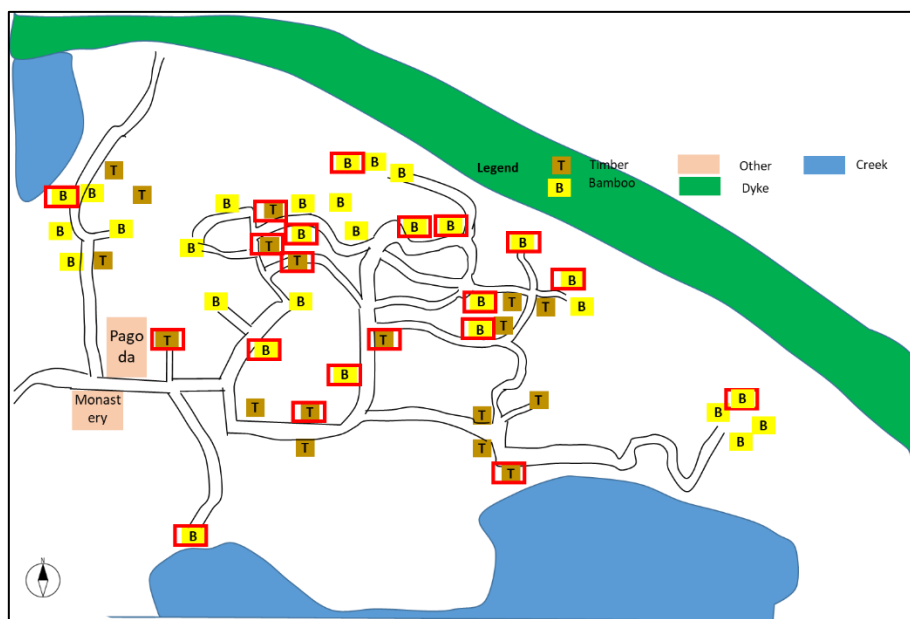


Figure 3.2-6 Map of Daw Na Kone Village
(Author)

3.3 Methodology

To identify the community recovery in the four villages, exploratory survey was applied for selection of questions initially, and then semi-structured interviews were conducted at the household level. A total of 80 household surveys were administered in four villages. Each survey took 30–45 minutes for the interview, with translation from Myanmar language to English and vice versa. A follow-up survey by the non-structured interview also applied to identify village committee

⁴⁴ According to the Village Head in the Daw Na Kone Village

structures (Table 3.3-1). In addition, historical records (*Report on settlement operations in the Bassein and Henzada Districts*, and *Burma Gazetteer, Henzada District Volumes A & B*) by the British colonial governments were utilized for analysis. The research was approved and supported by Government Administrative Department and Relief and Resettlement Department in Hinthada District. The semi-structured interviews include basic information (average income, years living in the village, and disaster damage history); information on housing (house type, floor height, years living in the house, preparedness against flood), and on livelihoods (occupation, seasonal jobs, and size of the farmland owned).

Table 3.3-1 Research Schedule and Methods

Schedule	Methodology	Remarks
Dec 19-21, 2016	Exploratory Survey	Pre-survey for the selection of questions
June 13–17, 2017	Semi-structured Interview	20 Households in four villages = 80 households
Oct 28–Nov 6, 2017		
July 4-8, 2018	Non-structured Interview	Follow-up Survey

3.4 Results and Analysis

Appendix A shows the overview of the results. The table separately indicates the position of unprotected villages located outside of the dyke (A and C) and that of the protected villages inside of the dyke (B and D). Basic demographic information indicates that all respondents were Burmese and Buddhist; the average age of the household head was 50.2 years; and there were 4.8 persons in each household. Most of the respondents (97.5%) were born in the village. As expected, the house type (timber and bamboo houses) was related to the disaster impact; therefore, the results were divided into timber and bamboo houses for each village. The details of disaster impact, housing, livelihood, and community activities are explained in the following.

3.4.1 Disaster Impact

Among the four villages, casualties and missing persons were not reported. Most of the houses were

affected by the approximately 2.2 meter height of the inundation water above floor level both in timber and bamboo houses in villages A and C. There was no collapse of timber houses, although several bamboo houses were destroyed. Households that owned totally destroyed houses could receive 50,000 Kyat (equivalent to US\$ 38.83) and 20,000 (equivalent to US\$ 15.54) for partially damaged houses from the national government. International agencies and the Relief and Resettlement Department distributed relief items, such as water and food. The school in village C was closed for almost one month because of the floods, and the inundation water prevented two months of farming.

On the other hand, villages B and D neither impacted casualties nor damaged houses because of the dyke, but inundation water reached to less than a foot from the top of the dyke. As a result, villagers had to monitor constantly not to break the dyke since the dyke security system required villagers' volunteer involvement due to the lack of manpower. Nevertheless, in these efforts, relief items were not distributed to villages B and D because they were not directly affected.

3.4.2 Housing

Most of the respondents in villages A, B, and C have lived in these villages for more than three generations⁴⁵, which indicates that they are succeeding in saving their ancestral assets rather than choosing nomadic settlement. However, houses have been periodically rebuilt every 4.9 to 15.8 years due to structural changes in the family or the decay of wooden structures. The periodic cycle of rebuilding is shorter for the bamboo houses, and especially for those unprotected side (Appendix A). The Timber houses also show the same short life when on the unprotected side. This implies that rebuilding houses is not a rare event in the villages.

Not surprisingly, the average floor height in villages A and C is 1.92 times higher than protected

⁴⁵ Village D is observed to be different only because previous generations migrated into the village just after national independence in 1948.

villages (B and D) to cope with inundation in monsoon seasons. Specifically, most of the floor height of timber houses is elevated higher than that of bamboo houses, except in village B. After the 2015 flood, several houses were elevated one or two feet more. The foot pillars or basement foundations are elevated by the simple method (Figures 3.4-1 and 3.4-2). As the construction work was able to repair the houses without destroying them, elevation of the houses is a reasonable approach for timber houses.



Figure 3.4-1 Marks on the Foot Pillar for the Floor Elevation before 2015
(Source: Author)



Figure 3.4-2 Basement Foundation Elevation
(Source: Author)

In contrast, floor-height elevation has limitations of durability for bamboo houses on the unprotected side. According to a respondent living in village A, the house shakes because of the vibration from the motorboats used for transportation during the monsoon season. Therefore, they

cannot elevate higher floor due to the shakiness of the bamboo pillars. In order to respond to the situation, villagers utilize a temporarily elevated second floor made of bamboo and reed floor sheets (Figure 3.4-3). Bamboo house owners prepare a short corbel-receiving floor for the elevation in the house. Family members stay on the temporary second floor for two months. Since those days, they have prepared the material before the monsoon, but changing to timber houses is a better recovery strategy in this context of adaptation.



Figure 3.4-3 Floor Adjustment in a Bamboo House
(Source: Author)

On the other hand, the floor height in villages B and D (inside of the dyke) remains at a lower elevation because they experienced no direct impact from the flood. Even though village D experienced severe damage from the flood 20 years before, floor height has not been upgraded. Actually, the floor height of the timber and bamboo houses is almost the same in village B (Appendix. A). It is unclear that floor height was higher in the past and gradually became lower over time, but floor height has not changed in at least half a century. The floor height of two houses built about 50 years ago in village B was approximately 1 meter (Appendix. B).

As a summary of housing, the results imply that the houses on protected side remain lower floor

height because of the non-direct impacts, whereas the houses on the unprotected side are gradually adjusting their floor levels higher against annual floods. Since there is no other option so far, such as infrastructural measures against flooding in unprotected villages, continuous adaptation is the approach taken rather than being forced to migrate or accepting buy-out policies in a transformed socio-ecological environment.

3.4.3 Livelihood

3.4.3.1 Source of Income

The average monthly income indicates a strong incentive for villagers to stay in a flood-prone area. Interestingly, the average incomes on the unprotected side are higher than the protected incomes for those in timber houses. This is attributed to owning wider sections of farmland in unprotected areas especially for households living in the timber houses. In fact, the average monthly income of households living in bamboo houses on the unprotected side are approximately 2.56 times fewer than households in the timber houses, and the apparent gap is observed in the size of the owned farmland too (Appendix. A). On the other hand, the average income on the protected side does not show a greater disparity between timber and bamboo households because differences in farmland size are relatively smaller than those on the unprotected side.

The crops being planted inside and outside of the dyke also indicate differential strategies being adopted in a transformed environment. A water-resistant plant, which benefits from the fertile soil brought by the floods, is a major contributor to livelihoods in flood-prone areas. Reed (*Thinn* as a Myanmar name) is one of the major sources of income in villages A and C because dried reed is used for the material for locally woven sheets and mats. The merit of weaving those items is that mat making can be done without gender or age distinctions regardless of the season. In fact, all males and females above 10 years old can weave mats in village C, according to the villagers. Daily

workers can purchase or rent dried reeds from farmland owners as raw material, and they can sell it or repay the debt from the output. Beans are another source of income for farmland owners on the unprotected side. The beans are planted in the dry season after the monsoon; therefore, farmland owners have at least two source of income. This is the reason villagers have remained in a flood-prone area over the generations.

Reeds and beans are not planted on the protected side. The major crops are paddy rice and betel vines from betel palm. Betel vines are able to be harvested on small-scale land and, as a result, non-farmland owners can also cultivate within the household's land boundary. Furthermore, other professions, such as teaching, fishing, running a barbershop, carpenter, and working in government offices, are observed in the protected area while these occupations are rarely found on the unprotected side. This implies that limited farmland inside of the dyke attracts people into non-primary occupations to ensure a varied source of income rather than owning big farmlands. It is why the average income on protected side shows a relatively smaller gap between timber and bamboo households.

3.4.3.2 Intra-economic by Reeds

The mat making made by reeds consists of local intra-economic in unprotected villages. Figure 3.4-4 shows the flow of raw material (reeds) to finish products as mats. Landlords who own reeds are living in wooden structured house as they can earn more money in the villages. They sell the raw materials to other households who can work mat making. Farmers who bought raw material can work mat making during rainy seasons, as a result, they earn two source of income. Daily labors, who are relatively low income households work mat making at the house of famers, landlord, or at their own house. Some farmers and landlords are creditors of debts of low income households, therefore, person who have debts are working mat making as a repayment method. This kind of

visual intra-economic flow functions as safety net for low income, singles, and aging households.



Figure 3.4-4 Flow of Raw Material to Finish Product in Unprotected Villages
(Source: Author based on the semi-structured interview)

3.4.3.3 Historical Analysis on Livelihood

Have the sources of income changed over 150 years in the villages? It is needed to understand adaptive strategy for people living in forced transformative natural environment. Zoning management of the British colonial government aimed at obtaining stable taxes from the construction of the dykes. The government divided Hinthada district into 15 groups based on soil fertility in 1886 and this was revised into nine groups in 1901 because of updated assessments (India Office Record, 1886; India Office Record, 1901). Each tract had different tax rates imposed on paddy and other crops according to the quality of soil, transportation cost by creeks, and the villages' living costs (India Office Record, 1886).

The protected side is designated group VI which indicates "very fertile land, but partly exposed to flooding," while the unprotected side, group VIII, is "the low-lying flooded track...which lies

outside of the embankment”⁴⁶. Imposed tax rates on the output of paddies for group VI were classified as 3.25 (*soil class I*) and 2.50 (*soil class II*), whereas the rates in VIII were 1.25 and 1.00. This clearly indicates that paddies were planted on the unprotected side even though the quality of soil was relatively low for paddy. According to elderly living in unprotected side, paddy field had cultivated about 30 year ago, but they were changed into beans as increasing of frequency and severity of floods.

The report also indicated tax rates on the revenue from garden yields and miscellaneous others, which include betel vine. The yield of betel vine was indicated in Tract VI (protected side), which implies that betel vine has been cultivated inside of the dykes the same as at present. With regard to weaving mat, the report also showed that 4,250 persons worked for reed mat makers in several township especially flood-prone area⁴⁷. The mat making was considered a “subsidiary industry for large numbers of women of the labouring class all over the district”⁴⁸, which clearly illustrates that mat making has been traditional work on the unprotected area.

Overall, the major crops in protected and unprotected areas have not radically changed over 150 years, but paddies in flooded areas have now disappeared, and been replaced with beans due to the high frequency of the floods. The wasteland reclamation benefited the protected side, whereas people in unprotected side also obtains the benefits from flooding as low materials for reeds and wider farmlands.

3.4.4 Correlation of the Floor Height and Income

In the analysis, the correlation between floor height and income between timber and bamboo houses was examined to identify the different strategies used. Figure 3.4-4 and 3.4-5 show the correlation

⁴⁶ India Office Record, 1901, p. 37 and p. 47

⁴⁷ India Office Record, 1886, p. 3

⁴⁸ Morrison, 1910, p. 100

between floor height and income in timber and bamboo houses in four villages. Red circles indicate the unprotected villages (A and C), and blue squares stand for the protected villages (B and D). Two major findings are observed in this analysis: the correlation of only timber houses in the unprotected area, and asymmetric results in investments in housing.

3.4.4.1 Correlation of Timber Houses in Unprotected Area

Predictably, timber houses in protected villages are not correlated with income ($r = -0.026$), whereas those timber houses in unprotected villages are relatively correlated ($r = 0.668$) (Figure 3.4-4). Obviously, the floor height of the timber houses on the unprotected side are higher than the protected side. The figures clearly described that relatively higher income households in the unprotected area select timber houses rather than bamboo houses. Most of the households living in timber houses are categorized as having higher income.

Contrasting results show that no significant correlations are observed for bamboo houses in both on the protected and unprotected areas ($r = 0.094$ for unprotected and $r = 0.176$ for protected villages) (Figure 3.4-5). The majority of households living in bamboo houses have lower than average incomes both on the unprotected and protected side. In terms of the floor height, again houses on the unprotected side are higher than the protected sides. However, there is no over two meters bamboo houses because of the limitation of the height as mentioned above.

3.4.4.2 Asymmetric Results of Investment on Housing

The results also imply asymmetric tendency of the investment on their houses. As mentioned above, relatively richer households prefer timber houses on unprotected side. This strongly supports the respondents' statements that they are willing to rebuild with timber houses when they have the financial capacity to do so in order to increase resilience to the annual flooding because timber

houses symbolize wealth status in the flood-prone villages in this context.

On the other hand for protected side, two households of bamboo houses on the protected side are not willing to change to timber houses even they are relatively richer. Respondents who categorized the group answered that they are comfortable living in the bamboo houses. Obviously, their income has not been invested in changing the floor height because there is less likelihood of floods occurring on the inside of the dyke. This is a normal response as they have been protected by dyes for a long time. These results show that people who live in a built environment change their investments different ways; one invests on the house particularly floor height, and the other does not.

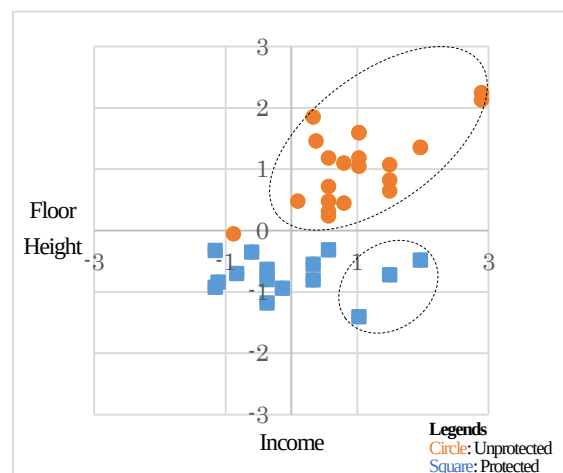


Figure 3.4-5 Correlation of Timber Housing Floor Height and Income

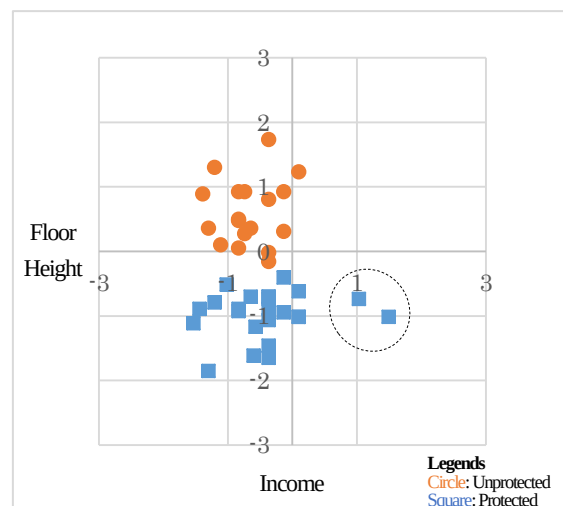


Figure 3.4-6 Correlation of Bamboo Housing Floor Height and Income

3.4.5 Institutional Structure on Disaster Recovery

Practical institutional structure on disaster recovery consist of several layers: village, village Tract, Township, District, and Region in addition to external humanitarian aid groups. At the national level, “Post-disaster needs assessment floods and landslides” (Government of the Republic of the Union of Myanmar, 2015) and “National recovery framework and plan Floods and landslides 2015” (Government of the Union of Myanmar, 2016) were published as mentioned earlier. Since the impact of the flood and landslide was large scale in the country, the comprehensive assessment and framework focused only on regional and district level, rather than village level. Besides that, two of the target villages were omitted from the flood-affected list provided by Myanmar Information Management Unit because they could not reach. As a result, villages A and C unprotected area could not receive emergency distribution initially. After a few weeks from the event, the district government provided relief items and funds for reconstruction for houses in the post-disaster phase.

In this section, community collective activities, also known as village committees, are identified in order to look at the effects of institutional structure on recovery from the micro-level. Village committees are the smallest institutional structure for villagers to deal with natural hazards, and we again observed different characteristics of committees in the protected and unprotected areas.

3.4.5.1 Village Committee

The target four villages belong to a Village Tract, which organizes 11 committees (Transportation, Education, Agriculture/Livestock, Fishery, Disaster Management, Land Use, River & Channel, Electricity, Business, Budget Management, and Culture/Religion). The Village Tract Disaster Management plays a coordination role before disasters by mainly monitoring the dyke, though there

is no intervention for recovery. Each village leader joins one or more committees in the tract. At the village level, villagers design their own committees based on their requirements or needs. Figure 3.4-6 shows the committee structures in four villages. Interestingly, each of the four villages have different types of committees because of their various natural and social environments.

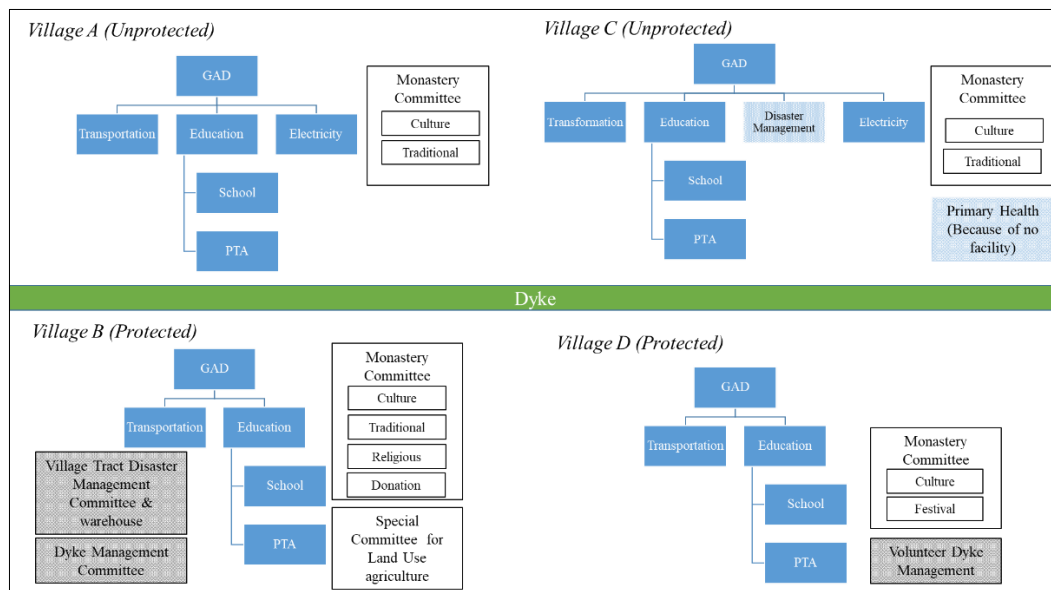


Figure 3.4-7 Comparison of the Village Committees
(Source: Author based on the semi-structured interview)

3.4.5.2 Difference in the Commonness

Although transportation and education committees (including sub-committees of Parents and Teachers Association and School) are common concerns among the four villages, following floods, the villages approach these issues in different ways. To cope with prolonged inundation, most households located on the unprotected side own boats, either with or without engines. Relatively poor households that do not own boats are supported by the neighborhood to commute to school or to the central city. On the other hand, we only observed a few boats on the protected side. Villagers on the protected side do not need boats for daily life even during monsoon seasons. However, the

school in Village B is shared with village A (Unprotected side) since the villages were united before the dyke construction. Boat owners in village A help children as a means of transportation every day in monsoon season. Cooperative manner is observed on transportation between villages over the dyke.

3.4.5.3 Contrast Approach on Disaster Management

Even though villagers are sharing their means of transportation over the dyke, the opposite approaches are identified with regard to the disaster management. On the protected side, village B and D operate dyke management committees, which focus on monitoring and maintaining the dyke because it is the only way to avoid disaster risks from the floods. As per warnings from the Irrigation Department in the center of Hinthada Township that are issued after monitoring the water level in the Irrawaddy River, men in the villages begin voluntary observation by working 24-hour shifts in the high season. The manual monitoring system requires considerable manpower as one person is required for every 1.5 miles in the dry season and for every 0.75 mile in the monsoon season. Villagers prepare sand bags, bamboo trunks, and other raw materials for making retaining walls for dyke protection. In particular, Village B is the central hub for the dyke management geologically; therefore, *Village Tract Disaster Management Committee* and *the warehouse* for emergency relief items are located at the village (Figure 3.4-6).

In contrast, more self-survival skills are prerequisite on the unprotected side. Village A and C have not organized the dyke management committees, as a result, villagers are not involved in dyke monitoring and security; nevertheless village A is positioned just behind the dyke. As the dyke is the cause of the prolonged inundation on the unprotected side, human resources are not required on the dyke. Particularly village C is located far from the dyke; consequently, villagers need to pay attention to their evacuation rather than the dyke management. Instead of the dyke management,

the *Disaster Management Committee* has newly organized in the village because of the non-government organization (NGO) intervention in post-disaster period. The committee operates the tasks such as early warning, search and rescue, shelter management, and first aid in case of emergencies. The committee undertakes these efforts because villagers have been accustomed to such practices. In other words, villagers are used to helping each other during flooding. For example, households living in bamboo houses evacuate temporarily to neighbors' floor-elevated timber houses for days or weeks. Furthermore, village C holds the *primary health committee* by themselves since there are no facilities of health care due to the isolated situation.

Consequently, self-organizing in unfavorable conditions attributes from the survival needs in both protected and unprotected villages, but the strategies are dissimilar. The contrasting have been rendered because of the development by the dyke for 150 years.

3.5 Discussion

3.5.1 Adaptive and Mitigation Strategies over the Dyke

These contrasting collective activities, housing, and livelihood imply that villagers are selecting their strategies based upon human survivability in the built environment. One is the adaptive strategy on the unprotected side and the other is mitigation strategy: relying on the dyke. In the agent and structure theory, villagers as agents have dealt with natural disasters by self-organized committees (structure) because of the fewer external resources. Eventually, the self-survival skills (elevation of houses and boats management) are developed empirically over the centuries in the flood prone area. In other words, the developed skills for survivability are transformed from the dyke construction.

Those two different approaches co-exist within an administrative boundary, yet there is also a silent conflict on dyke monitoring: the dyke is a critical protection measure whereas it is also the cause of the inundation. The incremental stress holds potential risks if the dyke is fractured by severe

rainfall in the future.

Table 3.5-1 shows the two comparative strategies on the agent structure theory in the case study. The strategies are divided by pre- and post-disaster phases. Protected villages mainly rely on mitigation measures (the dyke) and, as a result, their collective actions focus only on dyke monitoring and maintenance, but individual houses are not an object of investment. In contrast, housing investments on mitigation measures (elevated floors) depend on individuals' capacity to finance them. Financial capacity is traceable based on the farmland size possessed by the household. Individuals on unprotected have larger farm land than protected. As a result, economic disparity is greater than on the protected side, although they help each other with evacuation in case of disasters, and with transportation among villagers. In addition, an important finding is that the agent and structure are functioning inseparably for disaster risk reduction especially on the unprotected side. The villagers are victims as well as responders with self-survival skills against natural disasters.

Table 3.5-1 Comparative Strategies on Protected and Unprotected Side

Location	Phase	Agent		Structure	
		<i>Pre-disaster</i>	<i>Post-disaster</i>	<i>Pre-disaster</i>	<i>Post-disaster</i>
Protected (Inside)		No investment	At risks	Dyke management committee	
				Relying on mitigation	No proactive strategy
Unprotected (Outside)		Individual investment	Lower impact by adaptation	Practical custom of mutual help	

3.5.2 Potential Risks in Protected Villages

Given unexpected extreme weather events, possible fracturing of the dykes needs to take into account preparedness on the protected side. History tells us that several small and large breaches

occurred in 1871, 1875, and 1878 (Morrison, [1910](#)). One elderly man also remembered that fractures in the dyke occurred in the 1950s and 1970s, and those events had impact on local houses and livelihoods. Without preparedness, lower floor housing and most of the crops are vulnerable to floods. This implies that the protection offered by dykes benefits the lifestyle of some villages, but simultaneously such area accumulates systematic vulnerabilities. In other words, the strategy of depending on dykes removes other options. Such dependence may result in lost houses and sources of income by virtue of catastrophic impacts caused by climate change. Even though reinforcement of the dyke is important, raising the height of the dyke comes at enormous costs. Therefore, protected villages are subject to incremental adjustments and exposed to systemic vulnerabilities that unintentionally decrease their ability to adapt to unpredicted situations.

3.6 Conclusion and the Way Forward

This research demonstrates that recovery strategies of villages inside and outside of the dyke have been transformed by its construction. Over the course of 150 years, modifications to the natural environment have allowed villagers to transform their housing, livelihoods, and collective community activities. Villages on the unprotected side have altered their patterns of disaster risk reduction by adapting the floor height of their houses, changing from paddy crops to beans, and maintaining mat making. On the other hand, the dyke provides the benefit of greater reclaimed land inside of the dyke, but systematic vulnerability is also increasing in housing and livelihoods owing to the limited strategic options available. Given potential climate change scenarios, understanding the historical trials and the substantive life in villages is necessary to deal with unpredictable natural phenomena in the future.

In the next step of the research, similar but another independent variable case study is required to gain “building Block” as a series of the study (Gorge & Bennett, [2005](#)). In contrast to Myanmar’s

agent and structure model, the transformability of agents in a layered structure society needs to be identified as an example of the opposite pole of the agent structure theory. In addition, the scientific validity of the dyke's fractures needs to be examined to allow risk assessment of the protected villages. Houses and crops are vulnerable to inundation water, but deterioration of farmland due to the influx of silts also entails a devastating impact. To avoid the worst scenario, risk assessment of dyke fractures is strongly required as a part of the way forward.

Reference

- Birkmann, J., Agboola, J. I., Welle, T., Aho, M., Odunuga, S., Streit, V. J., & Pelling, M. (2017). Vulnerability, resilience and transformation of urban areas in the coastal megacity Lagos: Findings of local assessments and a household survey in highly exposed areas. *Journal of Extreme Events*, 3, 1-24.
- Center for Excellence in Disaster Management & Humanitarian Assistance. (2017). Myanmar (Burma) Disaster management reference handbook. Hawaii: Center for Excellence in Disaster Management & Humanitarian Assistance.
- Gibson, D.T., Pelling, M., Ghosh, A., Matyas, D., Siddiqi, A., Solecki, W., Johnson, L., Kenney, C., Johnston, D., & Plessis, D.R. (2016). Pathways for transformation: Disaster risk management to enhance resilience to extreme events. *Journal of Extreme Events*, 3(1), 1-23.
- George, A. L., & Bennett, A. (2005). *Case studies and theory development in the social science*. Cambridge: MIT Press.
- Government of the Republic of the Union of Myanmar. (2016). Myanmar national recovery framework and plan floods and landslides 2015. Government of the Republic of the Union of Myanmar.
- India Office Record. (1886). Report on settlement operations in the Bassein and Henzada Districts, season 1884-85.
- India Office Record. (1891). Report on settlement operations in the Bassein and Henzada Districts, season 1899-1890.
- Intergovernmental Panel on Climate Change. (2014). Climate change 2014: Summary for policymakers and technical summary. Derived from https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/WGIIIAR5_SPM_TS_Volume.pdf on April 20, 2018.
- Kreft, S., Eckstein, D., & Melchior, I. (2017). *Global climate risk index 2017: Who suffers most from extreme weather events? Weather-related loss events in 2015 and 1996 to 2015*. Bonn: Germanwatch.
- Matyas, D., & Pelling, M. (2015). Positioning resilience for 2015: The role of resistance, incremental adjustment and transformation in disaster risk management policy. *Disasters*, 39(1).
- Morrison, I.C.S. (1910). *Burma. Gazetteer-Henzada district volume A*. Rangoon: Superintendent, Government Printing and Stationery.
- Myanmar National Disaster Management Committee. (2017). Myanmar action plan on disaster risk reduction, 2017. Republic of the Union of Myanmar.

- Oliver-Smith, A. (1990). Post-disaster housing reconstruction and social inequality: A challenge to policy and practice. *Disasters*, 14(1), 7-19.
- Peacock, G.W., Zandt, V.S., Zhang, Y., & Highfield, E.W. (2014). Inequities in long-term housing recovery after disasters. *Journal of the American Planning Association*, 80(4), 356-371.
- Pelling, M. (2011). *Adaptation to climate change: From resilience to transformation*. London: Routledge.
- Pelling, M., O'Brien, K., & Matyas, D. (2015). Adaptation and transformation. *Climate Change*, 133, 113-127.
- The Utilization of Water Resources and Irrigation Department, Myanmar. (2018). A training report on the history of dyke, the dyke's management, communities' involvement for the workshop of SEEDS Asia. The Utilization of Water Resources and Irrigation Department, Myanmar.
- Union of Myanmar, Myanmar Engineering Society, Myanmar Information Management Unit, and Asian Disaster Preparedness Center. (2009). *Hazard profile of Myanmar*. Union of Myanmar.

Chapter.4

An Analysis on the 10 years Later from the Pilot Project of the Pre-disaster Redevelopment Planning in Florida State, U.S.

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4.1 Introduction

Pre-disaster recovery planning (PDRP) are gaining attention. In Japan, PDRP are underway in Shizuoka and Wakayama prefectures, etc., where tsunami damage is expected due to the earthquake such as the Tokyo metropolitan area and the Nankai Trough earthquake. Previous studies on PDRP concept in Japan have gradually built consensus. PDRP is a mixture of the two concepts which are “recovery preparation” that enables smooth recovery after a disaster, and “promotion of disaster risk mitigation” that reduces vulnerability and increases resilience without waiting for a disaster (Hyogo Earthquake Memorial 21st Century Research Institute, 2018). Other past literature related with PDRP discuss that implementation theory as a participatory or community driven community development (Ichiko et al., 2016; Iwaka et al., 2014), training for administrative staff (Kato et al., 2011), relocation of important facilities and infrastructure (Murakami & Ieda, 2018). Mainly research on methodologies for PDRP has been accumulated. There are also efforts for the memory of the community which shaped from the collection of individual memories of the residents to be used for PDRP (Kim et al., 2017; Isomura et al., 2019). These research accumulations are particularly remarkable since the Great East Japan Earthquake and Tsunami (GEJET), and PDRP has been specialized in earthquakes and tsunamis due to concerns about the Tokyo Metropolitan Earthquake and Nankai Trough Earthquake. On the other hand, as the United Nations Intergovernmental Panel on Climate Change (IPCC) shows serious concerns about the increase and exacerbation of meteorological disasters associated with climate change (IPCC, 2014), the recent heavy rains in Okayama Prefecture, northern heavy rains in Kyushu, etc., show us that work on PDRP should consider for climatic disasters (Otsuyama & Maki, 2018).

With regards to discussions on PDRP in the world, the United States Natural Disaster Assessment (Mileti, 1999) and the American Planning Association (APA) (Schwab, 1998; Schwab, 2015) are the champions of leading study of PDRP to develop the concept and methodology. In

terms of implementation, the Federal Emergency Management Agency (FEMA) is developing the guideline for PDRP for the provincial government and basic municipalities (FEMA, 2016; 2017). In the state of Florida, where there are many weather-related disasters, a pilot project started for PDRP since 2006 based on the lessons learned from damage consecutive hurricanes from 2004 to 2005 (Meyer et al., 2010). As a result, obligating the Florida coastal municipalities to formulate PDRP for a short time.

Although about 10 years have passed since the start of the pilot project, there is no study about how the local government utilized the PDRPs in peace time. Therefore, in this paper, we reviewed the results of the Florida PDRP, and set the following three research objectives to clarify what role it currently plays: 1) to clarify how the PDRPs were used during peace time, verified the target local governments from the perspectives of “recovery preparation” and “promotion of disaster mitigation”, which are the ambiguous concepts of PDRP, 2) to compare what kind of organizations enabled the revision of PDRP, and 3) to attempt to identify issues for returning knowledge to Japan.

The semi-structured interview method for pilot project implementers was adopted as the research method in this paper, and it was collected as supplementary data for secondary materials such as PDRPs and related local government plans. Two subjects were selected from the six municipalities that were the pilot project implementation localities, and a one municipality that did not belong to the pilot project but became model types of the pilot project were studied too. Thus, three municipalities were selected as research field. The research method and the reason for selecting the target municipalities are described in detail in the next chapter.

4.2 Research Framework and Methodology

4.2.1 Research Framework

In order to achieve the above research objectives, this research framework will be divided into the

following three categories, and the current status after 10 years from the PDRP and the future development will be discussed. As a past study on the evaluation of the recovery plan, Maki et al. (2008) has five viewpoints for the recovery policy evaluation for the Great Hanshin-Awaji Earthquake and the Niigata Chuetsu Earthquake: *needs assessment*, *theory assessment*, *implementation assessment*, *outcome assessment*, and *efficiency assessment*. Since this study is aimed at the pre-disaster recovery before a disaster occurs, it is impossible to measure *needs*, *outcomes*, and *efficiency assessments*. Therefore, in this paper, in order to proceed with discussion focusing on *theory assessment* and *implementation assessment*, “existence of plan revision” is clarified as an item to ask about review of the policy itself. In addition, the implementation history of the plan and the implementation of the specified action plan are verified as items for asking questions about whether the project has been steadily implemented.

4.2.1.1 Activation of the PDRP

In order to clarify the usefulness of the PDRP, we will verify whether the plan has been activated after the catastrophic disaster. Also, we will verify whether the procedure for ensuring the activation of the plan. The structure of PDRP in Florida consists of “actions before disaster occurrence” and “actions after disaster” in each field such as vulnerability assessment, hazard assessment, implementation procedure, infrastructure, housing, economy, and land use planning. The PDRPs designated that municipality can decide whether or not to activate the “post-disaster action” according to the damage scale (Otsuyama & Maki, 2018). As described above, if the PDRP has dual concepts that includes “preparation for recovery”, the municipalities invoked the actions in the event of a catastrophic disaster, and designated actions would be implemented. In this study, we grasp the descriptions of the procedure that enables the actions, and verify the implications for recovery preparation.

4.2.1.2 *Implementation of Action Plans on the PDRP*

In order to clarify the usefulness of the PDRP as “promotion of disaster mitigation”, the implementation of the action plan prescribed by the target local municipalities in the current plan is verified. This verification is the same as the *implementation assessment* (Maki et al., 2008) and clarifies whether or not the action plan to be implemented was actually realized. Since this verification is an *implementation assessment*, this target is different from the *theory assessment* based on performance indicators that set numerical targets and the review of the plan. The discussion will focus on the results obtained by the PDRP, not the evaluation of the effects of the prescribed actions, but focusing only on the implementation.

4.2.1.3 *Revision of the PDRP*

In order to clarify the implementation of the plan and its problem extraction, the revision of the PDRP is targeted. If disaster recovery is not a goal but a process (Smith & Wenger, 2007), the plan needs to be updated regularly instead of once planning. In this study, we will examine the significance of the process for the continuous development of the PDRP as *theory assessment* by clarifying the reason for the revision.

4.2.2 **Selection of the Research Field**

The target area of this study is the municipality with a PDRP in Florida as mentioned above. As shown in previous studies, Florida has been conducting a pilot project for PDRP since 2006 (Otsuyama & Maki, 2018; Schwab, 2015). Based on the results, it has become obligatory to formulate PDRP for Florida coastal municipalities since 2011, and recommendations to inland municipalities were implemented too (Florida Department of Community Affairs, 2010). However, due to the duplication of the function of the PDRP due to the establishment of the recovery

framework by the federal government in 2014, the obligation to coastal municipalities has been eliminated⁴⁹. As of April 2019, there are 17 municipalities that have a pre-recovery plan in 67 Counties in Florida⁵⁰.

The selection criteria for the research field is hurricane landed municipalities since 2010. The landed hurricane in Florida hurricanes are Hurricane Colin (Tropical cyclone in 2016), Hurricane Harmin (2016), Hurricane Irma (2017), and Hurricane Michael (2018)⁵¹. Hurricane Irma, one of the most powerful forces in the Atlantic, with Category 5 power, has gone north in central Florida, killing 96 people in the country. The hurricane caused 50 billion dollars of economic loss which is the fifth largest economic loss since 1980 (FEMA, 2018). Hurricane Michael, which developed rapidly to Category 5, moved northwest in Florida, causing storm surges up to 14 feet (about 4.27 m) in Florida (National Hurricane Center, 2019). In this study, Hillsborough County and City of Panama City were selected as research field because of the hurricane impacted municipalities as well as participating in the PDRP pilot project. In addition, Palm Beach County, Florida's first PDRP equipped municipality, which was the prototype of the pilot project, was selected, and a total of three municipalities were compared. Table 4.2-1 shows the demography and the basic data of the target municipalities, and Fig. 4.2-1 shows the location of each municipality.

Table 4.2-1 Demography of the Research Field

	Hillsborough County	Panama City	Palm Beach County	State of Florida
Population	1,229,226	36,484	1,320,134	18,801,310
Average Housing Price (\$)	179,500	147,300	242,500	178,700
Average Annual Income (\$)	53,742	40,114	57,256	50,883
Poverty Rate (%)	15.5	21.6	11.8	14.0

(Source: Author based on the U.S. Census⁵²)

⁴⁹ From an interview survey with a person in charge of the Florida PDRP. Schwab (2015, p. 18) also states that the mandatory PDRP was subsequently eliminated.

⁵⁰ Florida Development of Economic Opportunity, which has promoted the pilot project in Florida, is not currently in charge, and it is not clear how many PDRPs exist in Florida. As of March 2019, there are a total of 17 local PDRP were confirmed online. Especially in Southeast Florida and Midwest area found more PDRP than other area in Florida.

⁵¹ Confirmed by Historical Hurricane Tracks <https://coast.noaa.gov/hurricanes/> by National Oceanic and Atmospheric Administration (NOAA). This site covers information on past hurricanes (including tropical cyclones), and information can be obtained in various groups as needed.

⁵² Described based on US Census <https://www.census.gov/en.html>. Population data was taken from 2010, the average price of owned homes was from

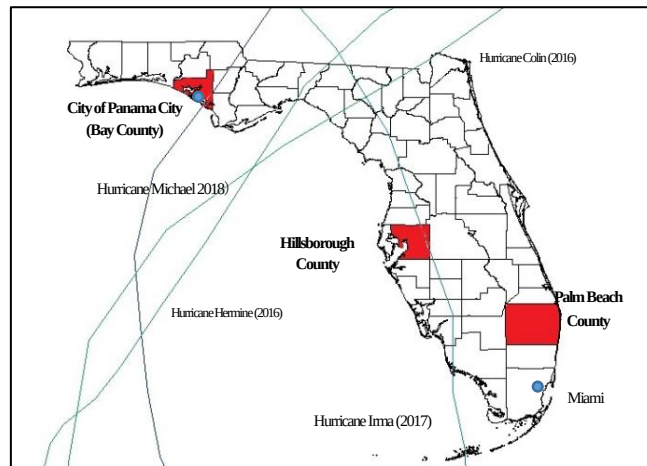


Figure 4.2-1 Research Field
(Source: Author based on the reference⁵³)

Hillsborough County is located in central Florida facing the Gulf of Mexico and is the central county in the Tampa Bay area, including Tampa, the second largest city in Florida. Fortunately, Hurricane Irma (2017) has expected major damage, but the damage was limited due to the fact that the course has shifted to the east and the power has fallen to Category 1 when it passed (National Oceanic and Atmospheric Administration: NOAA, 2018). Geographically, hurricane damage is expected, but direct hits have been avoided since 1921. However, the country is also highly vulnerable to natural disasters such as storm surges and flood risks due to population growth (Freeman & Ashley, 2017). It has been selected as a pilot project for the PDRP because of its natural disaster risk and high interest in disaster prevention by practitioners (Meyer et al., 2010).

Panama City is a municipality in Bay County, located in western Florida, facing the Gulf of Mexico. Panama City was severely damaged by Hurricane Michael (2018) and as of April 2019, the school district of three elementary schools was reorganized due to the outflow of over 8,000 residents⁵⁴. The reason that Panama City was selected in the pilot project was that it was required to be implemented at a different administrative level as a city, not only Counties (Meyer et al, 2010).

2013-2017, and average income and poverty rates were from 2017.

⁵³ Historical Hurricane Tracks <https://coast.noaa.gov/hurricanes/>

⁵⁴ Results based on the semi-structured interview survey with City Manager in the City of Panama City

Therefore, Panama City is the only city administration in the pilot project.

Palm Beach County is located in the southeastern part of Florida facing the Atlantic Ocean and close to Miami, the largest city in Florida. The fact that the BCP per capita in Palm Beach County is about 50% higher than the state and U.S averages. This data indicates that the county is one of the richest local municipalities in the country. On the other hand, coastal erosion has progressed and is exposed to the risk of sea level rise, as a result, not only hurricanes but also storm surges and flooding due to sea level rise frequently occur in the County.

4.2.3 Methodology

In this study, the semi-structured interview was selected as a method to complement the review of public documents and reports such as each PDRP and related comprehensive plan and crisis management plan. The semi-structured interview method covers not only the three target municipalities but also FEMA recovery officers, the Florida government's PDRP pilot project staff, and planning consultants involved in planning (Table 4.2-1).

Table 4.2-2 Details of the Survey

Subject	Roles of the Interviewer	Date	Location
Public Works in Hillsborough County	Role for planning of PDRP	November 15, 2018	Hillsborough County
Florida Department of Economic Opportunity	Role for implementation of PDRP	December 18, 2018	Tallahassee, Capital of the State of Florida
Planning Consultant in Panama City	Role for planning of PDRP	December 19, 2018	City of Panama City
FEMA Volunteer Liaison	Implementation of Recovery	December 19, 2018	City of Panama City
Public Works in Hillsborough County	Role for planning of PDRP	March 27, 2019	Hillsborough County
Division of Emergency Management in Palm Beach County	Role for planning of PDRP	April 10, 2019	Palm Beach County
City Manager	Role of decision making of PDRP revision	April 22, 2019	City of Panama City
Planning Consultant in Panama City	Role for planning of PDRP	April 23, 2019	City of Panama City

(Author)

Table 4.2-3 shows the question items used in the semi-structured interview. In addition to these questions, questions were added according to the flow of dialogue such as disaster damage situation in each local municipality. The average interview time in each municipality is 73 minutes. The interview was conducted in English without an interpreter.

Table 4.2-3 Contents of the Semi-structured Interview

Section	Questions
Plan Activation and Its Procedure	Have the County (or City) has active the PDRP? Has the procedure of the activation been designated in PDRP?
Execution of PDRP Action Plans	Were action plans for pre-disaster phases which written in PDRP executed for 10 years?
	If they were, what are the reasons?
	If they were not, what are the reasons?
Plan Revision	Has (or will) PDRP been revised in 10 years?
	If it has, what are the reasons?
	If it has not, what are the reasons?

(Author)

4.3 Description of the Present PDRP in Each Municipalities

In order to support the above research framework, we will grasp the situation at the time of formulation of the current PDRP of the three target municipalities. The upper part (at the time of formulation) of Table 4.4-1, major items summarized the basic information, functions, and organizational structure of each local municipality's existing PDRP. The details of each local government are shown below.

4.3.1 Hillsborough County

The PDRP in Hillsborough County started in 2008 and was adopted as the official plan of the county in 2010 with the participation of more than 250 stakeholders (Hillsborough County, 2010). As with other pilot projects, vulnerability assessment and pre- and post-disaster action plans are included in the plan. A total of 188 actions to be implemented in pre-disaster phase are designated in eight fields.

In the same eight fields, action plan identification and implementation were promoted by the Technical Advisory Committee (TAC)⁵⁵ organized by County, private companies, and NPOs (Hillsborough County, 2010). Hillsborough County's PDRP can be understood as a summary of eight TAC plans.

A unique point of the Hillsborough County PDRP is the setting of priority redevelopment areas (PRA). The PRA is an advance designation of priority recovery area where lower disaster risk such as inland. The PRA contains a highly vulnerable area as *Vulnerable PRA* and *Sustainable PRA* with low disaster risk. The *Sustainable PRA* includes the projection of the expected location of temporary housing (Meyer et al, 2010; Hillsborough County, 2010).

4.3.2 City of Panama City

Panama City was freed from the hurricane damage that occurred in 1995 and 2004, but the PDRP was completed in 2008 after spending a year from 2007 because of the study from the damage of neighboring local municipalities (City of Panama City Planning and Land Use Services, 2008). The plan was not compiled by groups such as TAC, but was compiled after five meetings by the Executive Committee. Since there is no clearly divided TAC method, the number of action plans themselves is relatively limited but the fields are diverse. As shown in previous studies (Hyogo Earthquake Memorial 21st Century Research Institute, 2018), vulnerability assessments are clearly stated, but participation by private companies and the general public is limited.

4.3.3 Palm Beach County

The first PDRP in Florida was created in Palm Beach County in 1996. After the planning, consultant who was involved in the plan acquired the state government budget to expand to other areas, and

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the pilot project has begun (Palm Beach County Division of Emergency Management, 2012). The current PDRP is the 3rd edition that was revised in 2006 and 2012, and the revision is progressing based on the reflection of each edition, so the current plan is widely deployed in 500 pages. . Like Hillsborough County, the TAC method is used, and the plan prescribes action plans in pre-disaster phase (short- and long-term) and post-disaster phase. One unique point of the PDRP in Palm Beach County is that it incorporates the impacts by sea level rise into the plan. In the County, where the lagoon is facing the Atlantic Ocean, frequent floods and coastal erosion have become social problems. Therefore, in 2009, South Florida Regional Climate Change Compact, a local association of southern Florida, was formed to promote efforts for climate change and sea level rise. From that trend, Palm Beach County has expanded its plan to include the sea level rise risk in the PDRP and to consider it as a regional issue rather than single county issue.

4.4 Results

According to the research framework, the results of the plan activation by the disaster, the action plan execution, and the plan revision are shown (bottom part of Table 4.4-1).

4.4.1 Plan Activation by Disaster Impacts

First, plan activation was examined through the experience of disaster impacts and PDRP activation. The activation of the plan was found to be unimplemented in each local government, although there was damage such as hurricanes. In Hillsborough County, hurricane Irma that occurred in 2017 caused damage to about 500 residential houses, but the plan activation was postponed because the damaged area was limited to areas along rivers and waterways⁵⁶. In addition, Panama City was stricken by the Hurricane Michael in 2018, but no actions designated in PDRP was implemented in

⁵⁶ Results based on the semi-structured interview survey in Hillsborough County

spite of extensive damage⁵⁷. It is because that crisis management in Florida is mainly carried out by the Emergency Operation Center (hereafter EOC), which belongs to County, in this case Bay County, which includes Panama City. Bay County has no PDRP, as a result, Panama City could not work on their own in terms of preparation and mitigation of disaster risk. Similarly, Palm Beach County was hit by Hurricane Irma but not catastrophic impacts, therefore, the PDRP was not activated⁵⁸.

There are no clear damage ratios or trigger standards in Hillsborough County as a procedure to activate PDRP. The decision-maker is not the EOC in charge of emergency response, but the Public Works Division, which is the predecessor of the PDRP, judges the need for activation⁵⁹. As a specific procedure, when it is decided to activate the PDRP, TAC will supervise each field for the first 60 days, and in the regulations, after 60 days, TAC's work will be transferred to normal work in consideration of the situation (Hillsborough County, 2010).

In Palm Beach County, catastrophic disaster, major disaster, and minor disaster are classified according to damage scale and its economic impact caused by hurricane, flood, and storm surge, and breaking embankment. The decision-making process is carried out by the county after collecting information such as damage assessment by the PDRP Executive Committee, which is derived from the Recovery Steering Committee. The Recovery Steering Committee is organized from the emergency period to the short-term recovery period. The impact and damage assessment will be reported to the director who is the decision-making body of the County, they can decide whether PDRP should be activated or not (Palm Beach County Division of Emergency Management, 2012).

⁵⁷ Results based on the semi-structured interview survey in City of Panama City

⁵⁸ Results based on the semi-structured interview survey in Palm Beach County

⁵⁹ Results based on the semi-structured interview survey in Hillsborough County

Table 4.4-1 PDRP in each Municipalities and the Result of the Research

Categories		Hillsborough County	City of Panama City	Palm Beach County
PDRP on Planning Phase	Year of the First Planning	2010	2008	1996
	Basic Data			
	Number of the Participation	More than 250 stakeholders	30~50 members	50~75 members
	Coordination with Other Plans	Comprehensive Plan, Comprehensive Emergency Management Plan, Local Mitigation Strategy	Comprehensive Plan, Comprehensive Emergency Management Plan, Local Mitigation Strategy	Comprehensive Plan, Comprehensive Emergency Management Plan, Local Mitigation Strategy
	Functions			
	Vulnerability Assessment	Included	Included	Included in 2012
	Action Plans	Included	Included	Included and independent as Recovery Plan (2011)
	Related with other issues	Partially included sea level rise	None	Included climate change since 2012
	Organization			
	Allocation of Recovery Staff in EOC	Detailed plan will be included in revised one on 2019	None because EOC belongs to County	Transition from response team to recovery team
The Present situation of PDRP	Organized Task Force	Task force team has been organized since the 1 st edition	None	Steering Committee & Executive Committee
	Experience of the Plan Activation	Not activated during Hurricane Irma (2017)	Not activated during Hurricane Michael (2018)	● None for Hurricanes ● Partially implemented for sea level rise
	Implementation of the Action Plans	● Updated since 2013 ● Mainly economic and land use teams completed the action plans	None	● Divide short & long-term ● Half of action plans were completed, but 9 items are on going
	Revision of the Plans and the Issues	● Expected in 2020 ● Issued Recovery Plan separately, and PDRP focuses on long-term recovery	Will be revised based on the experience of Hurricane Michael, but Bay County does not have plan to revise	Will be revised in 2021 through the minor revision in 2019

(Source: Author based on the reference⁶⁰)

On the other hand, in Panama City, the activation procedure and the decision-maker are not specified in the plan (City of Panama City Planning and Land Use Services, 2008), and it is unclear how the plan will be implemented in the event of an emergency. This is because 100% of the PDRP planning budget was dependent on a single year's state government budget, so the formulation

⁶⁰ Hillsborough County, 2010; City of Panama City, 2008; and Palm Beach County Division of Emergency Management, 2012.

period was as short as one year. That is why the plan was not able to describe the details, and stakeholder participation and input were not sufficient in terms of its procedure of activation⁶¹.

4.4.2 Results of the Execution of the PDRP Action Plan

Regarding the execution of the action plan, three municipalities show diversified results, therefore, this section discusses each municipality individually. In addition, Table 4.4-2 lists the activity items (action plans) defined in each current PDRP.

4.4.2.1 Hillsborough County: Extraction and Revision of Regulations between Ordinances

Reports on economic and land use plans based on the designated actions in pre-disaster phase were submitted, resulting in changes to the Property Ordinance⁶². First, the difference between economic and land use planning in the action plan and the stagnation in other fields is attributed to the TAC at the time of PDRP. The above two TACs, which had been active from the time of formulation, led to the submission of proposals to the county council as the final output, but other TACs stopped discussions after formulation, and the action plan was not achieved⁶³.

In the land use planning, the report identified the different used terms of disaster response and recovery plans in the three cities in the County (Tampa City, Temple Terrace City, and Plant City). The report pointed out that different rules apply in one county due to the ununiformed terms and definitions, therefore, the report proposes corrections. For example, the definition of restrictions on the use of houses after a disaster is limited for each disaster in Hillsborough County and Plant City, while Tampa City and Temple Terrace City do not have that definition. As a result, the regulation in the county was amended. As described above, the land use regulations, which will be a problem at

⁶¹ Results based on the semi-structured interview survey in City of Panama City

⁶² Results based on the semi-structured interview survey in Hillsborough County

⁶³ Results based on the semi-structured interview survey in Hillsborough County

the time of recovery and reconstruction, have been eliminated from the plan so that the relevance and uniformity of the county will be created as an outcome of action in pre-disaster phase⁶⁴.

4.4.2.2 Panama City: Lack of Cooperation with County and Loss of Execution

In the case of Panama City, the TAC method was not adopted, making it impossible for three planners in the city to execute the action plan⁶⁵. Although there are visible results such as vulnerability assessment in planning and concluding pre-contracts for industrial waste treatment after the disaster (Hyogo Earthquake Memorial 21st Century Research Institute, 2018), there is no evidence or report that the action plan was executed. As a factor as mentioned above, insufficient participation of stakeholders due to the limited formulation period of the single year budget contributed to the lack of cooperation with the county government⁶⁶. In particular, the pre-disaster efforts related to crisis management and damage mitigation, called Local Mitigation Strategy (LMS), mainly belong to county, so there is a discrepancy between planning and execution for the city administration. As a result, the closeness of planning and execution as seen in Hillsborough and Palm Beach counties, which shown later, was not observed, and the specific results obtained by the action plan of the PDRP at the time of the Hurricane Michael were not observed.

4.4.2.3 Palm Beach County: Classification of Short-term and Long-term Recovery

The action plan in Palm Beach County is divided into short-term and long-term. As shown in Table 4.4-2, short-term recovery focuses on the recovery of housing, infrastructure, and local industries, while the long-term recovery has seen a shift in focus such as the overall economy, land use planning

⁶⁴ Hillsborough County. (2010). Task3 Process for clarifying build-back standard. Retrieved April 12, 2019, from

<https://www.hillsboroughcounty.org/en/residents/public-safety/emergency-management/post-redevelopment-plan-documents>

⁶⁵ Results based on the semi-structured interview survey in City of Panama City

⁶⁶ Results based on the semi-structured interview survey in City of Panama City

regulations, and disaster mitigation activities. Specifically, the action plan for the housing sector in the short-term includes inventory preparation of temporary housing, preparation for temporary housing, etc., whereas long-term recovery includes a prevention of the acquisition of large-scale land after the disaster, and securing housing for middle- and low-income households in advance.

Table 4.4-2 Action Plans on Present PDRP

Subjects of the Action Plans	Hillsborough County	City of Panama City	Palm Beach County	
			Short-term	Long-term
Economic	18	11	0	6
Natural Environment (Including Debris Management)	21	14	10	6
Finance	13	5	4	0
Housing	31	8	7	2
Health/Welfare	40	-	1	2
Infrastructure	35	9	6	1
Land Use	21	7	1	12
Advocacy (Including Communication)	9	16	5	2
Mitigation	-	2	1	5
Culture/History	-	13	0	3
Local Industry	-	9	11	1
Institutions	-	9	9	0
Community DRR	-	-	2	1
Total	188	94	57	41

(Source: Author based on the reference⁶⁷)

The action plans in pre-disaster phase identified 98 items. Half of them have been completed or partially implemented, 9 items are ongoing, 1 item is subject to review, and the remaining 39 items are not implemented⁶⁸. As an example, regarding the disposal of disaster debris, the following items are listed: planning a post-disaster disposal plan, pre-contracting with a contractor, and conducting a pre-environmental survey of the disaster damp site (to restore the original state after use) has been

⁶⁷ Hillsborough County, 2010; City of Panama City, 2008; and Palm Beach County Division of Emergency Management, 2012.

⁶⁸ Results based on the semi-structured interview survey in Palm Beach County

completed⁶⁹. As an unimplemented example, the storage of infrastructure repair tools was described in the item of short-term infrastructure reconstruction, but the implementation was postponed because it was possible to request a private company such as a construction material supplier⁷⁰. In the housing field, long-term grant housing that is not a temporary housing was described in the action plan, but it has not been implemented since it can be handled by agreements with the Red Cross and churches⁷¹. As can be seen from these cases, actions that can be handled by the private sector and volunteers were excluded from the action plan.

4.4.3 Plan Revision

Regarding the plan revision, each municipality is planning a new revision, but the background is different. First in Hillsborough County, revisions since 2010 are scheduled for 2020, and work has begun in 2019⁷². Prior to the revision, there was little progress on the “recovery preparation”, as it was a major issue based on the previous formulation. Then, a “Recovery Plan” was developed separately and made into one chapter of the Comprehensive Emergency Management Plan (hereafter CEMP)⁷³. In the recovery plan, EOC, which is a key organization in the emergency response period, will be reorganized to Recovery Operation Center (hereafter ROC) after a certain period of time. The “recovery plan” also designated clarification of the organization that will respond at the time of FEMA intervention accompanying an emergency declaration. It is intended to clarify the recovery system and flow, such as setting the flow of three times of disaster impact assessment, and setting up the Recovery Task Force. Due to the independence of this “recovery plan”, the PDRP is scheduled to be revised to shift the focus to long-term recovery and reconstruction issues such as “promotion of disaster mitigation” and housing construction and job

⁶⁹ Results based on the semi-structured interview survey in Palm Beach County

⁷⁰ Results based on the semi-structured interview survey in Palm Beach County

⁷¹ Results based on the semi-structured interview survey in Palm Beach County

⁷² Results based on the semi-structured interview survey in Hillsborough County

⁷³ Results based on the semi-structured interview survey in Hillsborough County

creation.

In Panama City, revisions can be seen due to the hurricane Michael's damage. It is said that there was a temporary outflow of about 8,000 people, equivalent to about 22% of the city's population after the hurricane. The population outflow would be negative impact on the budget planning in the next 10 years because a census scheduled for 2020, therefore, repopulation is an urgent issue for the city⁷⁴. As a measure to regain this population, the PDRP will be revised mainly by firefighters in Panama City, but no specific direction has been shown yet⁷⁵. City Manager, who appointed just before the hurricane, provided a place for dialogue with citizens every Mondays, and directly communicated the progress of the recovery and collected ideas for the recovery.

The revision in Palm Beach County is scheduled for a minor change in 2019, and a major revision is planned with the arrival of human resources specialized in long-term recovery and reconstruction by 2021⁷⁶. Since two revisions have already been implemented, there is already a “recovery plan” specializing recovery preparations like Hillsborough County, and the current PDRP includes sea level rise due to climate change in particular. The issue for revision is how to involve residents in the future⁷⁷. There are Home Owners Association and Civic Association, which are close to neighborhood associations in the United States. However, there is little discussion on disaster prevention so far⁷⁸. Therefore, cooperation and collaboration with residents and residents' organizations are recognized as a current challenge for the revision.

4.5 Discussion

4.5.1 Specific Revision of “Recovery Preparation” and Periodic Revisions to Continue

⁷⁴ Results based on the semi-structured interview survey in City of Panama City

⁷⁵ Results based on the semi-structured interview survey with City Manager in the City of Panama City

⁷⁶ Results based on the semi-structured interview survey in Palm Beach County

⁷⁷ Results based on the semi-structured interview survey in Palm Beach County

⁷⁸ Results based on the semi-structured interview survey in Palm Beach County

“Promotion of Disaster Mitigation”

Based on the results, it was observed that there were no cases where the PDRP was activated after the occurrence of natural disasters, and it is not possible to show the comprehensive usefulness of the PDRP so far. In particular, content related to “recovery preparation” is used and evaluated when an actual disaster occurs, so it cannot be evaluated at this stage. However, in Hillsborough County and Palm Beach County, by making the recovery plan independent, the elements of “recovery preparation” are extracted from the ambiguity concept of the PDRP. In the recovery plan of Hillsborough County clearly indicated the transition of the organizational system from emergency phase to recovery phase. With the passage of time since the disaster, the crisis management staff in the emergency response period switched from the centralized organization to the TAC as decentralized organizational structure. In this way, it can be said that one of the achievements is the independence of the “recovery plan” from PDRP, and it the recovery plan plays bridge role between the emergency phase and the long-term recovery phase (Figure 4.5-1).

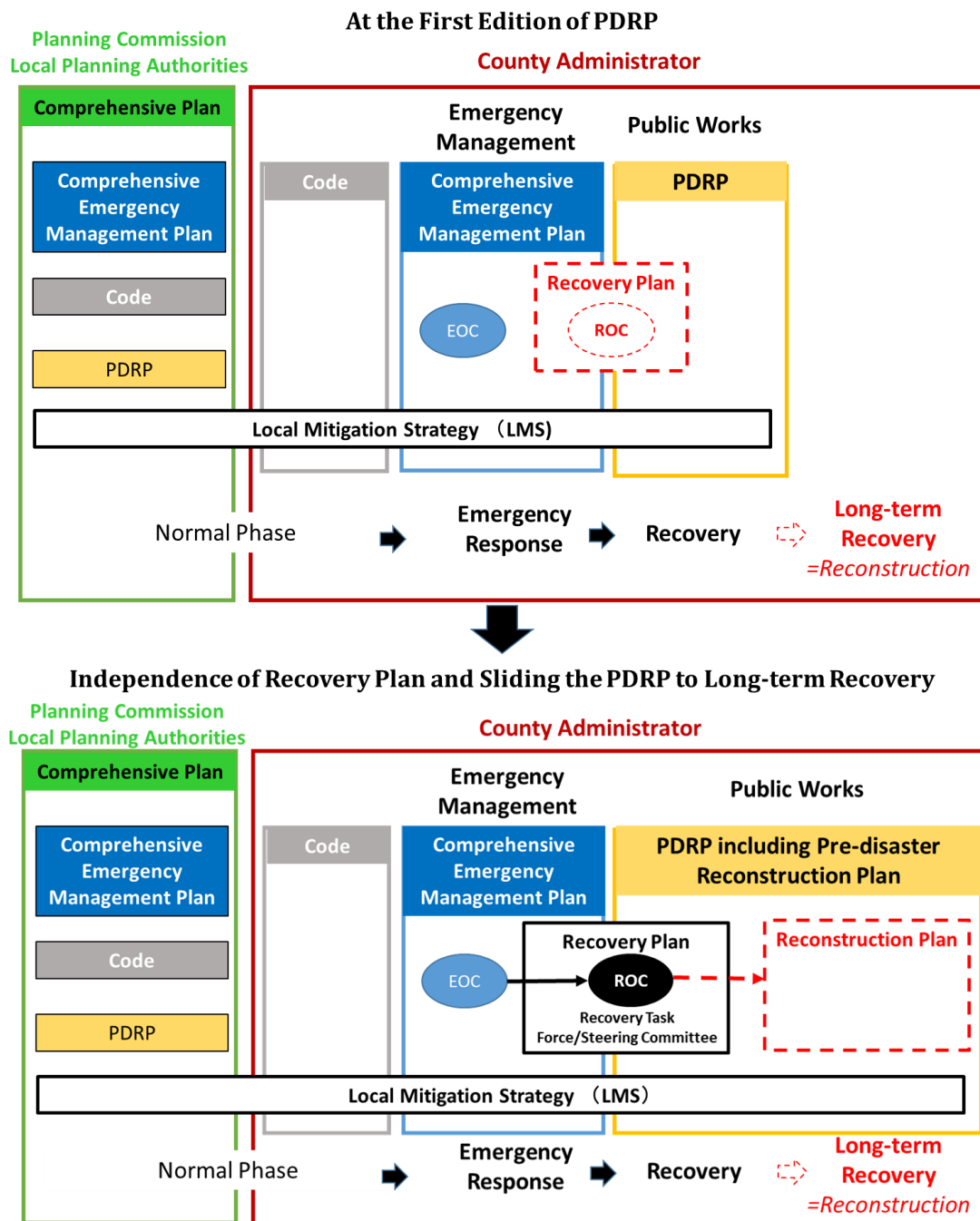


Figure 4.5-1 Revision of PDRP
(Author)

Another aspect of “promotion of disaster mitigation” is that the plan has been revised to improve the results and issues obtained through the action plan. In Palm Beach County in particular, two revisions have already been implemented and a further revision within a few years is expected.

Originally, the coastal municipalities in Florida were required to make a revision plan about once every seven years (Florida Department of Community Affairs, 2010), while Palm Beach County is proceeding with revision once every 7.3 years, while Hillsborough County 10 years, Panama City has been 12 years. In the revision of Palm Beach County, sea level rise due to climate change was regarded as a regional disaster risk and transformed into a multi-hazard PDRP as mentioned above. Palm Beach County faces the Atlantic Ocean side, and damage from coastal erosion has been observed, which is why the theme of sea level rise was easily accepted. In addition, by including the theme of climate change in the PDRP. As Maki (2010) points out that multi-hazard-type disaster countermeasures have been organized in the United States, Palm Beach County has adopted a multi-hazard type that responds to changes in the environment focusing on “promotion or disaster mitigation” rather than a single disaster. By doing so, it encourages the participation of a wider range of stakeholders and realizes regular revisions.

4.5.2 Difference of Interval of the Revision and Divergence between Disaster Mitigation and Recovery Preparation

PDRP development and revision are carried out by different departments in each municipality, and the difference appears as the results in action plan implementation and revision frequency. The Hillsborough County PDRP has been formulated mainly by the Public Works Division, but the general disaster response plan are handled by the Crisis Management Division. On the other hand, in Palm Beach County, it can be said that the Crisis Management Division is in charge of all the PDRP, recovery plan, and CEMP, and has a consistent formulation system. In Panama City, it was not planned for the entire County but by the city alone, as a result, planning and actions separated and lost its ability to revise until 2018. With regard to the current plan revisions, the PDRP in Bay County has not been announced as of 2019. Considering this situation, in addition to the contents

of the PDRP, it can be said that an important consideration is organizational overlap for the planning body and implantation actors.

Another important difference due to the difference in organizational structure is whether the implementing body of LMS and the planning body of the PDRP overlap. LMS is a plan and regional strategy that contributes to disaster mitigation during peacetime. As mentioned above, the main implementer is not the city administration but the county. Since LMS is a qualification requirement for FEMA non-emergency support funds⁷⁹, the formulation and adoption of LMS is very important in obtaining budget from the federal government that contributes to the promotion of disaster reduction in the region. In addition, since LMS is subject to renewal every 5 years, it continuously circulates the loop of regional hazard assessment and countermeasure implementation. The repeating revisions contribute to the identification of issues that hinder disaster reduction and the motivation for the revision of the PDRP⁸⁰. Therefore, if the LMS formulation and the PDRP formulation body are the same organization, the issues related to long-term recovery extracted by the LMS can be transferred to the PDRP. Reversely, if the formulation body is different as in Panama City, less interaction and less inputs to the revision of the PDRP can be expected. In other words, it can be said that the overlap of planning body of LMS and “recovery plan” will enhance “promotion of disaster mitigation” and the “recovery preparation” by the revision of PDRP and update of LMS. This is the essence of the evolution of PDRP.

4.6 Conclusion

The summary of this study includes the independence of the “recovery plan” and the continuous revision of the PDRP as the issues for the return of the knowledge obtained in this study to Japan.

⁷⁹ FEMA web site, retrieved August 20, 2019, from <https://www.fema.gov/hazard-mitigation-plan-requirement>

⁸⁰ Results based on the semi-structured interview survey in Hillsborough County

According to the “Research Report on Promotion of Recovery Preparation Plan” by the Cabinet Office in Japan, it points out that efforts to prepare for recovery due to the emphasis on preventive measures and emergency measures are stagnating (Cabinet Office in Japan, 2007). If the merits gained from the ongoing revision of the PDRP academically become more explicit, the resource allocation to the PPDP will be realized.

As future academic issues, as the case of Palm Beach County shows, it is necessary to verify the feasibility or effectiveness of planning and action plan execution involving residents and residents' organizations. In particular, if it is proved that “recovery preparation” and “promotion of mitigation” can be realized by the organic relationship between the action at the community (or neighborhood) level and the PDRP by the government, it will contribute to the expansion of the advance of pre-disaster recovery strategies.

Reference

- Cabinet Office in Japan. (2007). *Fukkou jyunbi keikaku sakutei no suishin ni kannsuru chosa houkokusho*. [Report on the promotion of recovery preparation planning]. [in Japanese]. Retrieved April 25, 2019, from <http://www.bousai.go.jp/kaigirep/houkokusho/hukkousesaku/pdf/fukkoujunbi200703.pdf>
- City of Panama City Planning and Land Use services. (2008). *Post-disaster redevelopment plan city of Panama City*, Florida, City of Panama City.
- FEMA. (2016). *Pre-disaster recovery planning guide for state governments*. FEMA.
- FEMA. (2017). *Pre-disaster recovery planning guide for local governments*. FEMA.
- FEMA. (2018). 2017 Hurricane season FEMA after-action report. Retrieved April 10, 2019, from <https://www.fema.gov/media-library/assets/documents/167249>
- Florida Department of Community Affairs. (2010). *Post-disaster redevelopment planning-A guide for Florida communities*, Florida State.
- Freeman, A.C., and Ashley, W.S. (2017). Changes in the US hurricane disaster landscape: the relationship between risk and exposure, *Natural Hazards*, 88, 659-682.
- Hillsborough County. (2010). Post-disaster redevelopment plan documents. Hillsborough County Emergency Management. Retrieved April 5, 2019, from <http://www.hillsboroughcounty.org/en/residents/public-safety/emergency-management/post-redevelopment-plan-documents>
- Hyogo Earthquake Memorial 21st Century Research Institute. (2018). Nakai Tofu jishin ni taisuru fukkou grand design to jizenfukkou keikaku no arikata –Kenkyu chosa houkokusho. [Report on recovery grand design and pre-disaster recovery planning against Nankai Trough earthquakes]. [in Japanese]. *Hyogo*

- Earthquake Memorial 21st Century Research Institute.*
- Ichiko, T., Yoshikawa, J., and Nakabayashi, K. (2012). 2000 nenndai ni tenkaishita “shinsai machi dukuri kunren” no jissi tokusei to kunnren kouka no kousatu –post higashi nihon daishinsai ki no jizenfukkoutaisaku wo kanngaerutamenno kisoteki kensho. [A study of chronicles and outcomes of community workshops for post-disaster recovery in Tokyo –Reviewing towards post-period for Tohoku-Pacific Ocean Earthquake, [in Japanese]. *Journal of City Planning Institute of Japan*, 47(3), 877-882
- IPCC: Climate change. (2014). *Synthesis report. Contribution of working groups I, II and III to the fifth assessment report of the intergovernmental panel on climate change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (Eds.)]. IPCC, Switzerland.
- Isomura, K., Maki, N., and Tsukihashi, O. (2019). Tsunami hisai soutei chiiki ni okeru chiiki seikatsu zou no jizen haaku syuhou ni kansuru kennkyu –Hyogo ken Minami Awaji shi Fukura Chiku ni okeru “Ushinawarenai machi” project- [Study on preliminary grasping method of community life image in tsunami affected area –“Not lost city” project in Hyogo Prefecture Minami-Awaji Fukura district-]. *Journal of Japan Society for Disaster Recovery and Revitalization*, 13, 21-30.
- Iwaka, K., Ueduki, Y., Hama, D., Yamanaka, R., (2014). Jizoku no ayabumareru chiiki deno jyumin syutai niyoru jizenfukkou machidukuri keikakuno ritsuan syodouki no kadai to taisaku [Problems and measures for formulation of preliminary reconstruction and urban development plan by residents in Minami Town, Pref. Tokushima]. [in Japanese], *Journal of Social Safety Science*, 22, 1-7
- Kato, T., Nakamura, H., Sato, K., and Hiroi, Y. Mikeiken no fukkou jyoukyo ni taiou surutameno jizenn jyunbi: Fukko jyoukyou image training syuhou no kochiku –Saitama ken ni okeru torikumi-. [A study on the imagination training for the situations of post-disaster urban reconstruction –Pre-disaster measurements for inexperienced situations of post-disaster recovery in the districts of Saitama]. [in Japanese]. *Journal of City Planning Institute of Japan*, 46(3), 913-918.
- Kim, M., Maki, N., Hirata, T., Inaji, S., and Kishikawa, H. (2017). Chiiki no itonomi no keizoku ni tyakumoku shita jizennfukkoukeikaku sakutei syuhou no kouchiku –Wakayama ken Yura-cho Ena deno jyumin sannkagata workshop wo tooshite. [Challenges in realizing sustainable community development: Case study of pre-disaster recovery planning in Ena, Wakayama, Pref]. [in Japanese]. *Journal of Social Safety Science*, 30, 1-11.
- Maki, N. (2010). Saigai taisaku kihounhou no sougousei, keikakusei to kyodai saigai heno taisyo -21 seiki zenhan no kyodai saigai jidai wo fumaeta saigai taisaku no arikata. [Proposal for disaster management act in high seismicity decades all hazards, all disciplines, and response to mega-disaster.] [in Japanese]. *Journal of Social Safety Science*, 12, 71-80.
- Maki, N, et al. (2008). Sougou tekina fukkou hyouka no arikata ni kannsuru kenntou –Hanshin Awaji daishinsai to Niigata ken chuetsu jishi no fukkou kennsyou-. [Program evaluation scheme for Japanese long-term recovery plan: How long-term recovery process from 1995 Kobe and 2004 Niigata earthquake were evaluated?]. [in Japanese]. *Journal of Social Safety Science*, 10, 225-232.
- Meyer, S., et al. (2010). Post-disaster redevelopment planning: Local capacity building through pre-event planning. *Journal of disaster research*, 5(5), 552-563.
- Mileti, D.S. (1999). *Disasters by design: A reassessment of natural hazards in the United States*. Washington D.C.: Joseph Henry Press.
- Murakami, R., and Ieda, J. (2018). Nankai trafil kyodai jishin no tsunami higai soutei chiiki niokeru “jizenfukkou” no torikumi jittai to kadai. [The actual cases of efforts and challenges: “Pre-disaster planning for post-disaster recovery” in the tsunami-disaster prone area along the Nankai Trough]. [in Japanese]. *Journal of City Planning Institute of Japan*, *Journal of City Planning Institute of Japan*, 53(3), 889-896.
- National Hurricane Center. (2019). *Hurricane Michael: National hurricane center tropical cyclone report*. National Hurricane Center.

- National Oceanic and Atmospheric Administration. (1921). Monthly weather review. Retrieved April 5, 2019, from https://www.aoml.noaa.gov/hrd/hurdat/mwr_pdf/1921.pdf
- National Oceanic and Atmospheric Administration (NOAA). (2018). *Hurricane Irma: NOAA water level and meteorological data report*. U.S. Department of Commerce National Ocean Service Center for Operational Oceanographic Products and Services, Maryland, U.S.
- Otsuyama, K. and Maki, N. (2018). Bosaiseisakutaikei ni okeru jizenfukou keikaku no ichiduke ni kannsuru nichibei hikaku to kadai chushyutsu [A comparative analysis and identification of issues on legislative systems for pre-disaster recovery planning in Japan and U.S.]. [in Japanese]. *Journal of City Planning Institute of Japan*, 53(2), 132-143.
- Palm Beach County Division of Emergency Management. (2012). *Post disaster redevelopment plan. 2012-2013 edition*, Palm Beach County.
- Schwab, J.C., et al. (1998). *Planning for post-disaster recovery and reconstruction*, American Planning Association.
- Schwab, C.J. (2015). *Planning for post-disaster recovery: Next generation*, American Planning Association.
- Smith, P.G., and Wenger, D. (2007). Sustainable disaster recovery: Operationalizing an existing agenda. In Rodriguez, H., Quarantelli, L.E., and Dynes, R.R. (Eds.), *Handbook of disaster research*, pp.234-257. New York: Springer.

Chapter. 5

Human Mobility and Immobility: A Trade-off Relation with Social Support in Non- Devastating Disaster Impacted Communities in Hillsborough County, Florida

5.1 Introduction

Uncertainty from climate change and intensified natural hazards is expected to cause more migration and displacement in the 21st century (International Organization for Migration, 2008; Adger et al., 2014). Research on disaster-induced migration, displacement or relocation draws attention particularly to “rapid-onset” disasters such as hurricane (typhoon), flood, earthquake, and tsunami (Mitchell et al., 2012; Iuchi, 2014; Fussell et al., 2014; Fussell, 2015; Kondo, 2018), and human mobility and immobility are attributed to several causes such as gentrification, climate impacts, or loss of legal protections (Freeman, 2005; Black et al., 2013). For instance, Hurricane Katrina is an appropriate example of the accumulated knowledge about displacement, especially the difficulties of repopulation for specific ethnicity-rooted pre-disaster housing policy contexts (Goetz, 2011; Arena, 2012; Graham, 2012). Both migrators and stayers have faced prolonged financial difficulties (Deryugina, et al., 2014; Yon & Waldorf, 2016). Although post-disaster displacement draws global concerns and academic interests, studies of immobility and trapped populations have been more limited.

Generally, human mobility is described in connection with ability, particularly wealth or resourcefulness. Human mobility is defined as “ability of individuals, families, or groups of people to choose their place of residence” (UNDP, 2009), while immobility is considered to describe those who choose to stay voluntarily. Adams (2016) indicated that the causes of immobility vary such as place satisfaction, fear of alternative locations, and negative attachment to place. On the other hand, trapped populations who stay at the original place, although wishing to move are considered as unable to leave or involuntarily staying due to insufficient resources to migrate (Foresight, 2011). In any case, mobility, immobility, and trapped populations are proactive or inactive strategies against negative disturbances and the difference between the choices correlates with wealth or resourcefulness (Black et al., 2013; Adams, 2016). Yet these concepts of immobility and trapped

situations need careful examination of what types of resources are correlated with and differentiate these two outcomes.

Hedging risk by purchasing insurance or risk reduction by migration or retreat to a safer place are logical options for resourceful households (Hino et al, 2017). As a result, the poor are typically described as having fewer options due to low resources. Generally, the statement intuitively makes sense, but what if human mobility forms a trade-off relation, what are we losing by mobility or what benefits are we receiving by immobility? Seeking a better and safer place would require financial capability, income and security are often considered as a trade-off relation (Adams, 2016). Authors hypothesize that such trade-off related with human mobility does not convergent into single cause, and forms of income and security need to be segregated based on the types of mobility strategies at household level. For example, moving to different place in peace time for short-stayers would be a strategy for a household to seek better job opportunity even though the new place is exposed to natural hazard risks. Or there would be something benefits for long-stayers at the one place. Hence, investigating a new forms of trade-off relation between human mobility and resourcefulness enriches less-biased understanding to immobility and trapped populations. We assume that is channels of social support as a passive but non-financial strategy in the context of neoliberal society. Social support, such as connections with family, friends, and neighborhood functions to minimize individual stress (Cohen et al., 1985; Holt-Lunstad &Uchino, 2015), are mainly examined in research on health behavior in public health or on sociopsychology. In the field of social science for disaster risk reduction, social support or social connections are studied in decision making for evacuation (Dynes, 2002; Collins et al., 2017, 2018), influences on mental health (Ikeuchi & Fujiwara, 2000; Shiotani, 2014), or migration in the post-disaster phase (Kimura et al., 1999). Kimura et al. (1999), in a study after the Kobe earthquake, revealed that disaster impacted households wish to stay at the impacted house, whereas elderly couples and young single

households who were severely impacted have already moved out from the impacted area since just after the event, but 60 % of out-migrants wish to come back to the original place where they grew up. Such place attachment reflects emotional attachment at the previous place even though negative events happened, though Marshall et al. (2012) pointed out that those attachments act as a barrier to migration when the residents seek fundamental changes rather than adapting at the place. The interrelation between social support and human mobility have not been examined by the empirical research as of this writing, therefore this paper aims to identify the intersection of both concepts and categorize strategies for high resource households as well as the vulnerable population particularly trapped and immobile populations.

In this study, households' moving frequency, housing insurance coverage, and disaster experiences in their lifetime have been surveyed for comparative analysis at the household level to identify variations of mobility, immobility, and trapped populations and its relations with social support. The research field was selected in four sub-divisions in Hillsborough County, Florida, U.S, in order to look at variations of strategies. A critical criteria of the selection was high human mobility. The State of Florida is a famous destination of domestic in-migration because of the mild weather even though it is gradually slow down (Perry, 2006; Frey, 2009). The County, including an economic central hub, Tampa Bay, was slightly impacted by hurricane Irma in 2017, and we assume that the experience affects residents' decisions to consider potential migration or stay.

This research describes types of strategies not only for high resourced mobile households but also for the vulnerable who are supposed as trapped or immobile populations. On the other hand, high resourced households who have potential mobility are facing "capitalized risk" because financial capacity for migration and affordability of insurances are the major strategies for them. Such different types of strategies for mobile or immobile households will be an evidence for the policy implication especially under the neoliberal society in climate change era.

5.2 Research Framework

5.2.1 Social Support

As mentioned above, perceived social support is one of the central concepts in this study. Social support mainly is divided into structural support and functional support. Structural support refers to social networks in the society which are measured by density, intensity, and channels, while functional support defined as subjective perception of expected support, and the functional support forks into two; perceived support and received support (Holt-Lunstad & Uchino, 2015). A distinction between “perceived support” and “received support” is critical because many research indicates that social support has positively correlated with health outcome, whereas received support, which has already received actual support, let receivers be stressful situation due to the psychological debt (Shiotani, 2014). As our research setting is a non-devastating disaster area rather than a post-disaster area might arise received support where the survey measured perceived support.

The concept of social capital is widely accepted in disaster science as it affects the ability in which respond, adapt, and recover through bonding in local voluntary organizations (Nakagawa & Shaw, 2004; Aldrich, 2012), bridging networks with outside resources, or a form in multi-dimensional assessment method/tool (Mayunga, 2007; Cutter et al., 2010). Social capital, as a form of fabrics of the human relations, has a mass-oriented approach rather than individual perspective since the core of the social capital is collective or community assets (Portes, 1998; Lin, 1999) and resources based on social networks (Adger, 2003). In this research, we intentionally chose to emphasize the channels of social support because collective view point sometimes aggregate individual asset which influence on individual judgement in diverse society. As Collins et al. (2018) note that density and diversity of social connections enhance safer behavior in case of evacuation, and the judgement does not attributed from collective actions at neighborhood level. Similar to evacuation, migration decision-making is individual-oriented rather than collective manner in most

of the cases except group relocations such as lower land to higher place due to the climate change or prohibit zoning by tsunami. That is the reason that social support, which scopes at individual and inter-personal group-oriented is better suited to this study rather than social capital which mainly adopted in collective manner in disaster science.

5.2.2 Mobility

Human mobility draws attention as a form of due to displacement (Mitchell et al., 2012; Iuchi, 2014; Fussell et al., 2014; Fussell, 2015), humanitarian issues, or inhabitable threats by sea level rise, however, households' moving due to job rotation or finding new job opportunities have not been attractive research topics for disaster science. As Adams (2016) distinguished that place attachment relates to satisfaction or dissatisfaction of the current living place, dissatisfaction functions as a cause of migration. What if a household repeatedly change their houses within a few years, how do they describe the place of attachment? An assumption that perception of place attachment varies among repeating moving, single moving, and non-moving households needs to be examined. In this survey, moving frequency and living years at the present house are the key variables to identify mobility or immobility.

5.2.3 Resourcefulness and Disaster Experiences

Past disaster experiences and resourcefulness are additional variables that affect decisions to move. First, disaster impacted households are at risk of displacement as mentioned above. Authors assume that difference between human mobility and immobility are detected if we look back respondents' past experience of disaster impact. Although past literature describes that the vulnerable population has pushed out from the impacted place (Mitchell et al., 2012; Fussell et al., 2014; Fussell, 2015), most of the papers do not show the aftermath. If vulnerable population are displaced into another

vulnerable place, most probably they repeat moving again and again. If disaster impacted experiences and mobility (moving frequency) has correlated, it is also evidence that vulnerable population also has the paradoxical ability to move repeatedly. The meaning of moving for the vulnerable and for those who have financial ability of moving should be distinguished scientifically. Second, resourcefulness is another variable as Foresight (2011) described an inverse relation between ability to move and vulnerability related with wealth or level of capital. It makes sense that resourceful household have more options to move, however, the relation is not able to justify why the poor who have limited resource are repeating migration. Also it is problematic to explain high income households who live in scenic but high risk coastal area. Figure 5.2-1 shows a modified schematic concept for the relationship between ability to move, vulnerability, and resourcefulness. This study hypothesizes that two peaks which means two groups of high mobility and vulnerable populations exist related with ability to move rather than a simple inverse relationship. In sum, six major variables (Social Support, moving frequency, years of living in the present house, disaster experiences, income, and owning house insurances) are selected for the analysis in this study.

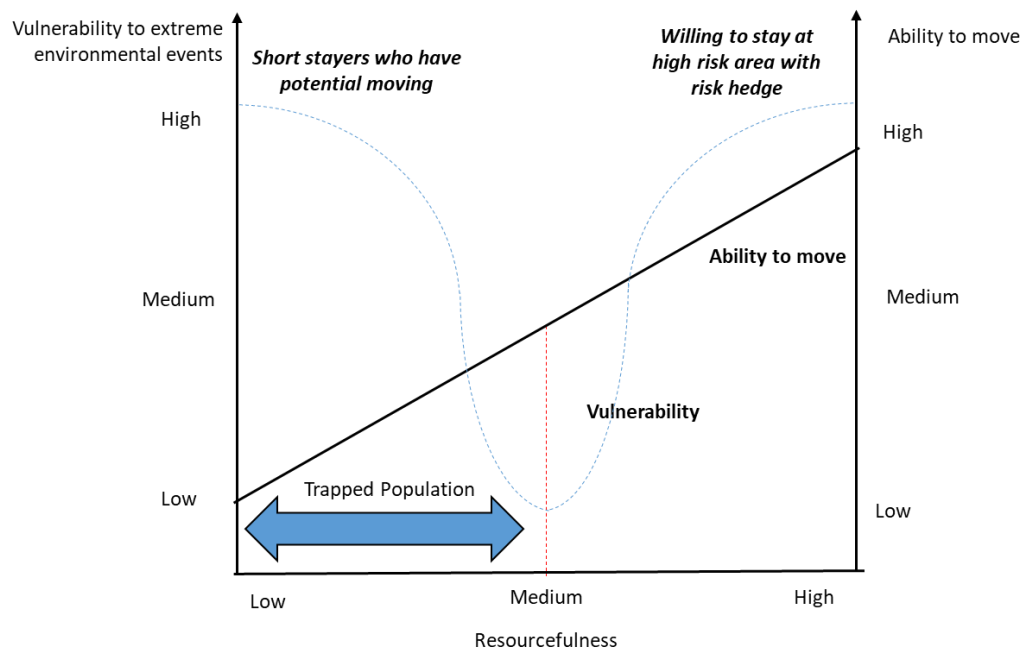


Figure 5.2-1 Vulnerability to Extreme Environmental Events and Ability to Move
(Source: Foresight, 2011, and modified by authors)

5.3 Research Field

Hillsborough County locates middle of Florida peninsula facing Gulf of Mexico. The county holds the third largest population in the State in which attributes from regional economic hub, Tampa Bay Region. Geographically, the county has high potential natural hazards risks particularly due to population growth and coastal development (Freeman, and Ashley, 2017). Although Hurricane Irma, the strongest hurricane born in the history of Atlantic ocean, had expected direct hit the County, the course changed easterly and the force of the hurricane dropped to category 1 when it passed (National Hurricane Center, 2018).

In the County, four sub-divisions were selected as a research field: Davis Islands, Progress Village, Town ‘N’ Country, and Sun City. The selection criteria of those four communities are different flood risk based on the FEMA Flood map, and diversity of dominant race/ethnicity. Table 5.3-1 shows the basic demography in four communities and Figure 5.3-1 illustrates the location of

each community. Davis Islands where reclaimed several lands for the development in 1920s was exposed to the risks of hurricane or flood historically (Covington, 1978). White Americans are major group in the island and the average median household income is higher than average of the County. During Hurricane Irma, mandatory evacuation order was issued, though the direct impact was limited due to the course change. Davis Islands selected the filed as a sample of high risk zone. Progress Village constructed in 1950s in order to build African-American elites community in a rural area 10 miles from the city center (Baum, 2016). Although the sub-division locates far from the coastal, the community impacted hurricane or tornado several times, and newly updated FEMA Flood map partially will include at the area which is the reason as middle risk community. Likewise Progress Village, some part of Town 'N' Country are going to be covered as revised flood zone. We selected mobile parks in Town 'N' Country in order to look at diversity of the residents in the sample because the community holds the high ratio of Hispanic population in the County. Sun City, a concept of communities for retirees had developed in Phoenix, Arizona in 1959, started in 1960s in Hillsborough County and formed present age-restricted community since 1987 named as Sun City Center (McCally, 1992). The sub-division was selected as the community locates outside of the flood zone in the renewed FEMA Flood Map.

Table 5.3-1 Basic Demography of the Research Field

	Population	Poverty Rate (%)	Median Household Income (\$)	Race/Ethnicity (%)		
				White American	African American	Hispanic or Latino
Hillsborough County	1,229,226	15.0	51,681	48.2	17.8	29.2
Progress Village	5,392	20.0	59,569	37.1	51.7	14.9
Town 'N' Country	78,442	7.0	52,929	76.0	9.7	43.8
Davis Islands		5.4	82,466	83.4	1.6	11.2
Sun City Center	19,258	7.0	47,285	95.8	2.0	3.2

(Source: American Fact Finder in United States Census Bureau, as of September, 2019)

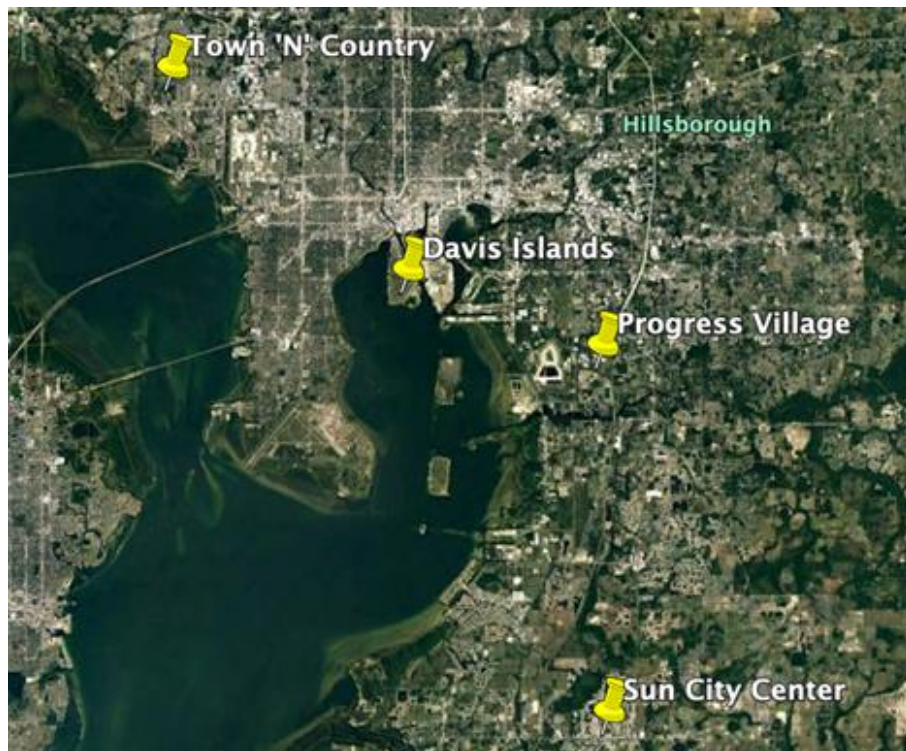


Figure 5.3-1 Map of Research Field
(Author based on Google Map)

5.4 Methodology

The face-to-face questionnaire survey was selected as a methodology to minimize unanswered items. At least two persons participated in the survey and one survey took minimum 20 minutes and maximum 95 minutes. A Spanish-English translator and Spanish modified questionnaire were prepared for households who preferred answering in Spanish. The survey started February 10 till June 12, 2019 (table 5.4-1). At the end of the survey, 10 dollars gift cards were given for the compensation by the interviewee. The questionnaire asks gender, age, race/ethnicity, house type, ownership of the house as the basic demography. Individual information such as full name, birthday, and home address were not collected.

Table 5.4-1 Schedule of the Survey

Date	Location	Remarks
Feb 10, 17, 18, 2019	Progress Village	-
March 23, 27; May 1, 2, 6, 2019	Davis Islands	-
April 28; May 4, 2019	Town 'N' Country	Hired a Spanish-English Translator with Spanish Questionnaire
June 12, 2019	Sun City	-

Six variables are selected for the quantitative analysis: Past disasters experiences, lifetime moving frequency, Number of owning house insurance(s), future plan of moving, and the knowledge of community planning related with emergencies. The detail questions are listed in table 5.4-2. First, authors examined correlations among variables, and then we looked at the relations between variables with scatter diagrams. Then, correspondence analysis were performed to identify groups among variables.

Table 5.4-2 Variables and the Questions on the Survey

Variables		Questions
Mobility	Years of Living in the House	How many years have you lived in your home?
	Moving Frequency	How many times did you move during the first 20 years of your life? How many times have you moved between the ages of 21 and 40? How many times have you moved since age 41?
Resourcefulness	Income	Household annual income (average) *select only one 1. Lower than \$ 35,000, 2. \$ 35,000 - 50,000, 3. \$ 50,000 - 70,000, 4. \$ 75,000 greater, 5. Don't want to answer
	Type of Insurances	Insurance of the House *Multiple chose is applicable 1. NFIP (Flood), 2. Wind Hurricane Insurance, 3. Home Owners, 4. RV, 5. Mortgage, 6. Other, 7. None of those
Social Support	Channels of Social Support	Which do you consider as your social support? *Multiple choice is applicable 1. Family, 2. Friend, 3. Neighborhood, 4. Co-workers, 5. Place of worship, 6. Non-Government Organizations or Non-Profit Organizations, 7. Other
Vulnerability	Disaster Experiences	Year of the event, place, types of event, whether Evacuation or stayed at the house. Asking three sets of the questions.

5.5 Results and Analysis

Questionnaire survey has conducted for 82 households (20 in each). The detailed overall results are shown appendix, but not surprisingly 30.5 % of respondents have no housing insurance at all while 39% are owning more than two insurances. Table 5.5-1 shows the correlation sequence on six variables. Only *income* and *insurance* are relatively positive correlated (0.489**) at the overall results. Notably, disaster experiences do not correlated with other variable in case of this research sample because of the low impact of the Hurricane Irma. Particularly in high and middle risk zones observed while significant correlation was not observed in low risk zone as expected (Figure 5.5-1 and Table 5.5-2).

Table 5.5-1 Correlation Sequence of Variables

Variables	A	B	C	D	E	F
A) Years of Living in the House	1.000					
B) Moving Frequency	-0.069	1.000				
C) Income	0.070	0.240	1.000			
D) Type of Insurances	0.079	0.191	0.489**	1.000		
E) Channels of Social Support	-0.044	-0.044	0.010	0.026	1.000	
F) Disaster Experiences	0.118	-0.045	0.100	0.058	0.155	1.000

** P < 5%

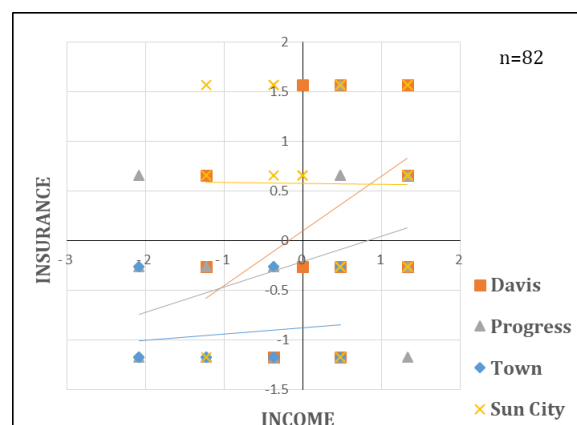


Figure 5.5-1 Scatter Diagram for Income and Type of Housing Insurances

Table 5.5-2 Correlation Coefficient between Income and Type of Housing Insurances

Group		Correlation Coefficient
High Risk	Davis Island	0.562**
	Progress Village	0.652**
Middle Risk	Town 'N' Country	0.664**
Low Risk	Sun City	-0.229

** P < 5%

5.5.1 Potential Moving and Disaster Experiences

Figure 5.5-2 shows scatter diagram of four communities. X axis indicates years of living in the present house and frequency of moving for Y axis. Red circles specify households who answered that willing to move in the near future. As expected, Davis Islands and Progress Village are mainly dominated by long stayers whereas mobile park home in Town 'N' Country and Sun City have relatively more short stayers. Households who have willing to move are concentrated in short stayers particularly less than 5 years living in the present house (Red highlight zone). On the other hand, there is no households who willing to move for long stayers who have lived more than 28 years (Blue highlight zone).

The similar results appeared for non-housing insurance households (Figure 5.5-2 Right). Green squares are plotted for non-housing insurance households on the same diagram. Most of the non-insurance holders congregated in less than 5 years short stayers. A couple of households who have no insurance for longer stayers are house owners under middle flood risk area. Although the non-insurance households include renters in apartments, house owners may be at risk when catastrophic disaster occurs.

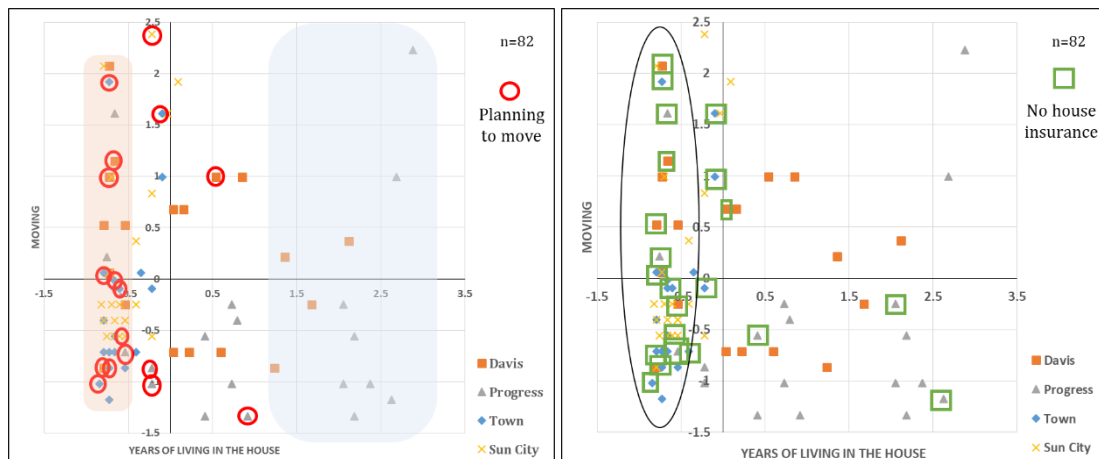


Figure 5.5-2 Scatter Diagrams for Years of Living in the House and Moving Frequency
(Left with households who plans to move; Right households who have no housing insurances)

What are the statistic relationship between potential planning to move and disaster experiences?

Figure 5.5-3 shows the configuration map of the multiple correspondence analysis. The multiple correspondence analysis has been utilized because of the non-quantitative question about future potential moving or settlement. The cumulative contribution rate of the first and second dimensions on Figure 5.5-3 is 69.6%. The questions was asking that whether they are willing to settle at the house as long as possible or they are willing to move in the future. The results indicate that non-disaster impacted households are close to who are willing to stay at the house as long as they can. On the other hand, households who answered willing to move in the future are located near the non-insurance households. Interestingly, households who answered “No idea” locate near more disaster experiences in their past life which implies “trapped” population due to the immobility. Regarding insurance, non-insurance holder households locate close to “willing to move” and “Disaster-1” (Disaster-1 stands for households who have experienced disaster impact at least once in a life, Disaster-3 while Disaster-3 means more than three disaster impacted history). The answer “Stay as long as possible” places near the “Non-disaster” which means households who have no experience of disaster impact in their life. These results are inferred that x-axis would be disaster impacts

histories and y-axis might be potential moving. Thus, the analysis implies that the frequent experiences of disaster impacts and possession of insurances would increase the population mobility.

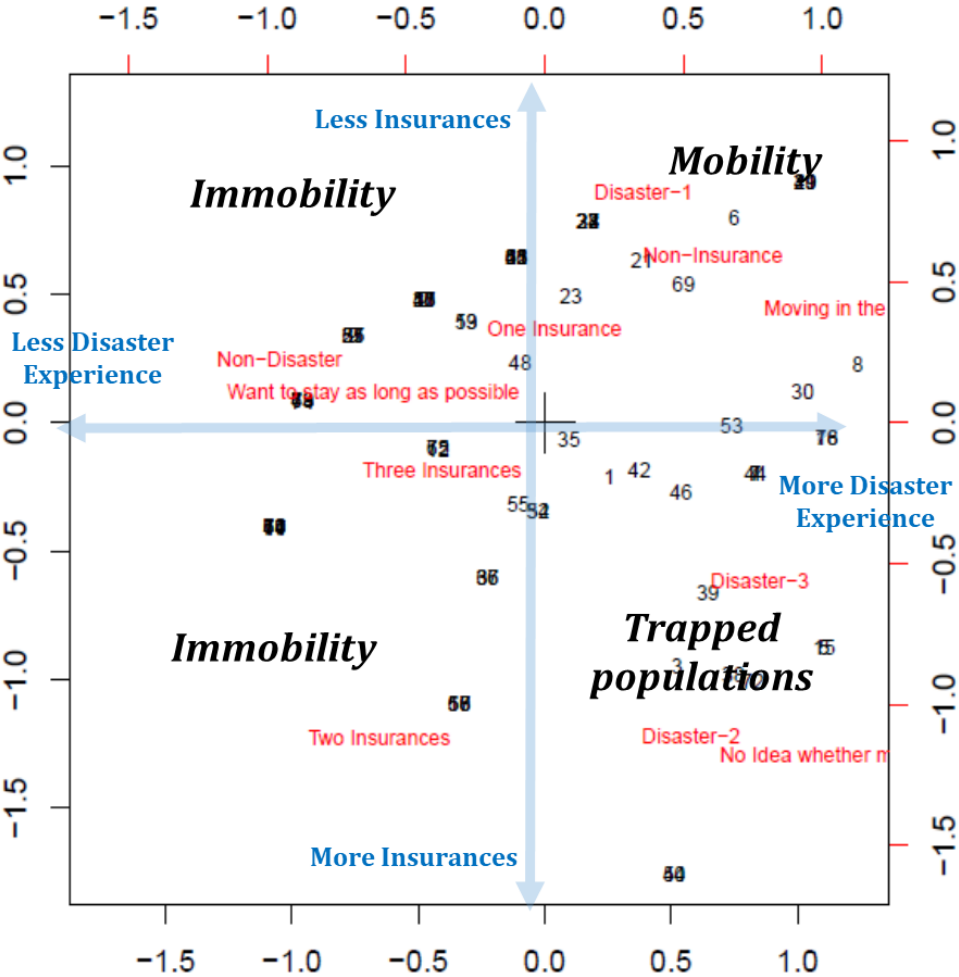


Figure 5.5-3 Configuration Map of Correspondence Analysis for Insurance, Disaster Experiences, and Willing to Move or Not

5.5.2 Social Support, Moving Frequency, and Insurances

Regarding social support in terms of emergency case describes an interesting result. First of all, chi-square test was examined (Table 5.5-3). Particularly years of living at the house has significant difference among variables. Correlation between areas (different risk zones) are not observed, however inversely correlations are detected when the explanatory variables were divided short

stayers (less than 12 years) and long-stayers (more than 13 years) based on the chi-square test into living years of the house (Figure 5.5-4 and Table 5.5-4). It denotes that risks at the living place and the dominant ethnicity are not linking with building channels of social support in this sample. Remarkably, only long-stayers more than 13 years were inversely correlated with social support and moving frequency. It means that more moving would decrease whom you can rely on in case of emergency. The result makes sense that it is not easy to adjust into different social environment when we move into new place. Conversely, households who lived in at the same place would have more chance to build relationship in the community. Interestingly, 75 % of the long-stayers answered that “family”, “friend”, “community”, and “place of worship” as their channels of social support.

Table 5.5-3 Chi-Square Test on Social Support and other Variables

Item	Social Support		
	X ²	DF	P
Years of Living at the House (Less than 12 years or more than 13 years)	15.414	5	0.0000 ***
Lifetime Moving Frequency	7.285	5	0.007
Income	22.456	15	0.0000*
Owning Types of Insurances	15.931	15	0.0000
Plans to migrate	14.177	10	0.0001
Type of the House (House or Mobile)	15.936	5	0.0000 **
Owning or Renting	6.937	5	0.0084

(***<p 1%, **<p 5%, *<10%)

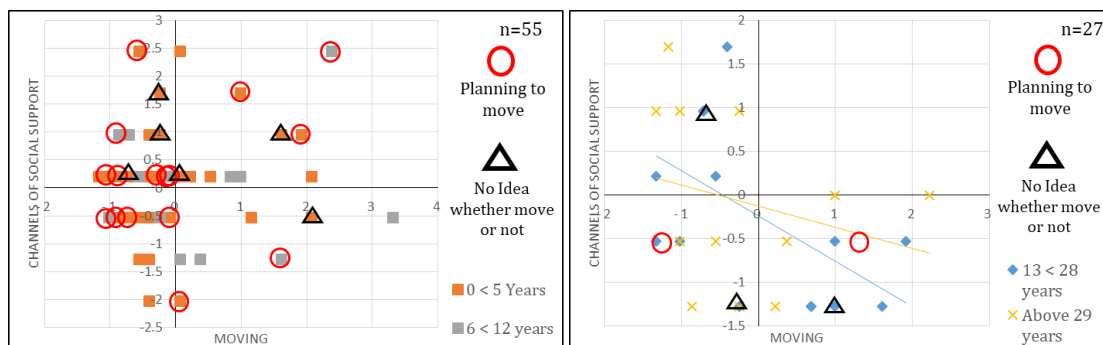


Figure 5.5-4 Scatter Diagram for Channels of Social Support and Moving Frequency

Table 5.5-4 Correlation Coefficient between Income and Type of Housing Insurances

Group		Correlation Coefficient
High Risk	Davis Island	-0.341
Middle Risk	Progress Village	0.023
	Town 'N' Country	0.017
Low Risk	Sun City	0.154
0 > 5 Years		0.222
6 > 12 Years		0.094
13 > 28 Years		-0.548**
Above 29 Years		-0.537**

(** P < 5%)

The multiple correspondence analysis also gives us another dimension about the relationship between channels of social support and insurances. Figure 5.5-5 indicates the configuration map with 71.6% cumulative contribution rate of the first and second dimensions. The left-top group consists of households who are non-insurance holders but have more channels of social support (Social-3). The top-middle group would be resourceful as they have more channels (Social-4) and three insurances. On the other hand, the lower-left group are categorized as short-stayers (6-12 years) and has only one-insurance. Based on the analysis, the x-axis might indicate social mobility and y-axis means more resource options such as insurances and channels of social support.

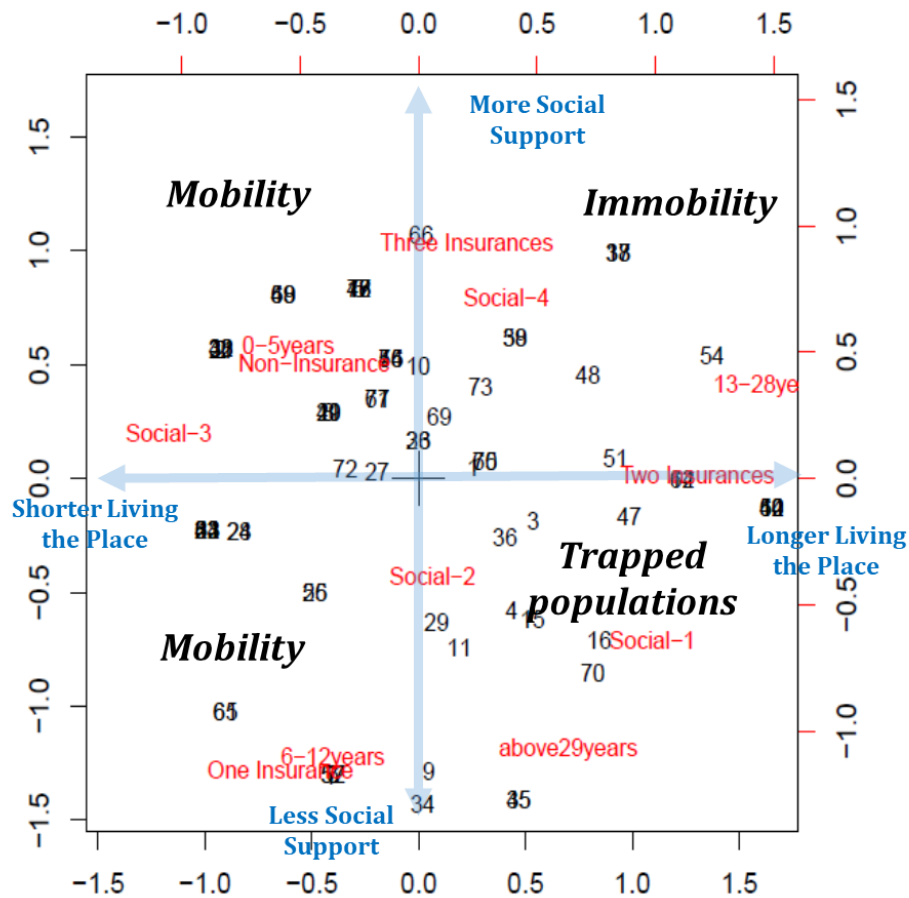


Figure 5.5-5 Configuration Map of Correspondence Analysis for Insurance, Channels of Social Support, and Years of Living in the House

In sum, collected data tells us that the previous experiences such as moving frequency and their life time disaster impact experiences were related with households' risk management strategies which bifurcated into two; risk hedge by insurances particularly short-stayers or building channels of social support for long-stayers. The substratum of the bifurcation was solvent and their financial capability rather than place of living or difference of ethnicity.

5.6 Discussion: Trade-off Relations between Insurance and Social Support

The results describe different strategies for short-stayers and long-stayers whether risk hedge by insurances or relying on social support. The high social mobility group characterized themselves as

higher income, more moving frequency, and coping risk by multi-possession of insurances. They are able to live in high-risk zone because of the resourcefulness or living in safer place at less potential risk of natural disasters. Short-stayers particularly low-income group, on the other hand, has no capability for insurance but they utilize channels of social support instead. However, our results implies that disasters could be a factor of push mechanism of social mobility as correspondence analysis specifies that non-insurance holders are willing to move in the future. Although migration is one of strategy for risk hedge, their social support might be lessened due to the cut off by the local networks as our results revealed. Past literatures also support that migration or displacement induced by natural disasters cause of fabrics of human networks globally (Shiozaki et al., 2007; Mitchell, et al., 2012; Hamideh, S., & Rongerude, J, 2018).

Insolvent households who dropped financially out of risk hedge scheme are unwillingly pushed into migration in peace time or displacement in post-disaster phase, and might lose social support too. In other words, the insolvent households are exposed not only natural disasters but also capitalized risk in terms of financial capacity which enables to secure supposedly in neoliberal society. O'Hare et al. (2015) also pointed out that risk transfer produces maladaptation cycle which locks the system in a paradox because of the short-term restoration pressure, and as a result, insolvent households are excluded in a spontaneous manner. However, the poor has not been vulnerable population at all the time. Developing and maintaining channels of social support seems survival strategies for the relatively lower-income households in this research. Place of worship such as church in our samples plays central role as the local fabrics from the peace time. The idea of "Place of attachment" or participation in local voluntary organizations in past literature (Cutter et al., 2010; Skerratt, 2013; Lee & Fraser, 2019) harmonizes this results since place of worship enable local citizens to participate in social interactions to build channels of social support at small scale.

Table 5.6-1 shows comparative strategies on each identified group in the sample. As mentioned

above, households who have financial capacity and high mobility are relatively short-stayers. They are exposed at natural disaster risk as well as capitalized risk because financial capacity is the fundamental lifeline for them. On the other hand, long-stayers who are relatively immobility are relying on social support due to the lack of solvent for insurance. A group of repeating migration also short-stayers but low resourcefulness. They are facing capitalized risk but avoiding natural disasters through the repeating migrations. These three strategies are overlapping rather than clear separation based on life stage and financial capacity.

Table 5.6-1 Variations of Strategies on Each Category

<i>Strategy</i>	<i>Characteristics</i>	<i>Exposure</i>
Individualized Coping by Insurances	Short-Stayers and high mobility	Natural Disasters and Capitalized Risk
Relying on Social Support	Long-Stayers and immobility	Natural Disasters
Repeating Migration	Short-Stayers and low resourcefulness	Capitalized Risk
Less Options: Less insurance and lower social support	Trapped population who do not know whether stay or move	Natural Disasters with high social vulnerability

5.7 The Way Forward

Our data shows that groups of short-stayers especially who have lived at the same place are willing to move again with high mobile capacity while long-stayers who have lived more than 29 years would be considered as immobile populations as they wish to stay as long as they can at the present location. The long-stayers again divided two groups who has more channels of social support, and trapped populations who have less option whether they stay or migrate. Financial capability is critical for those who repeating migration and short-stayers because they are exposed to natural hazards as well as capitalized risk. The long-stayers also exposed to capitalized risk, but social support is the central strategy to deal with natural hazards even though their financial capacity is lower than high mobile populations. If they get in trouble of the financial management, they fail into

trapped populations.

For the next step of the research, the density of social support needs to be examined. Even though one household answer that they have single channel of social support, the strong connection might be reliable than a couple of weak ties. Moreover, human immobility and trapped populations in post-disaster phase would also be required to identify how those immobile and trapped populations reacts to negative disturbances.

Reference

- Adams, H. (2016). Why populations persist: mobility, place attachment and climate change. *Population Environment*, 37, 429-448.
- Adger, W.N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, 79(4), 387-404.
- Adger, W.N., Pulhin, J.M., Barnett, J., Dabelko, G.D., Hovelsrud, G.K., Kevy, M., Oswald Spring, U., & Vogal, C.H. 2014. Human security. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., Barros, V.R., Dokken, D.J., Mach, K.J., Mastrandrea, M.D., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., Girma B., Kissel, E.S., Levy, A.N., MacCracken, S., Mastrandrea, P.R., and White, L.L. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp.755-791.
- Aldrich, D.P. (2012). *Building resilience: Social capital in post-disaster recovery*. Chicago: The University of Chicago Press.
- Arena, J. (2012). *Driven from New Orleans: How nonprofits betray public housing and promote privatization..* Minneapolis MN: University of Minnesota Press.
- Baum, L.E. (2016). Neighborhood perceptions of proximal industries in Progress Village, FL. *Graduate Thesis and Dissertation*. Available at <http://scholarcommons.usf.edu/etd/6180>
- Black, R., Arnell, N.W., Adger, W.N., Thomas, D., & Geddes, A. (2013). Migration, immobility and displacement outcomes following extreme events. *Environmental Science & Policy*, Special Issue 27, 32-43.
- Cohen, S., & Wills, T.A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, 98(2), 310-357.
- Collins, J., Ersing, R., & Polen, A. (2017). Evacuation decision-making during Hurricane Matthew: An assessment of the effects of social connections. *Weather, Climate, and Society*, 9, 769-776.
- Collins, J., Ersing, R., Polen, A., Saunders, M., & Senkbeil, J. (2018). The effects of social connections on evacuation decision making during Hurricane Irma. *Weather, Climate, and Society*, 10, 459-469.
- Covington, J.W. (1978). The story of Davis Islands 1924-1926, *Sunland Tribute*, 4(5). Available at: <http://scholarcommons.usf.edu/sunlandtribune/vol4/iss1/5>
- Cutter, S.L., Burton, C.G., & Emrich, C.T. (2010). Disaster resilience indicators for benchmarking baseline conditions. *Journal of Homeland Security and Emergency Management*, 7(1), 1-22.
- Deryugina, T., Kawano, L., & Levitt, S. (2014). The economic impact of hurricane Katrina on its victims: Evidence from individual tax returns. *Nber Working Paper Series, Working Paper 20713*. Cambridge,

- MA: National Bureau of Economic Research.
- Dynes, R.R. (2002). *The importance of social capital in disaster response*. University of Delaware Disaster Research Center Preliminary Paper, No.327. University of Delaware
- Foresight. (2011). *Migration and global environmental change: Future challenges and opportunities. Final Project Report*. London: Government Office of Science.
- Freeman, A.C., & Ashley, W.S. (2017). Changes in the US hurricane disaster landscape: the relationship between risk and exposure. *Natural Hazards*, 88, 659-682.
- Freeman, L. (2005). Displacement or succession? Residential mobility in gentrifying neighborhoods. *Urban Affairs Review*, 40, 463-491.
- Frey, W.H. (2009). *The great American migration slowdown: Regional and metropolitan dimensions*. Metropolitan Policy Program at Brookings, Washington D.C., U.S.
- Fussell, E., Curtis, K.J., & DeWaard, J. (2014). Recovery migration to the city of New Orleans after Hurricane Katrina: A migration systems approach. *Population Environment*, 35(3), 305-322.
- Fussell, E. (2015). The long term recovery of New Orleans' Population after Hurricane Katrina. *American Behavior Science*, 59(10), 1231-1245.
- Goetz, E.G. (2011). Where have all the towers gone? The dismantling of public housing in U.S. *Journal of Urban Affairs*, 33(3), 267-287.
- Graham, L. (2012). Razing Lafitte: Defending public housing from a hostile state. *Journal of the American Planning Association*, 78(4), 466-480.
- Hamideh, S., & Rongerude, J. (2018). Social vulnerability and disaster recovery decisions: public housing in Galveston after Hurricane Ike. *Natural Hazards*, 93, 1629-1648.
- Hino, M., Field, C.B., & Mach, K.J. (2017). Managed retreat as a response to natural hazard risk. *Nature Climate Change*. DOI: 10.1038/NCLIMATE3252
- Holt-Lunstad, J., & Uchino, B.N. (2015). Social support and health. In Glanz, K., Rimer, B.K., and Viswanath, K. (Eds.), *Health Behavior: Theory, Research, and Practice* (5th ed.). John Wiley & Sons. Inc. U.S.
- International Organization for Migration. 2008. *Migration and climate change. IOM Migration Research Series*. International Organization for Migration. Geneva: Switzerland.
- Ikeuchi, H., & Fujiwara, T. (2000). The effects of loss of material possessions and social support network on the quality of life (QOL): The Great Hanshin Earthquake victims. [In Japanese] *Japanese Journal of Social Psychology*, 16(2), 92-102.
- Iuchi, K. (2014). Planning resettlement after disasters. *Journal of the American Planning Association*, 80(4), 413-425.
- Kimura, R., Hayashi, H., Tatsuki, S., & Urata, Y. (1999). Clarifying the human behavior of the disaster victims after the Great Hanshin-Awaji earthquake. [In Japanese]. *Journal of Social Safety Science*, 1, 93-102.
- Kondo, T. (2018). Planning challenges for housing and built environment recovery after great east Japan earthquake: Collaborative planning and management go beyond government driven redevelopment projects. In Santiago-Fandino et al. (Eds.), *The 2011 Japan Earthquake and Tsunami: Reconstruction and Restoration, Advances in Natural and Technological Hazards Research*. Springer International Publishing.
- Lin, N. (1999). Building a network theory of social capital. *Connections*, 22, 28-51.
- Lee, J., & Fraser, T. (2019). How do natural hazards affect participation in voluntary association? The social impacts of disasters in Japanese society. *International Journal of Disaster Risk Reduction*, 34, 108-115.
- Marshall, N.A., Park, S.E., Adger, W.N., Brown, K., & Howden, S.M. (2012). Transformational capacity and the influence of place and identity. *Environmental Research Letters*, 7 034022, doi:10.1088/1748-9326/7/3/034022
- Mayunga, J.S. (2007). Understanding and applying the concept of community resilience: A capital-based approach. *A draft working paper prepared for the summer academy for social vulnerability and resilience building*, Munich, Germany

- McCally, D. (1992). Sun City Center: Something new under the sun. *Tampa Bay History*, 14(1), 31-43.
- Mitchell, C.M., Esnard, A.M., & Sapat, A. (2012). Hurricane events, population displacement, and sheltering provision in the United States. *Natural Hazards Review*, 13(2), 150-161.
- Nakagawa, Y., & Shaw, R. (2004). Social capital: A missing link to disaster recovery. *International Journal of Mass Emergencies and Disasters*, 22(1), 5-34.
- National Hurricane Center. (2018). *National hurricane center tropical cyclone report, Hurricane Irma*. National Hurricane Center.
- O'Hare, P., White, I., & Connelly, A. (2016). Insurance as maladaptation: Resilience and the 'business as usual' paradox. *Environment and Planning C: Government and Policy*, 34(6), 1175-1193.
- Perry, M.J. (2006). *Domestic net migration in the United States: 2000 to 2004*. Current Population Reports, U.S. Census Bureau.
- Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, 24, 1-24.
- Shiotani, Y. (2014). The negative impact of psychological encouragement as enacted social support on the mental health on lightly damaged victims of the Great East Japan Earthquake. [In Japanese] *Japanese Journal of Social Psychology*, 29(3), 157-169.
- Shiozaki, Y., Tanaka, M., Meguro, E., & Horita, Y. (2007). Study on the change of characteristics of residential space and the social "isolation" of residents of the disaster restoration public housing. [In Japanese] *Journal of Architecture and Planning*, 611, 109-116.
- Skerratt, S. (2013). Enhancing the analysis of rural community resilience: Evidence from community land ownership. *Journal of Rural Studies*, 31, 36-46.
- UNDP. (2009). *Human development report 2009. Overcoming barriers: Human mobility and development*. New York: UNDP.
- Yun, S.D., & Waldorf, B.S. (2016). The day after the disaster: Forced migration and income loss after hurricane Katrina and Rita. *Journal of Regional Science*, 56(3), 420-441.

Chapter.6

Discussion: Similarity and Dissimilarity in Multiple-Case Study

6.1 Introduction

This chapter aims to extract similarity and dissimilarity on structure and agent model from the case studies in Myanmar and U.S. As mentioned in chapter 1, multiple-case study requires analysis on cross-case conclusions⁸¹. First, extracted evidence and conclusions from chapter 2 to 5 are reviewed and summarized. Then, structure and agent model is examined in order to identify similarity and dissimilarity as a cross-case analysis.

6.2 Evidence from Each Chapter

6.2.1 Summary of the Chapter 2

In Chapter 2, as the structure study, legislation for DRR were examined mainly in Japan and U.S. Four times changes in the DRR policy system were recognized in at least 25 years in U.S., and the evolution of PDRP as a proactive measures was observed. However, the usefulness of the PDRP has not been verified in both Japan and U.S. because of the non-devastating disasters. Furthermore, it was shown that it is necessary to consider diversion of PDRP not only for earthquake and tsunami but also for meteorological hazards in Japan.

6.2.2 Summary of the Chapter 3

In Chapter 3, as the first agent study, recovery strategies at the household level in the rural flood-prone area of Myanmar was studied. There was a clear difference between protected villages by dyke and unprotected village. The villagers living in unprotected side have built elevated-floor houses, while the villagers in protected side have lived in the lower floor height houses, and their livelihood depending on non-flood resistant plants. From the above, villages outside the dike continued to change their houses and livelihoods to adapt to floods, whereas risk was

⁸¹ Yin, (2018), p.58, SAGA Publications, Inc.

underestimated for villagers in protected side.

6.2.3 Summary of the Chapter 4

In Chapter 4, as a structure study in U.S., a comparative study in three municipalities, Hillsborough County, City of Panama City, and Palm Beach County, was conducted in order to identify the 10 years results of PDRP in the State of Florida. Results show that the independence the “recovery preparation plan” from the PDRP was observed in two municipalities, and Local Mitigation Strategy (LMS) functions as a promoting DRR mitigation. Those two plans play critical roles as mitigation in peace time as well as preparation of recovery because when PDRP will be updated, new data from LMS can be transferred to PDRP.

6.2.4 Summary of the Chapter 5

In Chapter 5, as an Agent study in Florida, U.S., this study was conducted in four residential districts in Hillsborough County, in which suffered damage from Hurricane Irma in 2017. Residents in high-mobility and high-risk areas have multiple home insurances as a risk hedging strategy, while households living in newly designated flood risks area have less or non-insurance ownership. The results show that two different type of mobile populations; first one are more resource in terms of income and insurance; and the other is relatively low income households who repeating moving in their lifetime. It became clear that long-term residents in the group with low insurance ownership have more social support which functions as a non-financial strategy.

6.3 Cross-Case Analysis

Table. 6.3-1 shows the matrix of cross-case analysis for segregation of similarity and dissimilarity on structure and agent model. Author identified that stepwise evolution of structure in case of

Myanmar and Florida are common finding, although there was huge gap between initiative holders in each case. In terms of agent perspective, embankment and insurance function as brain freeze which conceptualized by Arendt (1978) are observed as similarity. On the other hand, placelessness is an exceptional finding in case of Florida especially who are considered as high social mobile households. The detail of the each findings are explained following.

Table 6.3-1 Matrix for Cross-Case Analysis

	<i>Similarity</i>	<i>Dissimilarity</i>
<i>Structure</i>	Stepwise evolution	Disparity of initiative and self-organization
<i>Agent</i>	Construct Ignorance and Implanted Risks	Placelessness in high social mobility

(Source: Author)

6.3.1 Similarity on Structure: Stepwise Evolution

Finding similarities between extreme different structures in Myanmar and U.S. is not an easy task, though stepwise evolution of DRR activities are sharing issue. As observed in chapter 2, the DRR legislation in United States was evolved stepwise through experiences of the natural and human-induced disasters. Similarly in Myanmar, though it is happened at the smallest scale, flood impacted villages are organizing their own DRR committee in post-disaster phase.

6.3.2 Dissimilarity on Structure: Disparity of Initiative and Self-Organization

Nevertheless the lack of legislation in national, regional, and municipality levels, coping capacity and organizational activities at village and village tract level are developed in post-disaster phase. It means that initiative of DRR are grasped as bottom-up approach. In other word, self-survivability is a critical factor rather than structure development at this phase.

On the other hand, structure in Florida State as observed in chapter 4, citizens' participation was limited in three municipalities of case study. One of the cause stemmed from the high social mobility in Florida. If residents in neighborhood has been replaced frequently, the function of self-

organization would be weakened or deteriorated because the relationship between self-organization and the years of living at the same place has positive correlation in terms of local disaster risk reduction and attached with local voluntary organizations (Yamada, 2012; Lee & Fraser, 2019).

The difference between two case studies are attributed from the considered as the dissimilarity of self-organization. Eizenberg (2018) categorize self-organization into three types (Table 6.3-2), and argues that disenfranchised groups are “outcasts of the planning system”⁸² and their motivation is survivability and necessity. The categorization fits to case of Myanmar in our analysis as their space of participation has been closed at the municipality level, while decision-making within a group was strong enough to cope with natural disaster for their survivability. On the other hand, case in Florida seems *Ordinary* because the groups are “varied in their socioeconomic background” and “share a community-oriented interest”⁸³. However, one of huge gap between case in Florida and *Ordinary* group is the replacement of the residents, therefore, collective action for consensus building has been difficult. The self-organization in Florida does not reach to Powerful group which facilitate their interests into planning system due to the replacement of the residents and the non-structured neighborhood. As a result, planning of PDRP did not involve citizens directly, and most of the respondents on questionnaire in chapter 5 also do not know what PDRP is⁸⁴. In sum, initiative to develop structure was institutional-oriented due to the lack of self-organization in Florida whereas direct involvement in Myanmar because of the lack of institutional interventions.

⁸² Eizenberg, 2018 p.49, *Planning Theory*

⁸³ Eizenberg, 2018 p.49, *Planning Theory*

⁸⁴

Table 6.3-2 Categories of Self-organization

Category	The group character	Formal-informal	Spaces of participation (based on Miraftab)	Main motivation (goals)	Essence of practice	Position of planning institution
A	Disenfranchised	-	Closed	Necessity	Space production	Ignores/ Legalizes
B	Ordinary	+	Invented	Community/ Collective	Space conception	Negotiates/ Collaborates
C	Powerful	++	Invited	Entrepreneurial	Space consumption/ Exchange	Facilitates/ Restrains

(Source: Eizenberg, 2018)

6.3.3 Similarity on Agent: Constructed Ignorance and Implanted Risk

Ignorance of risk is not simply lack of knowledge or lack of awareness. Tierney (2014) argues that natural hazard risks are produced in society and ignoring risk due to the concentration of economic development (Tierney, 2017). Proctor (2008, p3) categorizes ignorance into three types; “ignorance as native state (or resource), ignorance as lost realm (or selective choice), and ignorance as a deliberately engineered and strategic ploy (or active construct)”. The case in Myanmar in chapter 3 demonstrates that villagers who live in protected side are considered ignoring risk because their houses and livelihood are vulnerable in case of destroying dyke. The ignorance seems selective choice as it stems from the dyke construction since it has been out of their hands. The villagers need to face such uncertainty and unpredictable risk, but they can do nothing to change their built-environment. Such risk, termed implanted risk which reshape human behavior by artificial product (or structure) embedded in built-environment, has been a potential threats for the villagers in protected side.

Similarly, case in U.S. of chapter 5 tells us that multi-insurance holders for immobile households utilize risk transfer in terms of finance. Purchasing insurances might be proactive countermeasures against risks, though such risk transfer also may fail into momentary ignorance of risks. As O’Hare et al (2016) pointed out that the nature of insurance which tends to build back does not function as

adaptation because the insurance aims “business as usual”. Living at coastal area or high risk zones where require multiple insurances, the wealthy seems protected by insurances, as similar as the dykes, but the insurance which embed the implanted risk into their households. Such implanted risk does not threat directly and immediately to those who are in ignoring risk, but there is hidden vulnerability in case of rare events.

6.3.4 Dissimilarity on Agent: Placelessness

A critical dissimilarity between two cases on agent analysis is place attachment in their neighborhoods. Group of mobile households who are repeating migration in their lifetime seems less attachment in the neighborhood based on the results of limited social support in case study in Florida, U.S. If a household repeats migration with short intervals, it seems difficult to cultivate the attachment in each place. Placelessness is a term that “involves detachment from the particularity of places” (Relph, 2016). Trapped populations, who wish to move but cannot, have lived at the same place, yet the situation fits into placelessness. Even though they stay there for a long, living with less social support means detachment from the communities.

This placelessness was not observed in case of Myanmar because of the dependence of primary industry over the centuries and the local-intra economic. As indicated in chapter 3, villagers have lived in the unprotected area more than three generations, and their main source of income is beans and mats made by reeds. Their ancestral land has produce benefits for landlord as well as tenant farmers. The tenant farmers received raw materials from landlord and even lower income households are working to produce mat as a repayment for their debts as observed in chapter 3. Such low intra-economic maintains the visual relationship among villagers in unprotected area, and single living household and widows also involved in the working in the villages. Hence, it is difficult to find placelessness in the sample of case in Myanmar.

Reference

- Eizenberg, E. (2018). Patterns of self-organization in the context of urban planning: reconsidering venues of participation. *Planning Theory*, 18(1), 40-57.
- George, A. L., & Bennett, A. (2005). *Case studies and theory development in the social science*. Cambridge: MIT Press.
- Lee, J., & Fraser, T. (2019). How do natural hazards affect participation in voluntary association? The social impacts of disasters in Japanese society. *International Journal of Disaster Risk Reduction*, 34, 108-115.
- O'Hare, P., White, I., & Connelly, A. (2015). Insurance as maladaptation: Resilience and the 'business as usual' paradox. *Environment and Planning C: Government and Policy*, 34(6), 1175-1193.
- Proctor, R.N. (2008). Agnotology: A missing term to describe the cultural production of ignorance (and its study). In Proctor, R.N., & Schiebinger, L. (Eds.), *Agnotology: The making & unmaking of ignorance*, pp.1-36. Stanford, CA: Stanford University Press.
- Relph, E. (2016). The paradox of place and the evolution of placelessness. In Freestone, R. Liu, E (Eds.), *Place and placelessness revisited*, pp.20-34. NY: Routledge.
- Tierney, K. (2014). *The social roots of risk: Producing disasters, promoting resilience*. California: Stanford University Press.
- Tierney, K. (2019). *Disasters: A sociological approach*. Medford, MA, Polity Press.
- Yamada, T., and Karatani, Y. (2012). Analysis on relationship between acceptance of flood risk and activities for disaster reduction in a flood-prone area [In Japanese]. *Journal of Japan Society for Natural Disaster Science*, 30(4), 441-453.
- Yin, R.K. (2018). *Case study research and applications: Design and methods*. (6th ed.). S. California: GA Publications, Inc.

Chapter.7

Conclusion and the Way Forward

7.1 Conclusion: Mobility and the Trade-off

In this study, multiple-case study in the extremely different cases in the Myanmar Delta rural area, and Florida where are weather-related disaster-prone areas with and without DRR policy systems, was administrated in order to identify trade-off relationship on the mobility of disaster survivors. Although the past literatures have suggested that mobility and resources have a positive correlation and vulnerability has an inverse correlation, households that do not have resources and move repeatedly are observed as high mobile households as a different type of the mobility. In addition, as immobile groups in Florida cannot depend on resources, they have relied on social support that is not exchanged in the monetary economy as the same as villagers in unprotected area. Furthermore, as a common feature of groups with hidden vulnerabilities in both cases, construct ignorance is for villagers in protected side and trapped populations in Florida were observed due to the implanted risk (social embedded risk). Such ignorance arises passively because individual approach cannot solve the issue of dykes or financial capability for the vulnerable populations. Especially those who are trapped populations and mobile populations in Florida, they are at risk of placelessness due to the loss of place attachment. What they are gain when they move or migrate, we need to know what we are losing in which cannot be bring out because of the place attached.

7.2 Conceptual Model of Human Mobility and its Trade-Off Relation

Figure 7.2-1 describes a conceptual model of human mobility and its trade-off relation based on the past literature and the results of this study. The ability to move and vulnerability have two different peaks for the wealthy and the poor. The two different moving ability are totally different causes that willing to move or unwillingly moving frequently without financial resources such as non-insurance holders in case of Florida.

Resources and capitals are divided into natural and financial as we observed that indigenous risk

avoidance was performed in unprotected side of Myanmar case. Some of villagers have both natural and financial resources such as timber homes with larger farmland as a landlord. Also immobile populations in case of Florida has medium income level and wish to stay as long as possible, therefore, immobility locates at the middle of the resources. Finally, trapped populations could be designated for lower ability to move due to the isolation from the resource and capital.

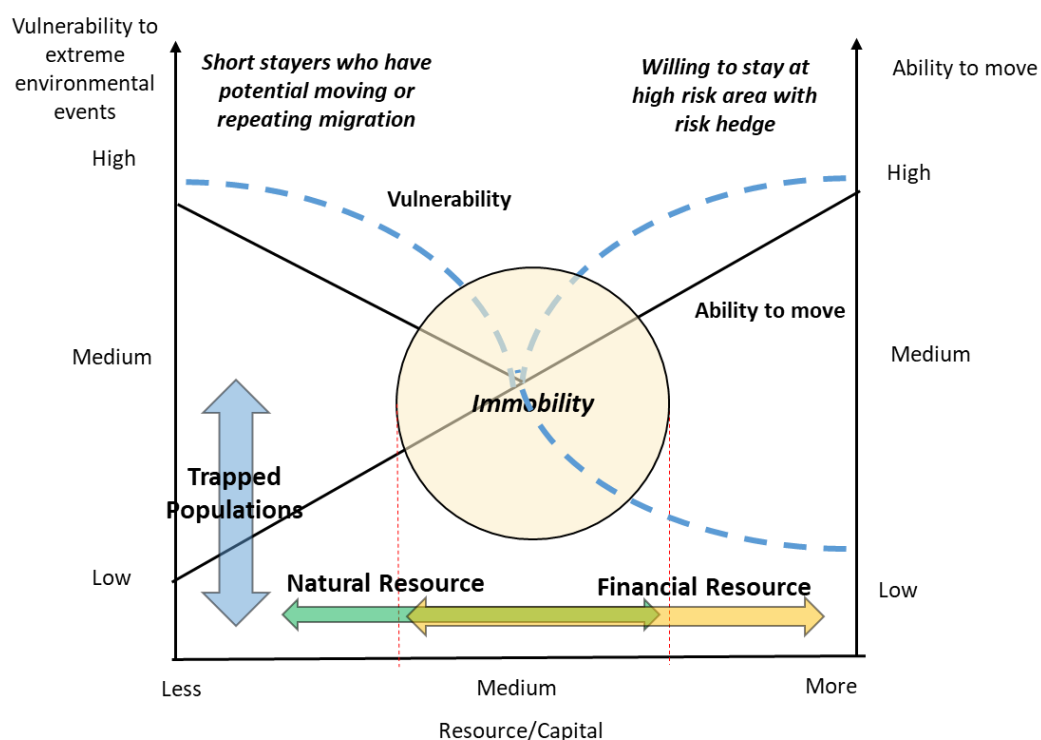


Figure 7.2-1 Revised Vulnerability and Ability to Move
(Author based on Foresight, 2011)

Figure 7.2-2 shows the distribution of the groups who found in the study. As we observed in chapter 4, villages in Myanmar are relatively lower mobility than people in Florida. Villagers in unprotected side are facing annual floods and sometimes the height of inundation water reaches to 2 meter, but still they are adapting. Those who lived in timber houses and owned farmlands have natural resources as well as financial resources, therefore unprotected group locates at immobility.

On the other hand, villagers living in protected side are at risk in case of rare extreme event as a trigger of breaking dykes. Both of groups are allocated left side, which means lower financial resources but have natural resources, low mobility, and medium. As we observed in chapter 5, there were two types of mobility in case of Florida, one hand was higher income, and the other hand was repeating migration due to low resourcefulness. Also immobile households, who have more channels of social support with medium resources should be located at the center. Finally, trapped populations who are low resourcefulness and low mobility locates left lower side which indicates isolated from capitals and resources.

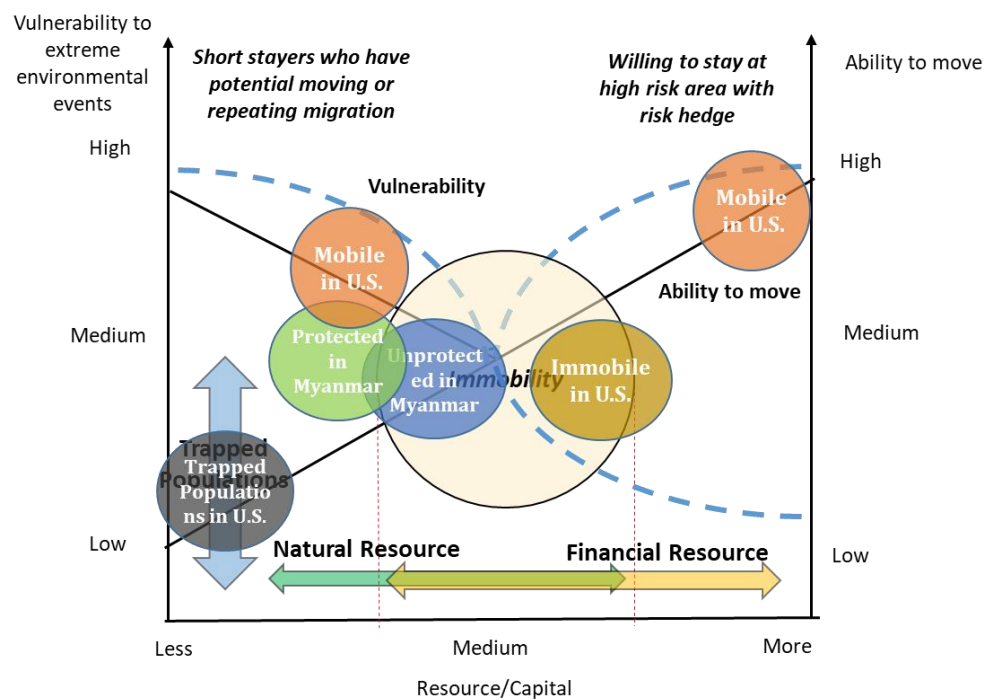


Figure 7.2-2 Distribution of Each Group on the Revised Vulnerability and Ability to Move
(Author based on Foresight, 2011)

7.3 Needs of Policy Intervention for Trapped Populations

The identified policy gap is a group of trapped populations in Figure 7.2-2. Migrants and displaced populations draw more global attention especially political refugees or environmental displacement

but trapped populations are falls into placelessness. One of potential approaches is building social support which we observed in chapter 5. Social support for the immobile population are mainly family, friend, and place of worship, but other stakeholders such as NPOs and NGOs would be another resources for trapped populations. A task for the institutional bodies requires connection informality to formal structure as we figured out in chapter 2.

7.4 The Way Forward

7.4.1 Design of Policy Incentives for Precautionary Principle

For the way forward, two specific research topics should be deepen. First, policy perspective on precautionary approach requires more examination to answer those questions: what kind of incentive and disincentive for middle and basic municipalities are needed to ensure precautionary approach on recovery preparation, and how we can balance the intervention and freedom of individuals on disaster recovery especially mobility in post-disaster phase. First question contains that the sense of two complement functions on LMS and PDRP that enhance recovery preparation and disaster mitigation in peace time. For instance, a system that the recovery fund is given to municipalities if they completed planning of LMS and PDRP, might be controversial issue in Japan. It would be, but such discussion should be started as the national population and revenue is decreasing while disasters are increasing. The second question has deeper root of society. The balance of regulations and freedom is a classic debate for history, and human mobility is a basic right for human being. We need more research and data to prove the relation of human mobility and recovery so that typology of disaster recovery based on the society could be described.

7.4.2 Pluralities of Place Attachment by Mobility

In this dissertation, trade-off relationship on mobility was mainly focused, though there might be

positive perspective of mobility related with place attachment. Antonsich (2010) argues that plurality of belonging is an emerged concept in age of mobility especially for middle-class households. Plural belonging means “plurality of scales” and “plurality of forms of belonging” (Antonsich, 2010, p.653). Tomaney (2016) indicates that “elective belonging” is a symbolic form of belonging in age of mobility. Elective belonging means the “select places to live before putting down roots in order to ‘be at home’” (Tomaney (2016, p.98). The term implies that people try to find final home through the repeating migration. As a result, a person could realize their attachment to several places. Such pluralities of place attachment would have research potential for urban societies and recovery policies.

7.4.3 Expanding the Model with Gradation of Mobility

This study focused only on two extreme cases in Myanmar and Florida, U.S., however, human mobility has more gradations and diversity. Further research is needed to describe the variations of human mobility and disaster recovery in other countries, communities, and different types of place attachment. Such additional works enrich the expansion of the model which suggested above. The expanded model might show the dynamism that how urban development impacts on human mobility and what we should not miss by the mobility. We need more studies.

Reference

- Antonsich, M. (2010). Searching for belonging-An analytical framework. *Geography Compass*, 4/6, 644-659.
- Foresight. (2011). *Migration and global environmental change: Future challenges and opportunities. Final Project Report*. London: Government Office of Science.
- Tomaney, J. (2016). Insideness in an age of mobilities. In Freestone, R. Liu, E (Eds.), *Place and placelessness revisited*, pp.95-107. NY: Routledge.

Appendix

Appendix A: Summary of the Result in Myanmar

Unprotected Side (Outside)		Village A		Village C		Typical House/Livelihood Appearance	
House Type		Timber	Bamboo	Timber	Bamboo		
Disaster Impact	Flood Damage	No casualties or injury, but mainly bamboo houses are inundated for about two months.				 	Flood in village AFlood in village C
		Above the floor (except for two houses)	Five destroyed, and all others are above floor level	Over the floor (except for three houses)	Five destroyed, and all others are above floor level		
Housing	Ave. Floor Height	1748.5 mm		2,130 mm		 	Elevated timber houseElevated bamboo house
		1,822.7 mm	1,008.6 mm	2,290 mm	1935.6 mm		
	Ave. Years Living in the village	72.7% are more than three generations	66.7% are more than three generations	100% are more than three generations	77.8% are more than three generations		
	Avg. Age of Built House	11.25 Years	7.33 Years	9.0 Years	4.39 Years		
Livelihood ⁶⁵	Avg. Income (Monthly)	279,091 Kyat	116,111 Kyat	320,909 Kyat	118,333 Kyat	 	Weaving matFinished product
	Avg. Size of Owned Farmland	3.41 AC	0.22 AC	11 AC	0 AC		
	Paddy Rice	2 ⁶⁶	None	None			
	Beans	8	None	11	1		
	Betel Vine Leaves	None		None			
	Mat Weaving	4	5	11	9		
Community Activities	Education	Primary/Middle school in the village is shared with village B and transportation is provided by villagers' boats.		Vulnerable school was closed due to the inundation in 2015 and 2016. Villagers tried to rebuild with help from local and international donors.		 	School in Village A in monsoonSchool in Village C in monsoon
	Transportation	All timber house owners have boats for transportation in monsoon, and voluntary use is provided for local people, esp. for those commuting to school.					
	Disaster Risk Management	Not only elevation of the house but evacuation over the dyke is another strategy.		Adaptation strategy involves elevated housing and evacuation to the monastery.			
Protected Side (Inside)		Village B		Village D		Typical House/Livelihood Appearance	
House Type		Timber	Bamboo	Timber	Bamboo		
Disaster impact	Flood Damage	None		None (Flood occurred in 1997. All houses were flooded higher than the floor).		 	Dyke near village BEmergent lake after flood in 1997 in village D
Housing	Avg. Floor Height	955 mm		867.5 mm			
		984 mm	991.1 mm	1,071 mm	799.7 mm	 	
	Avg. Years Living in the Village	70% are more than three generations	88.9% are more than three	62.4 Years	44.9 Years		

⁶⁵ Number of households.

⁶⁶ Two households cultivate paddy inside of the dyke.

			generations			Timber house	Bamboo house
	Avg. Age of the Built House	12.8 years	15.4 years	15.8 years	6.5 years		
Livelihood	Avg. Income (Monthly)	197,000 kyat	183,333 kyat	166,000 kyat	121,533 kyat	 	Betel vine farm Finished betel product
	Avg. Size of Farmland Owned	0.6 AC	0.22 AC	1.1 AC	1.07 AC		
	Paddy Rice	None	1	2	3		
	Beans	1	1	1	1		
	Betel Vine	6	4	4	10		
	Weaving Mat	None	2	None	2		
	Others	Six (teacher, government officer, etc.)	One (barber)	None	Four (fishery, government officer, etc.)		
Community Activities	Education	Going to school in Village A		Children go to another village school located inside of the dyke			Collective transportation activities
	Transportation	Three boats in the village		Two boats in the village			
	Disaster Risk Management	Focuses on dyke monitoring by the volunteers in the monsoon season and alternates among villagers, but only inside of the dyke.		Focuses on dyke monitoring in the monsoon season by volunteers. Maintains both sides because of no village on the other side.			

Appendix B: Overall Result of the Survey in Myanmar

Village Name	Control#	Age	Gender	Occupation	Size of Farm Land(AO)	Seasonal jobs	Income in a month (Ave)	Number of Household	Years stay in this village	Years of the built house	Type of House	Height	Owning or renting house
Village A: Luk Chang East Village (Outside)	1	43	Male	Farmer	4	Paddy inside dyke, and beans outside dyke.	25000	4	more than 100 years	2	Timber	2130	Owning
	2	64	Male	Daily labor	0	mat.	40000	5	more than 100 years	2	Bamboo	1980	Owning
	3	61	Male	Farmer	4	Beans, Mat.	35000	6	22 years	8	Timber	2065	Owning
	4	55	Male	Daily labor	0	Mat.	10000	2	more than 100 years	27	Ming	1470	Owning
	5	53	Male	Daily labor	0	mat.	95000	5	since born	8	Timber	1410	Owning
	6	37	Male	Shop, Daily labor	0	Labor Service	100000	4	more than 80 years	1	Bamboo	1720	Owning
	7	45	Male	Daily labor	0	Labor Service	15000	4	more than 100 years	5	Bamboo	1430	Owning
	8	33	Male	Farmer	10	Paddy and beans	275000	6	35 years	8	Timber	1700	Owning
	9	30	Male	Daily labor	0	Labor Service	175000	4	more than 80 years	10	Bamboo	1980	Owning
	10	36	Male	Teacher	0	N/A	400000	5	Over 100 years	05	Timber	2230	Owning
	11	29	Female	Daily labor	0	mat, agriculture	150000	5	more than 80 years	9	Ming	1350	Owning
	12	61	Female	Not working but a child sending money	0	N/A	350000	6	more than 100 years	14	Timber	1815	Owning
	13	68	Male	Generator and Farmer	25	Beans	250000	2	more than 100 years	30	Timber	1580	Owning
	14	41	Male	Farmer	6	Beans	250000	5	more than 100 years	18	Timber	1720	Owning
	15	29	Male	Daily labor	0	N/A	150000	6	more than 100 years	2	Bamboo	1910	Owning
	16	45	Male	Daily labor	0	Mat.	70000	3	more than 100 years	8	Ming	1500	Owning
	17	68	Male	Daily labor mechanical engineer	0	Mat.	110000	5	more than 100 years	2	Bamboo	1600	Owning
	18	42	Female	farmer	1	Beans	250000	5	more than 100 years	2	Timber	1620	Owning
	19	77	Male	farmer	5	Beans, Mat.	250000	6	more than 100 years	20	Timber	1980	Owning
	20	56	Male	Farmer	5	Beans, Mat.	350000	5	more than 100 years	4	Timber	1920	Owning
Village C: Na Baik Kong Village (Outside)	21	76	Male	Farmer	20	Beans, Mat.	500000	6	more than 100 years	1	Timber	2750	Owning
	22	78	Male	Farmer	10	Beans, Mat.	300000	4	more than 100 years	20	Timber	2130	Owning
	23	68	Male	Farmer	20	Beans, Mat.	300000	6	more than 100 years	25	Timber	2370	Owning
	24	75	Male	Daily labor	0	Beans, Mat.	50000	3	more than 100 years	3	Bamboo	1650	Owning
	25	26	Male	Daily labor	0	Beans, Mat.	120000	4	3 years	3	Bamboo	1650	Owning
	26	43	Male	Farmer	3	Beans, Mat, shop	225000	5	more than 100 years	01	Timber	2520	Owning
	27	46	Male	Shop	0	Shop and Mat	110000	8	17 years	3	Ming	1980	Owning
	28	70	Male	Daily labor	0	Beans, Mat.	175000	6	more than 100 years	2	Ming	1620	Owning
	29	62	Male	Farmer	3	Beans, Mat.	200000	5	more than 100 years	5	Timber	1720	Owning
	30	46	Male	Farmer	20	Beans, Mat.	500000	4	more than 100 years	01	Timber	2680	Owning
	31	51	Male	Farmer	10	Beans, Mat.	300000	3	more than 100 years	4	Timber	2370	Owning
	32	38	Male	Farmer	2	Beans, Mat, shop	200000	7	more than 100 years	2	Ming	2160	Owning
	33	32	Male	Farmer	5	Beans, Mat.	300000	5	more than 100 years	22	Timber	2050	Owning
	34	27	Male	Farmer	5	Beans, Mat.	275000	3	more than 100 years	10	Timber	2380	Owning
	35	35	Male	Daily labor	0	Beans, Mat.	150000	5	more than 100 years	15	Bamboo	2450	Owning
	36	42	Male	Farmer	14	Beans, Mat.	400000	7	more than 100 years	10	Timber	2230	Owning
	37	56	Male	Farmer	11	Beans, Mat.	230000	6	more than 100 years	2	Timber	2290	Owning
	38	46	Male	Daily labor	0	Labor Service, Mat, and Fish	100000	8	more than 100 years	6	Bamboo	1980	Owning
	39	29	Male	Daily labor	0	Labor Service and Mat.	100000	4	more than 100 years	5	Ming	1730	Owning
	40	20	Female	Daily labor	0	Mat.	60000	5	more than 100 years	05	Bamboo	2200	Owning

Village B: Leik Chaung West Village (Inside)	41	59	Male	Betel Vine	0	Betel Vine leaf, and shop	225,000	6	since born	5	Timber	970	Owning
	42	62	Male	Betel Vine	0	Betel Vine	125,000	6	since born	8	Timber	1235	Owning
	43	73	Male	Betel Vine	0	Betel Vine leaf and shop	45,000	3	since born	3	Concrete	340	Owning
	44	56	Male	Government Officer	0	N/A	100,000	3	since born	5	Timber	1030	Owning
	45	37	Male	Daily labor	0	N/A	350,000	5	3 years relocated due to dyke maintenance	3	Bamboo	850	Owning
	46	46	Male	Farmer	2	Paddy and Beans	300,000	5	more than 100 years	18	Mixing	1010	Owning
	47	74	Male	Farmer	3	Beans	250,000	3	more than 100 years	32	Timber	1255	Owning
	48	56	Female	Not working, but a child sending money	0	selling banana, coconuts	80,000	2	more than 100 years	4	Bamboo	1140	Owning
	49	72	Male	Not working, but a child sending money	0	1200 Betel Vine	70,000	2	more than 100 years	6	Timber	950	Owning
	50	66	Male	Betel Vine & Daily labor	0	mat, 3,000 Betel Vine	200,000	10	more than 100 years	2	Bamboo	1080	Owning
	51	35	Female	Farmer and teacher	3	2,000 Betel Vine	350,000	6	more than 100 years	50	Timber	1020	Owning
	52	53	Male	Meat	0	3,000 Betel Vine	300,000	4	more than 100 years	2	Timber	620	Owning
	53	46	Male	Carpenter	0	N/A	225,000	7	more than 100 years	3	Timber	1120	Owning
	54	40	Female	Daily labor	0	Labor Service	120,000	6	more than 80 years	0.5	Bamboo	1030	Owning
	55	59	Male	Daily labor & livestock	0	farming	150,000	3	more than 100 years	6	Bamboo	1010	Owning
	56	61	Male	Barber	0	N/A	100,000	7	more than 100 years	55	Bamboo	920	Owning
	57	62	Male	Betel Vine & Daily labor	0	Betel Vine 6,000	150,000	4	more than 100 years	20	Bamboo	1030	Owning
	58	63	Male	Daily labor	0	mat	200,000	7	more than 100 years	30	Bamboo	850	Owning
	59	42	Male	Palm Tree labor	0	N/A	150,000	5	more than 80 years	6	Timber	750	Owning
	60	39	Male	Teacher	0	Betel Vine, mat	175,000	5	more than 80 years	11	Timber	890	Owning
Village D: Da Na Kone Village (Inside)	61	63	Female	Farmer	3	Paddy and beans, construction labor, and 2,000 Betel Vine.	65,000	4	63	35	Timber	1250	Owning
	62	45	Male	Farmer	4	Summer Paddy 4, and Betel Vine 1,500 plants	150,000	8	45	5	Bamboo	920	Owning
	63	52	Male	Daily labor	0	Vender (Vegetable and Betel Vine)	35,000	6	52	2	Bamboo	920	Owning
	64	64	Male	Irrigation Dept. Staff	0	4 month for irrigation Dept. job, mat.	100,000	6	64	4	Bamboo	900	Owning
	65	29	Male	Livestock management	0	10 cows, and chicken	150,000	5	29	10	Mixing	480	Owning
	66	47	Male	Betel Vine	0	Betel Vine 1000. Before had farm land 3 acre, but lost in 1997	50,000	6	47	2	Bamboo	360	Owning
	67	34	Male	Betel Vine, and Daily labor	0	Betel Vine 1,500 plants and masonry	65,000	4	68	2	Timber	900	Owning

68	68	Female	Betel Vine, and Daily labor and livestock	0	Livestock and Betel Vine 1,000 plants	60,000	6	49	12	Bamboo	980	Owning
69	49	Male	Betel Vine, and Daily labor	0	Betel Vine 2,000 plants	150,000	3	32	3	Mixing	820	Owning
70	32	Female	Betel Vine, and Daily labor	0	Betel Vine 2,000 plants, and Mat	25,000	2	32	2	Bamboo	790	Borrow from parents
71	52	Female	Farmer	4	Betel Vine 2,000, and beans	150,000	4	33	25	Bamboo	1030	Owning
72	61	Male	Farmer	1	Better 2,000 and vegetables, livestock	150,000	5	71	24	Timber	1070	Owning
73	56	Male	Betel Vine	0	Betel Vine 1500	150,000	2	60	15	Timber	975	Owning
74	40	Male	Farmer	5	paddy and Betel Vine	175,000	4	60	14	Bamboo	890	Owning
75	61	Female	Daily labor	0	Children working in Yangon, and irrigation Dt.	200,000	5	40	6	Bamboo	850	Owning
76	68	Female	Land Owner	3	Betel Vine 1,000, paddy land	175,000	2	50	2	Mixing	1205	Owning
77	42	Male	Irrigation Dept. Staff	0	N/A	128,000	8	20	4	Bamboo	760	Owning
78	37	Female	Betel Vine & Daily labor	0	Betel Vine 2000	125,000	4	52	4	Bamboo	500	Owning
79	27	Male	Farmer	1.5	Paddy	400,000	3	50	3	Timber	1160	Owning
80	46	Female	Fisherman	0	N/A	150,000	2	68	2	Bamboo	590	Owning

Appendix C: Questionnaire Survey in Hinthada, Myanmar

Questionnaire Survey in Hinthada

For Disaster Recovery and Disaster Risk Reduction

Disaster Prevention Research Institute,
Kyoto University

Ph.D. Student
Kensuke OTSUYAMA

1. This research aims to identify community recovery from Flood in 2015 which how people in affected area coped with the event and recover.
2. This questionnaire consists of **two parts**; Basic information of household, and status of the recovery.
3. **All the information retrieved from this questionnaire will be used for the purpose of academic research only and shall not give to any other party, except research team members in Kyoto University**
4. This questionnaire would be required almost **30-45 mins** to be filled. We highly appreciate for your precious time and sincere cooperation.

Part.1 Basic Information

Q1-1	Name of the Responder:				
Q1-2	Age				
Q1-3	Gender				
Q1-4	Religion				
Q1-5	Occupation				
Q1-6	Farmland	Yes		NO	
		Size			
Q1-7	Seasonal Jobs				
Q1-8	Income in a month (ave)				
Q1-9	Number of Household				
Q1-10	Family Structure (Describe Family tree)				
Q1-11	Years stay in this village				
Q1-12	Years stay in this house				
Q1-13	Stay before this village				
Q1-14	Infrastructure	Electricity,	Water		
Q1-15	Education Background	Father			
		Mother			
		Children			

Part.2 Disaster Recovery

Q2-1	Disaster Experience	Yes or No			
Q2-2	Experience of disaster	Year	Event	Damage	Loss

	(Year & Event)				
Q2-3	Rebuilt house	Yes or No			
Q2-4		By Family	By Village	By government	By Other groups
Q2-5	Type of House	Bamboo	Timber	Mixed	Other
Q2-6	Height of Floor				
Q2-7	Preparing for Recovery or Reduce impact for next disasters				
	Material				
	Money				
	Others				
Q2-8	Do you have skills that				
	Building house				
	Produce mats				
	Control boats				
	others				
Q2-9	Job Recovery Did you stop your job?	Days			
Q2-10	Any change of your salary average?				
Q2-11	Any impact on Education?				
Q2-12	Any impact on Religious Activities?				
Q2-13	Are there any community activities against disasters?				

Thank you very much

Appendix D: Questionnaire of the Survey in Florida, U.S.



Questionnaire Survey in Hillsborough County, Florida State
For Disaster Recovery and Disaster Risk Reduction

*Disaster Prevention Research Institute,
Kyoto University*

*Fulbright Visiting Scholar in University of Illinois at Urbana-Champaign
Collaborated with University of South Florida*

Ph.D. Student
Kensuke OTSUYAMA

5. This research aims to identify community and neighborhood recovery from Hurricane Irma in 2017.
6. All the information retrieved from this questionnaire will be used for the purpose of academic research only and shall not be given to any other party, except research team members at the University of Illinois at Urbana-Champaign, University of South Florida,(USF), Hillsborough County, and Kyoto University
7. This questionnaire should take no more than 20 mins. We appreciate your time and cooperation.
8. For your time to complete the questionnaire, a small gift will be given to each household after the interview with a person in the household.

Part.1 Basic Information

Q1-1	Initial of the Names Inicial de los nombres	<u>First</u> Nombre:_____, Last Apellido:_____
Q1-2	Age Group Promedio de edad	☐ 18-24 ☐ 25-44 ☐ 45-64 ☐ above 65
Q1-3	Gender · Género	☐ Male Masculino ☐ Female Feminino ☐ Prefer not want to answer/ Prefiero no responder
Q1-4	How would you describe yourself? Cómo se describirías a si mismo?	☐ White American Blanco Americano ☐ African American Afroamericano ☐ Hispanic or Latino ☐ Asian Asiatico ☐ India/Alaska Native Nativo Americano ☐ Hawaiian Native Pacific Islander Isleño Nativo de las Islas Hawaianas ☐ Other:_____ ☐ Prefer not want to answer Prefiero no responder
Q1-5	Workers in the household Personas que trabajan en el hogar	☐ No one working/Nadie ☐ 1 person ☐ 2 persons ☐ 3 persons ☐ More than 3 persons ☐ Prefer not want to answer Prefiero no responder
Q1-6	Household Annual Income (Average) Ingreso anual del hogar (promedio)	☐ Lower than \$35,000 ☐ \$35,000 - \$50,000 ☐ \$50,000 - \$75,000 ☐ \$75,000 greater
Q1-7	Number of household members Número de habitantes en su hogar	_____ Member(s) ☐ Single but families live nearby /pero con familia cerca Pets: ☐ Dog _____ #, ☐ Cat _____ #, ☐ Other (_____) _____ #
Q1-8	How many years have you lived in your Home? <u>¿Cuántos años has vivido en su hogar?</u>	<u># of _____ Years</u>
Q1-9	How old is your Home? <u>¿Cuán antiguo es su hogar?</u>	<u># of _____ Years</u> or ☐ Don't know

Q1-10	How many years have you lived in Hillsborough County? <u>¿Cuántos años ha vivido en Hillsborough County?</u>	<u># of</u> _____ <u>Years</u>
Q1-11	How many years have you lived in Florida? <u>¿Cuántos años ha vivido en Florida?</u>	<u># of</u> _____ <u>Years</u>
Q1-12	How many times did you move during the first 20 years of your life? <u>¿Cuántas veces se ha mudado desde que nació hasta los 20 años de edad?</u>	<u># of</u> _____ <u>Times</u>
Q1-13	How many times have you moved between the ages of 21 and 40? <u>¿Cuántas veces se ha mudado desde los 21 años a los 40 años de edad?</u>	<u># of</u> _____ <u>Times</u>
Q1-14	How many times have you moved since age 41? <u>¿Cuántas veces se ha mudado desde los 41 años de edad?</u>	<u># of</u> _____ <u>Times</u> or ☐ N/A
Q1-15	If you moved to Florida, what motivated your decision? <u>¿Si se mudara a Florida cuál sería la razón?</u>	☐ Job opportunity/Oportunidad de trabajo ☐ Education for children Educación para hijos ☐ Family matter/Situación familiar ☐ Growing up in Florida Crecer en Florida ☐ Other:_____
Q1-16	Do you plan to move to another house in the future? <u>¿Usted tiene algun plan de mudarse a otra casa en el futuro?</u>	☐ Plan to stay as long as possible / Planeo quedarme el mayor tiempo posibl ☐ up to 1 year ☐ up to 1-5 years ☐ up to 6-10 years ☐ up to 20 years ☐ No idea
Q1-17	Tenure of the House Tenencia de la casa	☐ Owning as a Primary residence /Poseo como residencia primaria ☐ Owning as a Second home / Poseo como residencia secundaria

		☐ Renting as a Primary residence /Rento como residencia primaria ☐ Renting as a Second home / Rento como residencia secundaria ☐ Staying in the Parents' House / Me hospedo con familia o amigos
Q1-18	House Type Tipo de casa *multiple choice is applicable	☐ A house/Una casa ☐ A mobile home/Una casa movil ☐ Apartments/ Apartamento ☐ Boat, RV, van/Barco, RV, furgoneta ☐ Other:_____
Q1-19	Insurance of the House Seguro de la casa *multiple choice is applicable	☐ NFIP (Flood) (Inundación) ☐ House Owner/Dueño de casa ☐ RV ☐ Mortgage/Hipoteca ☐ Other:_____ ☐ None of those Ninguna de las anteriores

Part.2 Disaster Recovery

Q2-1	Experiences with disasters (Year & Event) Experiencias con desastres naturales (Año y evento)	☐ Yes, had direct impacts Sí, sufrí impacto directo ☐ Yes, but limited impact(No electricity, no water)/Sí, pero sufrí impacto limitado (No electricidad, no agua) Damage Daño: () ☐ No impacted No afectado ☐ Latest: <u>Year</u> <u>Más reciente: Año</u> Place ☐ Current House/Casa actual ☐ Other Place/Otro lugar _____ Event ☐ Hurricane/Huracán ☐ Flooding/Inundación ☐ Tornado ☐ Storm Surge/ Oleada de tormenta ☐ Lighting/Rayos ☐ Earthquake/Terremotos ☐ Other: _____ Evacuation ☐ in the house/Me quedé en casa ☐ public shelter/ refugio público ☐ Stayed with family or friends con amigos o familiares ☐ Stayed at hotels/motels ☐ Stayed at your vehicle/camper
	Experiences of disasters (Year & Event) Experiencias con desastres naturales (Año y evento)	☐ Yes, had direct impacts Sí, sufrí impacto directo ☐ Yes, but limited impact(No electricity, no water)/Sí, pero sufrí impacto limitado (No electricidad, no agua) Damage Daño: () ☐ No impacted No afectado ☐ 2nd: <u>Año</u> Place ☐ Current House/Casa actual ☐ Other Place/Otro lugar _____ Event ☐ Hurricane/Huracán ☐ Flooding/Inundación

Q2-2	Did you know of any natural hazard risks in your neighborhood before you moved in? ¿Sabía usted de algún riesgo de peligro natural en su vecindario antes de mudarse?	☐ Yes ↓ Where did you get the information?/ ¿De dónde obtuvo la información? ☐ FEMA ☐ Florida State Government ☐ Hillsborough County ☐ City of Tampa ☐ Neighborhood ☐ Private Companies ☐ Insurance (Funds only) ☐ Red Cross ☐ Other Non-Government Organizations or Non-Profit Organizations (Name: _____) ☐ Other: _____	☐ No ↓ When did you know the natural hazard risk at your neighborhood? ¿Cuándo supo del posible riesgo de peligro natural en su vecindario? ☐ After start living ☐ When disaster occurred ☐ I don't know
Q2-3	Did you rebuild or repair your house because of the disasters? ¿Reconstruyó o reparó su casa debido a los desastres?	☐ Yes ☐ No Which disaster (mentioned above)? ¿Cuál desastre (mencionado arriba)? ☐ Recently, ☐ 2nd one, ☐ 3rd one, ☐ 4th one ☐ Other: _____ And how? ¿Cómo? Please check all that apply: Por favor marque todas las que aplican: ☐ by your funds/Por sus fondos ☐ by Bank loan/ Por préstamo bancario ☐ by insurance/ Por aseguranza ☐ by disaster Assistance/ Asistencia de desastres ☐ Other: _____	
Q2-4	Did the disasters impact your salary due to your job being suspended? ¿Los desastres impactan su salario debido a que su trabajo fue suspendido?	☐ Decreased Disminuyó: And Why? ¿Por qué? ☐ Could not continue the job/ No se pudo continuar el trabajo ☐ Temporary stopped the job Paralizado temporalmente el trabajo ☐ Migrated to other place Migrado a otro lugar ☐ Temporary evacuated other place Temporalmente evacuado a otro lugar ☐ Other: _____ ☐ Increased/ Aumentó: And Why? ¿Por qué? ☐ Changed job Cambié de trabajo	

		☐ Additional tasks/works Trabajos o tareas adicionales ☐ Migrated to other place Migré a otro lugar ☐ Temporary evacuated other place Temporalmente evacué a otro lugar ☐ Other: _____
		☐ Not changed Sin cambios
Q2-5	Did the disasters impact your children's education due to school closures? ¿Los desastres impactaron la educación de sus hijos debido al cierre de escuelas?	☐ Yes, temporary (less than 7 days) Sí, temporalmente (menos de 7 días) ☐ Yes (more than 7 days) Sí (más de 7 días) ☐ Yes, because of the migration Sí, por la migración ☐ Not at all Para nada ☐ N/A (No children)
Q2-6	Which organization contributes to your Emergency Response (Food, water distribution)? ¿Qué organización contribuye a la respuesta de emergencia (alimentos, distribución de agua)?	☐ FEMA ☐ Florida State Government ☐ Hillsborough County ☐ City of Tampa ☐ Neighborhood (HOA or ETC) ☐ Private companies ☐ Insurance (Funds only) ☐ Red Cross ☐ Other Non-Government Organizations or Non-Profit Organizations (Name: _____) ☐ Other: _____
Q2-7	Which organization contributes to your Financial recovery? ¿Qué organización contribuyó a su recuperación financiera?	☐ FEMA ☐ Florida State Government ☐ Hillsborough County ☐ City of Tampa ☐ Neighborhood (HOA or ETC) ☐ Private companies ☐ Insurance (Funds only) ☐ Red Cross ☐ Other Non-Government Organizations or Non-Profit Organizations (Name: _____) ☐ Other: _____
Q2-8	Which organization contributes to your physical (Housing) recovery?	☐ FEMA ☐ Florida State Government ☐ Hillsborough County ☐ City of Tampa

	¿Qué organización contribuye a su recuperación física (Vivienda)?	☐ Neighborhood (HOA or ETC) ☐ Private companies ☐ Insurance (Funds only) ☐ Red Cross ☐ Other Non-Government Organizations or Non-Profit Organizations (Name: _____) ☐ Other: _____	
Q2-9	Which do you consider as your social support here in Hillsborough County ¿Cuál considera usted como apoyo social en el condado de Hillsborough?	☐ Family ☐ Friend ☐ Neighborhood ☐ Co-workers ☐ Place of worship ☐ Non-Government Organizations or Non-Profit Organizations (Name: _____) ☐ Other: _____	
Q2-10	Do you know of Plans for Hillsborough County? ¿Conoces los planes para el condado de Hillsborough?	☐ Local Mitigation Strategies ☐ Comprehensive Plan ☐ Comprehensive Emergency Management Plan ☐ Floodplain management plan ☐ Pre-disaster Redevelopment Plan ☐ Pet disaster management Plan ☐ Other: _____ ☐ I don't know	
Q2-11	Did any government plans help your household during disasters? ¿Algún plan del gobierno ayudó a su hogar en desastres?	Yes ↓	No ↓
		How do they contribute to you? ¿Qué aportan para usted?	Why did they NOT work well to you? ¿Por qué NO le funcionaron bien?
Q2-12	Do you know your Community Emergency Response Team (CERT)?	Yes ↓	No ↓
		How do they contribute to you? ¿Cómo le aportan?	Why did they NOT work well to you? ¿Por qué NO le

	¿Conoces el Equipo de Respuesta a Emergencias de la Comunidad? ¿(CERT)?		funcionaron bien?
Q2-13	Are you concerned about the potential for future disasters?	☐ Yes, I'm concerned and preparing for ☐ Yes, I'm concerned but not prepared ☐ Not at all	
Q2-14	Do you have any recommendations or comments for disaster management authorities or universities? ¿Tiene alguna recomendación o comentario para las autoridades de gestión de desastres o universidades?		

Thank you very much for your great contributions

If you would like any clarification or have questions about this questionnaire survey, please contact the lead interviewer: Kensuke OTSUYAMA otsuyama.kensuke.82m@st.kyoto-u.ac.jp or +1-312-860-4667