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Household Preparedness Typology and Coping Capacity: Implications for Building Disaster Resilience in Developing Countries

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ABSTRACT

This article examines flood preparedness characteristics and coping capacity of households based on the findings of two research studies conducted in Thailand, and discusses the implications for disaster resilience building. The first study looked at the characteristics of household preparedness. Data were collected using a questionnaire from 1,592 randomly selected households in Thailand's four regions, and descriptive statistics were obtained to analyze household preparedness characteristics. The first study's findings revealed four types of action, which were used to create a typology of household preparedness as a tool for analyzing the cost and amount of effort associated with each specific preparedness action, which, in turn, influences households' decision to adopt. The flood coping capacity of households was investigated in the second study. Data were collected using a survey questionnaire with 300 households in three flood-prone communities of Songkhla Province in Thailand's southern region, using a quota sampling method. Data were then analyzed using multiple regression technique. Both preparedness and human capital increased the level of household coping capacity, according to the findings. Based on the findings of these two studies, recommendations for improving people's resilience in disaster-prone communities in developing countries are proposed.

1. INTRODUCTION

When a large-scale disaster occurs and its effects exceed the capacity of local government to handle, people in disaster-stricken communities must perform some basic response and recovery tasks in order to not only save their lives and property, but also to restore their livelihood. In some developing countries, a lack of adequate equipment and emergency personnel limits local governments' ability to effectively care for their people and address the needs that arise simultaneously from several affected communities at nearly the same time. As a result, households in developing countries must remember that, when it comes to disaster response and early recovery, they will inevitably become the true first responders, responsible for helping themselves until aid from government agencies and related organizations arrives in the communities. And, in order to do so, households must be well-prepared and have a high level of disaster coping capacity.

Although disaster preparedness is important because it can help people save lives and protect property, not everyone takes the necessary steps to prepare for a disaster. In fact, previous research has found that even in high-risk areas, household preparedness is quite low, particularly in developing countries [1]. This is particularly true in Thailand, where we could still see people trapped inside their homes, stranded on their rooftops, waded through flood waters trying to evacuate, or waited at home for survival kits distributed by government officials and volunteers after large-scale disasters such as massive floods struck the country in the previous ten years. Despite the fact that the Thai government has invested in and implemented several disaster risk reduction projects for more than a decade, it appears that many Thai people are still unprepared and lack the capacity to effectively handle the needs that arise during disaster response and early recovery phases. Thus, disaster preparedness behavior of households must be investigated because the findings of such a research study can help promote preparedness among households and increase their coping capacity.

The majority of prior studies on household preparedness was on measuring preparedness levels and the factors that influenced preparedness behavior. Many of them looked at factors affecting household preparedness using Paton's Social-Cognitive Preparation Model as a framework. These studies have revealed a number of factors, with self-efficacy serving as a mediating or moderating factor in improving individual and household preparedness [2-5]. Simply put, earlier disaster preparedness research has focused on both socioeconomic and psychological factors (such as self-efficacy, risk perception, and so on). However, little attention has been paid to analyzing in detail the characteristics of each preparedness action (the preparedness measure itself), which may have implications for household disaster preparedness behavior. More understanding of preparedness characteristics will not only fill a gap in the disaster research literature, but will also allow disaster risk reduction professionals to develop or redesign programs that promote preparedness and, as a result, enhance household resilience.

2. LITERATURE REVIEW

2.1 Household disaster preparedness

A state of readiness for emergency response is referred to as preparedness. People, groups, and organizations that are well prepared can better deal with the effects of a disaster. Preparation activities include anticipating what may occur during hazard events, ensuring that we have a plan in place to deal with any possibilities that may arise during the incident, training emergency workers, and educating people about their roles in emergency response operations [6, 7]. Preparedness improves coping capacity by allowing people to more effectively adapt to the impact of extreme events. Mitigation has the potential to reduce the effects of hazards, but it does not eliminate all risks and vulnerabilities. Thus, preparedness is important because it provides people with the knowledge, skills, and resources they need to respond to unabated emergency threats.

Furthermore, prior to a disaster, preparedness activities such as planning, plan exercise, and resource acquisition can help facilitate an effective emergency response and guide the recovery process [7]. Individuals, households, and related organizations can be more successful in emergency response and recovery if certain actions are taken ahead of time, as they have resources ready to use and have learned or practiced how to respond to such an emergency before it occurs. During a disaster, knowing how to take appropriate protective measures can help reduce loss and damage. In short, the more planning that can be done ahead of a disaster, the more efficient the response to that particular disaster [6].

Individuals and households can take common preparedness actions such as stockpiling nonperishable food, drinking water, and essential supplies for at least three days [2], developing a family communication plan during an emergency and practicing it with family members, and keeping family members informed about hazard risk, evacuation routes, and public shelters [8], securing furniture [9], elevating the structure of houses or buildings in order to reduce flood damage, purchasing insurance to cover disaster-related losses [1], and participating in first aid and CPR training [10]. Furthermore, some academics recommend that households have the following specific items: flashlight (or batteries, torch, candles, matches, lantern with batteries); a written family's evacuation plan and important documents; a battery-powered radio with batteries; an outdoor grill; a generator with supply of fuel; a first-aid kit and thermometer; cash; blanket, and rain gear; personal care and hygiene items; emergency services telephone numbers; and a list of other emergency contacts [11-15].

Because preparedness improves people's ability to deal with emergencies, disaster management scholars have spent decades identifying the factors that motivate individuals and families to take preparedness actions. Between 2001 and 2019, several research studies were conducted to determine why people took or did not take precautionary measures. The findings of these studies revealed several predictors of household disaster preparedness, including prior experience or being affected by previous disasters [16], disaster-related education [17], preparedness knowledge [18], self-protection knowledge [19], risk perception [20-22], information and information sources [23], prior exposure to hazards [14, 24], neighborhood belonging [22], socio-economic factors such as income, home ownership, race, age, type of housing [11, 12, 25], educational levels [1, 9, 11], social support [14], and access to resources (including personal capacity, financial resources, social connections and support from related agencies) [26]. The identification of these factors is critical because the results can promote preparedness among households and individuals. This issue, however, is not addressed in our study because it has already been thoroughly investigated in previous studies, as discussed above. Instead, the goal of our research is to gain a better understanding of the characteristics of household preparedness.

2.2 Household coping capacity

It is now generally recognized that disaster impacts can be minimized if disaster risk factors like hazard, exposure, and vulnerability are established and wisely handled. Managing such risk factors usually entails systemic interventions and substantial investments in the construction or improvement of city infrastructures. However, these systemic steps can be costly, beyond the financial ability of certain cities. Increased coping capacity is another way to reduce disaster impacts. This coping capacity refers to people's, organizations', and structures' ability to deal with adversity, risk, or disasters [27]. People, populations, and organizations with high coping ability are more resilient to the impact of natural and man-made disasters [28]. Disaster coping ability must be built ahead of time, and it necessitates ongoing awareness, support, and good management.

People's disaster coping ability must be developed because they are the real first responders, dealing with disaster impacts before government agencies and other organizations arrive. People with a high coping capacity will be more able to adapt and care for themselves during an emergency because they will be able to ensure their own safety and survival [29]. As a result, disaster coping capacity development, maintenance, and improvement are essential, and more research is needed, particularly on how to create and enhance such capacity. Person and household coping ability, in previous literature and research studies, has been shown to be influenced by several factors such as social capital [29], human capital [29], pre-disaster readiness building actions or preparedness [30-32], and financial capital [29]. As a result, some of these variables were chosen to measure the relationships with our household coping capacity analysis (Study 2).

3. METHODOLOGY

To investigate flood preparedness characteristics of Thai households in Study 1, data were gathered through a questionnaire survey of 1,600 randomly selected households from four major regions: the northern, northeastern, central, and southern. The climates of the northern, the northeastern, and the central regions are quite similar. These three regions have three seasons: rainy (June-October), winter (November-February), and summer (March-May). The southern region is quite distinct because it has only two seasons: rainy season (June-January) and summer (February-May).

The research team conducted the survey from March to June 2016, and questionnaires were distributed door to door to households in each region. All data collection processes strictly adhered to research on human subject practices. To obtain the most equal proportion of sample in each area for better comparison of household preparedness, a quota-system

sampling approach was used. These questionnaires were sent to six provinces: Pitsanulok, Uthai Tani, Nakhon Sawan, Ubon Ratchatani, Nakhon Sri Thammarat, and Songkhla, all of which were heavily flooded in 2010 or 2011. The survey included questions about the respondent's personal information, household characteristics, and ten questions about whether or not they had taken the following preparedness measures since 2010 or 2011:

(1): Elevating a house and/or taking other flood-proofing measures

(2): Stockpiling of nonperishable foods and drinking water

(3): Putting together first-aid kits (basic supplies and needed medications)

(4): Keeping emergency cash on hand

(5): Getting a boat or other vehicles ready to support commuting in a flooded community

(6): Looking for weather information

(7): Getting flood insurance

(8): Looking for information on public shelters

(9): Looking for information on evacuation routes and procedures

(10): Attending disaster preparedness trainings/workshops

By checking the box, the representative of each household was asked to choose the options that were most relevant to his or her information and to answer the ten flood preparedness questions on a dichotomous scale, yes (1) or no (0). After receiving questionnaires from all six provinces, they were double-checked to ensure that all questions were answered and all items were correctly filled out. There were eight questionnaires with invalid data, so they were excluded from our analysis. As a result, the total sample size for this analysis was 1,592, with 396 (24.9%) from the northern region, 400 (25.1%) from the northeastern region, 397 (24.9%) from the central region, and 399 (25.1%) from the southern region. The following steps were data coding and recoding, computing new variables, and data screening. The percentage of yes or no answers for each question was then obtained in order to investigate the characteristics of flood preparedness among Thai households.

In Study 2, a survey questionnaire was developed, guided by previous literature and Study 1 findings, to assess levels of perceived coping capacity, human capital, social capital, and preparedness, as well as to collect data for other variables hypothesized in our model. In the first part of the questionnaire, respondents were asked to provide information about their gender (1 for male and 2 for female), age (provide whole number of years), level of education (choosing from 1 to 5, with 1 for elementary school and 5 for higher than bachelor's degree), level of monthly income (choosing from 1 to 7, with 1 for less than 10,000 Thai Baht and 7 for more than 30,000 Thai Baht), and number of family members (provide whole number of family). Then, they were asked to select a Yes (1) or No (0) answer to questions about preparedness activities, whereas questions about perceived response ability, perceived knowledge about flood hazards, and perceived relationship of people within the community require them to indicate their level of agreement, which ranges from (1) strongly disagree to (5) strongly agree.

To assess household's flood coping capacity, the dependent variable in Study 2, the head or representative of each household was asked to self-assess his or her ability to perform three basic flood response and recovery activities:

(1) In the event of a flood, how confident are you in your family's ability to maintain good health and ensure the safety of all family members, given your knowledge, skills, experience, and resources?

(2) In the event of a flood, how confident are you in your family's ability to provide food and drinking water to all family members at least until aid from outside your community arrives, given your knowledge, skills, experience, and resources?

(3) In the event of a flood, how confident are you in your family's ability to return to normalcy (e.g., repairing a house and other properties, returning to work, reopening a family business, recovering farming/agriculture, livestock, and livelihood)?

Respondents were asked to select one of the following options to answer the questions: not at all confident (1), somewhat confident (2), neutral (3), very confident (4), and completely confident (5). The Household Coping Capacity Index (HCC Index) was calculated by adding and averaging the scores from these three identically weighted questions. This HCC Index measures each household's ability to effectively address the needs of family members during a crisis such as severe flooding. To ensure internal consistency, Cronbach's alpha was also calculated by using scores of the three identically weighted questions related to perceived ability of household to perform basic flood response and recovery activities. Reliability Analysis (under Scale option in SPSS) was perform and the analysis resulted in the Cronbach's alpha Coefficient value of 0.756. This HCC Index has values ranging from 1 to 5, with 5 indicating the highest level of flood coping capacity and 1 indicating the lowest level of flood coping capacity.

Household flood preparedness, human capital, and social capital were the three main independent variables in Study 2. Seven items were used to assess household flood preparedness based on a synthesis of findings from Study 1 and related literature. Each of these seven items required respondents to check a Yes (1) or No (0) box. The Flood Preparedness Level Index (FPL Index) was calculated by adding all of the scores together and then averaging them. To ensure internal consistency, Cronbach's alpha was also calculated (Cronbach's alpha Coefficient = .756). This FPL Index has values ranging from 0 to 1, with 1 indicating the highest level of preparedness and 0 indicating the lowest level of preparedness.

Three statements were used to assess the second independent variable, Human Capital:

(1) You and your family members are well-versed in flood hazards and the effects they can have on your family.

(2) You and your family are well-versed in flood mitigation, preparedness, response, and recovery.

(3) Your village or community's leader and members have extensive knowledge and hands-on experience in flood mitigation, preparedness, response, and recovery.

Respondents were asked to read the three statements and then indicate their level of agreement on each, which included the following options: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). Human Capital Index (HCAP Index) was calculated by adding and averaging the scores from these questions. The Cronbach's alpha test was then used to ensure internal consistency (Cronbach's alpha Coefficient = .762). This HCAP Index has values ranging from 1 to 5, with 5 representing the highest level of human capital and 1 representing the lowest level of human capital.

The last independent variable, Social Capital, was assessed using the three statements:

(1) People in my village are very familiar with one another. We are a cohesive, harmonious, and supportive group.

(2) People in my village help and support one another as much as we can during crises such as severe floods.

(3) Normally, the majority of people in my village actively participate in village events such as religious or traditional ceremonies, village committee meetings, and other social gatherings.

Respondents had to select one of the following options: strongly disagree (1), disagree (2), neutral (3), agree (4), or strongly agree (5). The Social Capital Index (SCAP Index) was calculated by adding and averaging the scores from these questions. To ensure internal consistency, Cronbach's alpha was used (Cronbach's alpha Coefficient = .781). This SCAP Index has values ranging from 1 to 5, with 5 representing the highest level of social capital and 1 representing the lowest level of social capital.

From February to April 2017, the research team used quota sampling to survey 300 randomly selected households in three flood-prone communities along the U-tapao River in Songkhla Province (in Thailand's southern region). Questionnaires were distributed to households in each community door to door. All data collection processes strictly adhered to research on human subject practices. The primary reason for using quota sampling was to compare flood coping capacity by community. As a result, the proportion of the sample in each community should be as close to equal as possible. Before analyzing the data, missing data, skewness, and kurtosis were checked to ensure centrality. Following the cleaning of the data, new variables (the three index variables) were computed. Then, descriptive statistics such as frequencies, percentages, and means were obtained to investigate the characteristics of respondents and households, as well as the level of coping capacity. Then, using multiple regression analysis, the relationships between selected variables were investigated in order to determine the factors influencing household coping capacity.

4. RESULTS

4.1 Survey respondents' characteristics

Study 1 respondents were 56.1 percent female and 43.9 percent male. The average age of respondents was 42.3 years old, and the majority had completed elementary school (31.4 percent). Furthermore, while 26.1 percent of respondents owned a small business or were self-employed, 25.2 percent worked on a daily basis. At the household level, the majority (56.2 percent) reported a monthly household income of 10,000 – 20,000 Thai Baht (or approximately 312 – 624 US dollars), with an average of four family members. In terms of disaster experience, the majority of households (76.6 percent) in Study 1 had experienced massive flooding at least once in their lifetime and were affected by the 2011 flood disaster (54.9 percent).

In Study 2, 300 households from three settlements along the U-tapao River in Songkhla Province, Thailand, completed questionnaire surveys. According to the results of data analysis, 31.7 percent of respondents were men and 68.3 percent were women. Respondents were 48.9 years old on average. The majority of respondents lacked a university diploma (80.3 percent). In terms of occupation, farmers accounted for 38.3 percent of respondents, while 29 percent were self-employed. The majority of respondents (82.0 percent) reported a monthly household income of 10,000 to 20,000 Thai Baht (or approximately 312 - 624 US dollars), with an average of five family members.

4.2 Flood preparedness characteristics of Thai households (Study 1)

Table 1 shows the different types of flood preparedness actions taken and not taken by Thai households. Only three preparedness measures received more than half of the "yes" votes. These included (Measure 2) stockpiling of nonperishable foods and drinking water (57.5 percent), (Measure 3) assembling first-aid kits (basic supplies and needed medications) (57.5 percent), and (Measure 6) looking for weather information (79.9 percent). The other seven measures had an unusually high proportion of "no" responses (as presented in Table 1). Such findings imply that the majority of Thai households take simple or basic preparedness measures that are closely related to their daily activities, are low-cost, and do not necessitate extra effort. Preparedness measures that necessitate more effort and money are unlikely to be chosen.

Table 1. Preparedness measures taken and not taken by Thai households (n = 1,592)

Household's preparedness actions	Yes (%)	No (%)
(1) Elevating a house and/or taking other flood-proofing measures	47.6	52.4
(2) Stockpiling of nonperishable foods and drinking water	57.5	42.5
(3) Putting together first-aid kits: basic supplies and needed medications	57.5	42.5
(4) Keeping emergency cash on hand	47.1	52.9
(5) Getting a boat or other vehicles ready to support commuting in a flooded community	29.4	70.6
(6) Looking for weather information	79.9	20.1
(7) Getting flood insurance	12.8	87.2
(8) Looking for information on public shelters	38.7	61.3
(9) Looking for information on evacuation routes and procedures	40.1	59.9
(10) Attending disaster preparedness trainings or workshops	33.2	66.8

Furthermore, data analysis revealed two interesting findings when using percentages of "yes" answers to examine household preparedness characteristics in each region. To begin, the majority of respondents from all four regions took preparedness action number 6. Furthermore, when examined more closely within each region, it had the highest percentage of "yes" responses when compared to the other nine preparedness actions. As a result, it appeared to be the most popular or common preparedness measure used by Thai households. Second, when compared to the other nine actions, preparedness measure number 7 received the lowest percentage of "yes" responses in all four regions. In other words, most Thai households did not have insurance policies that covered losses caused by a flood disaster, implying that purchasing flood or disaster insurance was not a common preparedness action among most Thai households. This could be due to at least two factors: (1) economic situation (family income) and (2) knowledge of the benefits of disaster insurance. In terms of the first factor, low-income households,

such as poor farmers in the countryside and daily-paid workers in cities, are clearly unable to purchase insurance. In the second factor, some households may have enough money to purchase disaster insurance but may not recognize the benefits of disaster insurance in enhancing their ability to recover their farming, livestock, business, and livelihood following disaster events. This lack of awareness discourages them from purchasing insurance. Thus, we argue that these are the two key factors that may prevent the majority of people in developing countries from obtaining disaster insurance, which is critical for mitigating disaster impacts and strengthening household recovery capacity. However, more research studies are required in the future to provide empirical evidence to support this claim and to better understand this issue.

4.3 Flood coping capacity of Thai households (Study 2)

The flood coping capacity (HCC) of Thai households was investigated using data collected from 300 randomly selected households in flood-prone communities in Songkhla Province between February and April 2017. Flood coping capacity of households was assessed using three subjective measures: perceived ability to care for all family members' health (Coping Capacity 1), perceived ability to provide food and drinking water for family members (Coping Capacity 2), and perceived ability to recover from a disaster (Coping Capacity 3). Coping Capacity 2 received the highest mean score, followed by Coping Capacity 1 and Coping Capacity 3. This suggested that households in flood-prone communities were more confident in their ability to provide food and drinking water for family members after flooding. They were, however, less confident in their ability to return to normalcy, such as repairing their home and property, returning to work, and reopening their family businesses. Furthermore, when the mean scores of the overall household coping capacity (HCC index) were compared among the three communities, the results revealed that households in the U-tapao River basin's midstream communities had the highest level of flood coping capacity, followed by households in the downstream and upstream communities. However, when the mean difference was examined using One-way ANOVA, the results revealed that the mean differences were not statistically significant at the 95 percent confidence level. This suggested that households' flood coping capacity was not affected by living in different locations or parts of the U-tapao River basin.

4.4 Factors influencing Thai households' coping capacity (Study 2)

To investigate what factors influenced the coping capacity of households living in flood-prone communities along the U-tapao River, the dependent variable Household Coping Capacity (HCC Index) was regressed on six predictor variables: number of family members, educational level (dummy), family's average monthly income (dummy), Household Flood Preparedness Level (FPL Index), perceived Human Capital Level (HCAP Index) and perceived Social Capital Level (SCAP Index). Multiple regression analysis yielded statistically significant results ($F = 15.634$, $p < .001$). Our model explained 24.3 percent of the variation in the Household Coping Capacity Index, the dependent variable ($R^2 = .243 \times 100 = 24.3\%$). Table 2 summarizes the findings.

Table 2. Regression results of household coping capacity on selected variables (N = 300)

Variables	b	Beta
No. of family members	.000 (.021)	-.001
Education (lower than a university degree) (dummy variable)[A]	-.048 (.097)	-.027
Income per month (between 10,000-20,000 Baht) (dummy variable)[B]	-.012 (.099)	-.006
Household Flood Preparedness Level (FPL Index)	.704*** (.141)	.260
Human Capital Level (HCAP Index)	.390*** (.063)	.354
Social Capital Level (SCAP Index)	.023 (.058)	.023
Constant 1.240		
R^2 .243		

Note: b = unstandardized regression coefficient with standard error (in parentheses); Beta = standardized regression coefficient; A = Compared to those having a university degree or higher (for educational level of respondents); B = Compared to those having a monthly income of more than 20,000 Thai Baht

The FPL Index had a statistically significant, positive effect on the HCC Index, as predicted (b =.704, p.<.001). Controlling for the effects of all other predictors, this indicated that households with a higher level of flood preparedness tended to have a higher level of flood coping capacity. Each one-point increase in the FPL Index was associated with a.704–point increase in the HCC Index on average. Simply put, households that took more proactive preparedness measures were more confident in their ability to respond to the effects of flooding. This level of preparedness, in turn, increased or improved households' overall coping capacity.

The HCAP Index had a statistically significant, positive effect on the HCC Index, as expected (b =.390, p.<.001). Controlling for the effects of all other predictors, this suggested that households with a higher level of flood response knowledge, skill, and experience tended to have a higher level of flood coping capacity. Each one-point increase in the HCAP Index was associated with a.390–point increase in the HCC Index on average. In other words, households with more flood response knowledge, skill, and experience were more confident in their ability to cope with the effects of a flood.

The other four independent variables, which included the number of family members, educational level, average monthly income of the family, and perceived social capital level, were not found to be significant predictors of Household Flood Coping Capacity.

5. DISCUSSION

While a substantial amount of research on household disaster preparedness has established a number of actions taken by households as part of their disaster preparedness [1, 10, 12, 15] and the reasons that motivate people to take such actions [11, 14, 17], the basic characteristics of each preparedness action have yet to be well studied. As we argue in this paper, the basic characteristics of each preparedness action could be one of the most significant factors influencing people's decision to select preparedness choices that better fit their needs and socioeconomic circumstances. Our study (Study 1) fills this gap by looking at household disaster preparedness in Thailand, examining the basic characteristics

of each action, and then creating a typology of household preparedness based on the financial resources needed and the amount of time and effort expended on each action.

		Time and Effort Required	
Financial		High	Low
Resource	High	Type-A	Type-B
Required	Low	Type-C	Type-D

Figure 1. Typology of household preparedness

As presented in Figure 1, the findings of Study 1 revealed four forms that reflected the disaster preparedness characteristics of households: Type A, Type B, Type C, and Type D. According to our research, most Thai households favor Type-D preparedness action over the others. Type-D applies to disaster preparedness steps that are basic and closely linked to household activities. As a result, these preparedness actions are not costly and do not necessitate additional work. Type-D activities include stockpiling food, drinking water, and other vital supplies; assembling first-aid kits with basic supplies and needed medications; and checking for weather updates. Preparedness steps such as stockpiling food and drinking water are relatively simple to implement since people can go to supermarkets to buy food as they normally do every day, week, or month, depending on their family's habits. Some products purchased for everyday consumption and use can also be used as spares in the event of an emergency. Searching for weather information is also a Type-D activity. Weather forecast information will alert people to potential hazards. Nowadays, getting information about hazards is as simple as using social networking sites like Facebook or Twitter, as well as web surfing, watching television, and listening to a local radio station. Households prefer Type-D steps due to the low cost and low effort required.

Type-A measures necessitate an additional budget, time, and effort to implement. Elevating a house, upgrading a building's structure and materials, and taking other structurally modified steps are all examples of Type-A. A household may need money to buy equipment and supplies, as well as pay construction staff, to alter or upgrade the foundation of a house to minimize flood impacts. If construction workers are not employed, members of a household must put in their own effort to complete the job. Furthermore, changing or upgrading a house's structure and other components can take time. For these factors, this category of preparedness actions is more affordable to middle-to-upper-income households than to low-income households, which constitute the majority of the population in most developing countries. (It is also important to note that the concept of Type-A measure may not be applicable to renters who do not own the house because they only live there for a short period of time and, thus, do not need or have the motivation to take this type of measure.)

Type-B interventions are those that cost more resources but require less time or effort. Buying disaster insurance, holding emergency cash on hand, and planning equipment (such as a car) to facilitate evacuation from disaster areas are all examples of this form of measure. Purchasing disaster insurance, in particular, is rare in most developing nations, where the majority of the population also has a low income and, hence, cannot afford insurance. Thus, in developing nations, high-income households may be able to purchase disaster insurance, keep emergency cash on hand, and have a vehicle for evacuating impacted areas, while low-income households may be unable to do so due to a lack of financial resources. In a developing country like Thailand, however, one exception in Type-B preparedness intervention is preparing a boat to facilitate commuting in a flooded community. Having a paddle boat in rural Thailand may be considered normal, as using paddle boats has been a part of their livelihood for a long time. As a result, the cost requirement concept cannot be extended to this preparedness choice because households in riverside areas, such as those in Thailand's central and southern regions, usually have a paddle boat in their home.

Type-C preparedness actions necessitate more time and effort but do not necessitate additional funding (or only little budget is required in some cases). And, in most cases, these steps have little to do with everyday household tasks. Participating in emergency preparedness trainings/workshops and finding information about evacuation routes, protocols, and safe shelters are examples of Type-C preparedness. In Thailand, disaster preparedness trainings for the general public are usually organized within the facilities of related government agencies such as the Provincial Disaster Prevention and Mitigation Office, the Disaster Prevention and Mitigation Center Regional Office, and the local government office in each city. While the trainings or seminars offered by these organizations are free of charge, participants must travel from their villages or communities to attend. This means that they must take a day off or halt their farming and business activities in order to do so, and in certain situations, they must pay their own transportation costs (if transportation is not offered or is not covered by the organizations hosting such trainings/workshops). Such additional effort (traveling from villages to training facilities) and opportunity cost associated with taking a day off or suspending farming and business activities may deter people from considering this action as their first or most preferred preparedness choice.

The same reasoning can be applied to searching for information about evacuation routes, evacuation procedures, and safe shelters, which are unrelated to people's daily household activities in Thailand. Thus, in Thailand, compared to searching for weather information, which is more closely related to daily household activities, more familiar, and easier to obtain (because people know where to look for such information), people must expend more effort or time to search for information about evacuation routes, evacuation procedures, and safe shelters with which they are unfamiliar. This unfamiliarity with information, as well as the inconvenience of obtaining such information, will deter most Thai households from taking this action.

When employing this proposed typology to describe household preparedness, two critical concepts must be considered: self-efficacy and resource accessibility. Self-efficacy is the belief in one's own ability to perform a task successfully. In the context of disaster management, self-efficacy or preparedness efficacy is an important social cognitive precursor to disaster preparedness [5]. According to Paton [2], household preparedness, such as developing a personal or family response plan or implementing risk-reduction strategies, necessitates some effort and perseverance. As a result, if a person lacked self-efficacy, this could not be completed. In this sense, self-efficacy clearly influences people's intentions to prepare; that is, they will develop an intention to prepare only if they have reasonable expectations about their ability to perform the behavior [2-5]. As a result, how much each type of measure in this proposed typology is preferred or likely to be used by people is also determined by their level of self-efficacy.

Another concept that must be considered is resource accessibility. This is due to the fact that preparing for a disaster is impossible for people who are unable to prepare due to financial constraints, limited social connections, capacity, and support, particularly vulnerable populations or marginalized people such as the poor [26]. Poor people are at a disadvantage in terms of preparedness because they lack the necessary resources. Without adequate water, food, housing, transportation, and healthcare for day-to-day survival, it is difficult to store additional emergency survival items required for preparedness [26]. As a result, those with limited access to resources may find it more difficult or complicated to decide whether or not to implement each measure in this proposed typology.

In terms of disaster coping capability, Study 2 findings show that households in our research sites are very secure in their ability to conduct certain emergency response tasks such as maintaining good health and ensuring the safety of family members, as well as providing food and drinking water for all family members at least before help from outside the community arrives. However, they seem to be less secure in their ability to return to normalcy. One potential explanation for why this category of household coping ability is lower than the other two is that household recovery includes activities such as restoring a house and land, reopening family businesses, and recovering farming/agriculture, livestock, and livelihood, all of which require more financial resources than emergency response activities.

Furthermore, our findings suggest that higher levels of preparedness and human capital (as measured by disaster management knowledge, skill, and experience of village members and leaders) improve the overall resilience of households in the research areas, which is consistent with previous research studies [17-19, 31-34]. However, social capital, as defined by closeness and interaction among village members, was not found to be beneficial to household disaster resilience in our research sites, which contradicts previous findings [2, 35-40]. As a result, we contend that social capital can be a driver for household resilience in villages or communities where closeness or social cohesion is evident or very strong. A comparative study should be conducted to further investigate this topic.

6. CONCLUSION AND RECOMMENDATION

To significantly reduce disaster risk, the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) has identified four priorities of action that must be implemented at the local, national, regional, and global levels. Our research findings will help to advance these priorities, especially how to effectively encourage households in developing countries to take preparedness measures and improve their capacity to respond to and recover from disasters (Priority of Action 4) and how to promote investing in disaster risk reduction for household resilience (Priority of Action 3).

According to our study, most people in developing countries may take low-cost, low-effort actions rather than those that require more budget and/or effort due to a lack of financial capital and other socioeconomic constraints. We contend that for households to improve their resilience, all four types of disaster preparedness are needed. To encourage the implementation of these preparedness initiatives, additional financial or other forms of assistance must be given to a family of daily-paid workers, a single parent family, a low-educated family, a large family with many children and the elderly, and a family of immigrant labor, all of which are generally low-income households. Adoption of all four forms of preparedness initiatives by low-income households can be encouraged further through these techniques. When households embrace and execute these four forms of preparedness steps in tandem, their state of readiness will improve. This higher level of preparedness will then increase their disaster response and recovery capabilities, effectively increasing household resilience.

To encourage the adoption of Type-A preparedness actions such as modifying or upgrading the structure and other components of a house, barn, or business building, which require both more money and more effort, disaster risk reduction and resilience building professionals must devise more creative strategies or options to assist low-income families in being able to invest in disaster risk reduction. A clear example of encouraging disaster risk reduction investment for household resilience comes from the United States of America (USA), from which developing countries can learn.

Investing in disaster risk at the household level is encouraged in the United States through the Federal Emergency Management Agency's Hazard Mitigation Grant Program (for Individuals). Households, however, cannot apply directly for Hazard Mitigation Grant Program (HMGP) funding in order to get this financial support. Rather, they must work with the local jurisdiction to discuss their needs and request that their property be included in the local jurisdiction's hazard mitigation application. In addition, to be eligible for HMGP, the state and community must have an approved hazard mitigation plan, and the local community must be a member of the National Flood Insurance Program in good standing (not on probation, suspended, or withdrawn) for projects located within a Special Flood Hazard Area [41]. This Hazard Mitigation Grant Program (for Individuals) offers financial aid to home owners in major disaster-declared areas to restore their homes safer than they were before the disaster [41], thus mitigating the effects of future flooding. FEMA administers this aid, which is funded up to 75 percent of mitigation costs by the federal government of the United States, with the remaining 25 percent borne by each home owner. This type of cost-sharing aid between homeowners and the funding agency not only reduces the cost of Type-A preparedness actions, but it can also help households reduce their effort in upgrading/modifying their homes because they can use some of the grant money to pay for construction labor if they so choose. When the expense, time, and effort associated with Type-A preparedness actions are minimized, low-income households will be more likely to co-invest with the government to minimize disaster risk in their homes and other buildings. The more households invest in reducing disaster risk in their homes or buildings, the higher the degree of achievement of the SFDRR's Priority of Action 3 (investing in disaster risk reduction for resilience) in each developing country.

Type-B preparedness activities, such as purchasing disaster insurance and stockpiling emergency funds, may also be encouraged in developed countries through the use of government support, microfinance or community-administered disaster risk management funds. Households of flood-prone areas in the United States, for example, can receive subsidized flood insurance through the National Flood

Insurance Program (NFIP), which is operated by FEMA (federal government) and in collaboration with the property and casualty insurance industry, states, local officials, lending institutions, and property owners [42]. The estimated annual cost (premium) of flood insurance through the NFIP is about $708. This average cost of flood insurance, however, can differ depending on the level of risk in each community and state, as well as the level of coverage required by each applicant [43]. The costs of restoring flood damage to households' buildings and contents will be compensated by this federally backed flood insurance [44], allowing households to rebound from a catastrophe quicker and at a lower rate. Microfinance activities are another way to increase the adoption of Type-B preparedness measures. Microfinance gives poor or low-income households access to the financial services they need for disaster risk reduction and recovery. According to the Asian Development Bank (ADB), microfinance helps low-income families reduce disaster risk and increase resilience by, for example, (1) encouraging secure cash savings to deal with unexpected events, (2) providing small loans to deal with the negative financial effects of short-term unexpected financial shocks, and (3) providing insurance to pay off loans in the event of the death or disablement of key family members [45]. Disaster risk mitigation practitioners in developing countries should collaborate with members of disaster-prone communities and relevant agencies to apply microfinance concepts with existing or newly-established community funds in each community to encourage the implementation of Type-B preparedness actions.

Type-C preparedness initiatives, such as engaging in disaster preparedness training programs, may be promoted by collaborating with local non-governmental organizations (NGOs) or community-based organizations (CBOs) in developing training processes that are tailored to the needs and circumstances of each community. To minimize travel time, any training programs, for example, should be offered in community venues such as community centers or other similar facilities in community areas. Furthermore, such training programs should be held on dates and times that do not interfere with the work schedules of the target populations. Collaborating with local non-governmental organizations (NGOs) or community-based organizations (CBOs) involved in each area is recommended because they have a greater understanding of the backgrounds, circumstances, or constraints of the people in each area and, in general, have strong relationships with communities. Their understanding of community contexts, as well as the positive relationships they have established with each community, should be useful in designing and implementing disaster preparedness training programs for low-income households in developing countries.

Finally, our research (Study2) discovered that people's disaster preparedness and their knowledge, skill, and experience regarding disaster management are the primary sources of household resilience. This emphasizes the importance of self-reliance in improving people's resilience, which is consistent with previous research [30-32]. Thus, continued efforts to encourage households to take all types of preparedness measures and to inform people about hazards and disaster risk reduction are required so that people can help themselves as much as possible during and after a disaster, especially in developing countries where local government capacity to deal with the effects of large-scale disasters can still be minimal.

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APPENDIX

Questions in the questionnaire of study 1

Personal information:

(1) What age are you?
(2) What gender are you?
(3) What is your role in the household?
(4) What degree (education) do you currently hold?
(5) What do you do for a living?
(6) Have you ever experienced a major flood in your life?
(7) The 2011 floods had an impact on you and your family?

Household characteristics:

(1) How many members of your family are there?
(2) What is the monthly income for your family?

Preparedness measures taken:

(1) Have you taken any steps to raise or flood-proof your home since the 2011 flood?
(2) Do you keep water and non-perishable food on hand?
(3) Do you prepare first-aid kits with basic supplies and needed medications?
(4) Do you keep cash on hand for emergencies?
(5) Do you have a boat or other vehicles that you could use in the event of flooding?
(6) Do you check the weather forecast on a regular basis?
(7) Have you purchased flood insurance?
(8) Do you have any information on public shelters in the event of a flood?
(9) Do you have information on flood evacuation routes and procedures?
(10) Have you attended any disaster preparedness trainings or workshops since the 2011 flood?