Study on Process of Building Adaptive Capacity to Climate Change through Social Capital in Low-Income Communities: A Case Study of Nakhon Sawan Municipality in Thailand

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Abstract

This study observes the case study of the “Nakhon Sawan Community Development Organisation,” which is a network of 21 low-income communities in Nakhon Sawan City Municipality in Thailand. This network’s adaptive activities before, during, and after the mega flood in Thailand in 2011 are considered to be progressive. This study tries to investigate 1) What types of social network/capital can promote building adaptive capacities to flooding in low-income communities, and 2) Poor urban communities’ processes and conditions to form social capital that lead to building adaptive capacity. In this study, three types of social capital—bonding, bridging, and linking social capital—are used for analysis, and these three types are classified at three levels: local, national, and international. From the research, it is revealed that 1) From normal time to during and after the flood, bonding social capital, or the community network, is the basis of adaptive activities, 2) Bonding social capital can carry out adaptive activities in combination with linking and bridging social capital at national and international levels, 3) Low-income communities’ first step to expand its social networks with other organizations is uniting within a community and collaborating with neighborhood communities, and 4) A multi-layered, low-income community network system is effective for disaster management.

Key Words: low-income communities, adaptive capacity, adaptive activity, social capital, flood

1. Introduction

In recent decades, we have faced many natural disasters that are said to be caused by global climate change, such as flooding, storm surges, droughts, and heat waves. These natural disasters have caused great damage on people physically, socially, and economically. Currently, decreasing vulnerability to climate change is a big challenge. Adaptive capacity, exposure, and sensitivity are considered three determinants of vulnerability (Polsky et al. 2007).¹ The World Bank points out that exposure to risk by the urban poor is exacerbated by where they live within cities and their limited access to basic infrastructure and services. It also states that land tenure, employment, financial security, and availability of social networks affect the sensitivity and adaptive capacity of the urban poor to climate change and disaster risk. That is, the urban poor are particularly vulnerable to climate change and natural hazards (Baker 2012).² This study especially focuses on adaptive capacity and activity, and examines how the urban poor can build their adaptive capacity to climate change, especially flooding. In this study, adaptive capacity is defined as “The ability of a human or natural system to adjust to climate change, including climate variability and extremes, to moderate potential damages, to take advantage of

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opportunities, or to cope with the consequences,” following IPCC’s definition (IPCC 2001).³

Adaptation is currently an important research area, and there are many bodies of research on adaptive capacity and activities. Most scholars identify access to resources as the most important determinant of adaptive capacity (Smith and Pilifosova 2001, Adger 2003, Phillips 2003, Patt and Gwata 2002).^{4, 5, 6, 7} Therefore, identifying how poor communities access resources and build their adaptive capacity as well as what resources promote their adaptive capacity is very essential.

In poor communities in developing countries, physical as well as knowledge and information resources, which can be obtained within the community, are limited. Therefore, accessing resources outside of the community is necessary. How can these communities access outside resources? Many scholars identify that people are enabled to access outside resources through social networks. In sum, the poor community can build their adaptive capacity and access to resources by developing social capital and networks with other groups or organizations. Szreter and Woolcock (2004)⁸ state that such social networks are a “wire” through which information and resources run, and further that the network and relationship is social capital’s core component. On the other hand, other scholars such as Lin (2008)⁹ see social capital as the “electricity” running through those wires, or in other words as the information and resources that are exchanged. This study follows Szreter and Woolcock’s⁸ definition of social capital. To identify what types of “wires” can build adaptive capacities in poor communities and how they can develop such “wires” are the keys to building adaptive capacity.

This paper aims to address the following two questions:

- What types of social networks or capital can promote adaptive capacities to prevent against flooding damages in low-income communities?
- What processes and conditions of poor urban communities help to form social capital that leads to building adaptive capacity?

This paper takes up a case study of the “Nakhon Sawan Community Development Organisation” (NSCDO) in Thailand, a community network composed of 21 poor communities as of 2015 in Nakhon Sawan Municipality, Nakhon Sawan Province. The different features among 21 communities in the NSCDO are not critical in this study. Outline of Nakhon Sawan Municipality is summarized in Table 1.

Table 1. Outline of Nakhon Sawan Municipality

Region	Central Region
Distance and direction from Bangkok	237 km North of Bangkok
Area	27.87 km ²
No. of communities	67 communities
Population (as of May 2013)	86,703 people
Occupation	Business sector: 46 % Day worker: 25% Public servant: 11% Others: 18%

Data source: Web page of Nakhon Sawan Municipality (<http://www.nsm.go.th/>)

The Nan River and Ping River, both of which flow from the northern part of Thailand, run together into Chaopraya River in Nakhon Swan Province. Therefore, this area is one of the most flood-prone areas in Thailand. In the case of the mega flood in 2011, the river dike in the city was broken, and the built-up area of the city was inundated by one to two meters. In some

communities, the water remained stagnant for three to five months without retreating. The situation of the 2011 Mega floods is shown in Figure 1.

Figure 1. Situation of floods during May to Nov. 2011

Source: Data from 'Thailand Flood Monitoring System (<http://flood.gistda.or.th/>)'

The NSCDO's activities during and after the mega flood in 2011 received great attention (The Community Organizations Development Institute, 2011, The Asian Coalition for Housing Rights, 2012)^{10, 11} and were studied as low-income communities that have high adaptive capacities and conduct good adaptive activities in Thailand. This local-level community network is under the community network of Nakhon Sawan Province. In Thailand, there are hierarchically organized community networks, from the national level to the neighborhood level, and this layered community network system is organized by the Community Organizations Development Institute (CODI).

CODI is a public organization under the Ministry of Social Development and Human Security in Thailand, and its objective is to address the housing problems of the country's poorest urban and rural citizens. Networking between low-income communities is CODI's method to empower such communities. Today, low-income community networks are recognized as a strong tool to empower poor communities in Thailand as well as in other countries. The Asian Coalition for Community Action (ACCA) program seeks to address poor communities' housing problems by utilizing city-wide community networks, and is conducted in many developing Asian countries by the Asian Coalition for Housing Rights (ACHR), a coalition of Asian professionals and NGOs. There are several papers about the effectiveness of community networks to empower low-income communities (Leonhardt, 2015, Bhatkal and Lucci, 2015).^{12,}

¹³ However, there are very few researches that deal with the effectiveness of community networks on building adaptive capacities toward disaster.

2. Social Capital and Disaster

So far, a large number of articles have been devoted to the study of how social capital has effects on disaster management, such as providing access to various resources in a disaster situation and post-disaster (Elliot et al., 2010, Hurlbert et al., 2000).^{14, 15} Though the scholars have shown evidence of the efficacy of social capital to disaster management, resilience research has not yet embraced social capital as a critical component (Aldrich and Meyer, 2014).¹⁶ Szreter and Woolcock (2004)⁸ separate social capital into three main types: bonding, bridging, and linking. Some scholars adopt this typology to analyze the role of social capital in disaster management (Aldrich, 2012; Kawachi, Kim, Coutts & Subramanian, 2004; Szreter & Woolcock, 2004).^{8, 17, 18} Bonding social capital refers to trusting, co-operative relationships between members of a network who see themselves as being similar, regarding their shared social identity. An example of bonding social capital includes relationships between friends or family.

Bridging social capital, by contrast, comprises relationships of respect and mutuality between people who know that they are not alike in some socio-demographic or social identity sense (differing by age, ethnic group, class, and so forth). Another type of social capital is linking social capital, which is defined as norms of respect and networks of trusting relationships between people who are interacting across explicit, formal, or institutionalized power or authority gradients in society (Szreter and Woolcock 2004).⁸ The difference between bonding social capital and bridging social capital is that the former is characterized by homogeneous in demographic characteristics, and the latter has demographic diversity. The difference between bridging social capital and linking social capital is that the former is a horizontal metaphor, while the latter is a vertical one.

Disaster scholars have used social capital to understand the trajectory of individuals and communities. Social networks provide financial and non-financial resources (Aldrich and Meyer 2014),¹⁶ and many scholars have used the three typologies of social capital and show the roles of each type. *Bonding social capital*, the first and most common form of social network available to disaster-affected individuals (Norris et al. 2002),¹⁹ provides a number of types of resources, such as warning, disaster preparation, shelter, supplies, and immediate aid and initial recovery assistance during and after catastrophes (Hawkins & Maurer 2010, Heller et al., 2005).^{20, 21} In particular, family ties can be a first provider of assistance (Garrison & Sasser 2009, Haines, Hurlbert & Beggs 1996, Hurlbert et al., 2000).^{15, 22, 23} Ties among the community display higher levels of bonding social capital. Nakagawa and Shaw reveal that communities with higher social capital and community leadership showed higher satisfaction with community rebuilding, and also showed the quickest recovery in the case of the Gujarat and Kobe earthquake (Nakagawa & Shaw, 2004).²⁴

Bridging social capital has been shown to provide opportunities and information to access novel resources that assist in long-term recovery (Hawkins and Maurer 2010).²⁰ Ties to social organizations provide connections to an organization that can provide support through institutional channels and potential informational ties to individuals (Aldrich and Meyer

2015).¹⁶ After Hurricane Andrew, members of social groups received more support (Haines, Hulbert & Beggs 1996).²³

Many scholars point out that *linking social capital* also provides resources that assist in long-term recovery. Bonding social capital allows underdeveloped regions and low socio-economic individuals to “get by” during and just after catastrophes, but without linking connections to an extra-local organization, they have difficulties in long-term recovery (Woolcock et al. 2000, Dahal et al. 2008, Elliott et al. 2010).^{14, 25, 26} Thus, there are some researches on the role of three types of social capital during and after a disaster. However, there are very few researches that examine the role of social capital from pre-disaster to post-disaster continuously, especially including preparedness for disaster in a normal period. Therefore, this study attempts to examine the role of the three types of social capital from the normal period to that which follows a catastrophe. In addition, there are several levels of each of the three types of social capital, such as local, regional, national, and international levels. Each different level is expected to have a different role, but there is no research that classifies the three social capitals horizontally. Therefore, this research classifies the three social capital types by level and seeks to identify their role.

3. The NSCDO as a Case Study

3-1 Methodology of this Research

As previously mentioned, the NSCDO is observed in this study, and is composed of 21 poor communities in Nakhon Sawan Municipality as of 2015. In this study, a field survey was conducted from March 4th to 29th in 2015, and interview surveys were administered to a leader of the NSCDO, community leaders and committee members in the network, and villagers in the communities, as well as to CODI staffs and Nakhon Sawan Municipality office staffs. After the field survey, telephone interviews were also conducted 15 times. From the interview surveys and analysis of related documents, the processes of organizing the network and building adaptive capacity were clarified. Further, during the process of organization and building capacity, the types of social capitals and resources obtained were clarified.

3-2 Urbanization and Increase of Flood Damage in the Nakhon Sawan Municipality

The Nakhon Sawan Municipality is an area that is highly prone to flooding, experiencing small- to large-scale floods almost every year. Before around 1995, seasonal floods seemed to be rather beneficial to the villagers since most of them worked in agriculture or at freshwater fisheries, the main sources of household income in that area. First, regarding agriculture, humus was carried into the affected areas after flooding inundation as it enriched the soil. Consequently, a yard would generate the best-quality crops, such as sweet, waxy com, and high profit would result. Second, flood causes diversification of the aquatic ecological system, and a huge number of the freshwater animals had generated a high income for fishermen.

In this age, most of the houses in this area are traditional raised-floor, wood-frame houses. This kind of house provides space on the first floor. Functionally, space is useful for the house in the tropical zone as it enables the free flow of air during times of high temperature. Furthermore, space is required to store job equipment such as boats, fertilizers, fishing nets, and so on. Simultaneously, the traditional raised-floor house has the function of acting as a sort of

floodway during rainy season. When a flood occurs, people move their valuable items and functional furniture up to the second floor. Thus, this raised floor house matches people's lifestyle, and when flooding occurs, people do not suffer so greatly. However, some households did not have houses with raised floors, leaving them unable to respond to flooding disasters and to suffer greatly from the outcome. These individuals evacuated to relief centers that were established and supported by the local and national government. Still, people's life matched the local climate, including seasonal floods.

Since around 1995, immigrants to Nakhon Sawan Municipality from the rural areas had increased, the overall population also increased, and the previous circumstance had been changed. Most of the immigrants' occupations were not in the agricultural sector but mainly in the service jobs mainly in informal sector. Additionally, the main job type of residents who were born and raised in Nakhon Sawan Municipality changed from the agricultural sector to the service sector. Most of the houses for immigrants are houses with non-raised floors because raised-floor houses are not comfortable for the extended family member. Moreover, as their livelihood has changed such as from the agricultural to the service sector, the space of the first floor is no longer necessary. In addition, most of the newly developed houses for non-immigrants are also houses with non-raised floors. Therefore, residents' lives have come to be impacted by flooding now more than ever before.

4. The Nakhon Sawan Community Development Organisation

4-1 Formation of the NSCDO and its Suspension

(1) Development of the Women's Group

Nine communities in Nakhon Sawan Municipality have the problem of land tenure because they were squatters and thus feared eviction. Initially, residents worked together to tackle this problem in each community. This is the first case of social capital, and specifically is bonding social capital. The communities came to know that neighboring communities have the same problem, and finally they united to address the problem. This social tie among neighborhood communities is another example of bonding social capital as they demonstrated together to appeal their problem. By working collectively, they could appeal the problem more drastically, and the city municipality office finally became aware of the problem and began to support the communities. In addition, linking social ties appear here. In 1993, a joint group of women were organized by those communities with the support of the city municipality office, and became known as the "Women's Group." For the most part, women of the communities joined this group because housewives had more time for such an activity than did their husbands. They discussed their common problems, which involved not only land tenure but also debt, environmental management, and community welfare, and worked together to solve these issues. By developing a network in this community, the local groups could receive support to formalize their networks according to the municipality office.

(2) Development of the NSCDO

Eventually, one of the staffs of the municipality office connected the Women's Group to the Urban Community Development Office (UCDO). The UCDO is a former organization of CODI

and aims to support low-income urban communities with funds from the government. The UCDO began to support the Women's Group because the UCDO supports low-income communities to secure land tenure. This network between the Women's Group and the UCDO is an example of linking social capital.

In 1995, the group was reformed to be named the "Nakhon Sawan Community Development Organisation" with the support of the UCDO and the municipality office. The UCDO had a program to develop networks within neighborhood communities, and the city municipality office continued to support the NSCDO by, for example, providing facilities such as office space, stationary, and so forth. In addition, the UCDO provided the organization with some helpful resources, such as instructing upon management and public hearing techniques. In 2000, the UCDO merged with the Rural Development Fund to create CODI, a public organization under the Ministry of Social Development and Human Security in Thailand. Its main objective is to address the housing problems of the country's poorest urban and rural citizens. Eventually, however, member communities of the community network disagreed with one another on some particular issues, and also faced disagreements with the city municipality office. Finally, the community network ceased its operation from 1999 to 2005.

4-2 Reorganizing the Nakhon Sawan Community Development Organisation

(1) Reorganizing the NSCDO

In early 2005, CODI proposed to re-establish the community network. First, savings groups were established in eight communities in 2005. These savings groups are illustrative of bonding social capital. In the same year, the "Nakhon Sawan Development Network" was re-established as well.

(2) Joining the National Union of Low Income Community Organisations

After re-organizing the network, the NSCDO jointed the low-income community network of Nakhon Sawan, which consists of the provincial level of the layer of hierarchical community networks mentioned in the first chapter. This means that the NSCDO joined the hierarchical community network. The national-level community network is called "The National Union of Low Income Community Organisations" (NULICO). At the national level, NULICO is organized by committees that are composed of representatives of each region and team. There are four teams: 1) The land security team, 2) The community welfare fund team, 3) The law and regulation team, and 4) The internal development of the community networks team. NULICO committees mainly support the coordination of community organizations and local authorities to solve problems that occur in member communities. NULICO is an extremely powerful platform for community development—a platform that involves a synergy of learning, the sharing of experiences, the boosting of morale, and inspiration. Community networking has become the main community-led development mechanism of CODI. By joining this hierarchical community network, the NSCDO developed bridging social capital with community networks at the national, regional, provincial, and city levels. Further, although the community network has a hierarchical structure, the relationship between the NSCDO and each level of the community network is horizontal. Each community network and its member communities have broad demographic diversities beyond simply sharing the commonality of "low-income." Therefore,

social ties between the NSCDO and each community network can be recognized as bridging social capital.

Figure 2. National Union of Low Income Community Organizations

Source: Translated from National Union of Low Income Community Organizations (2010)

(3) Housing Improvements by the Baan Mankong Collective Program

Furthermore, in 2006, two communities of the NSCDO met the requirements and joined the Baan Mankong Collective Program (BM program), which is organized by CODI. The program channels government funds, in the form of infrastructure subsidies and soft housing and land loans, directly to poor communities, which plan and carry out improvements to their housing, environment, basic services, and tenure security, and also manage the budget themselves. Through this program, a large number of poor communities all over Thailand have succeeded to improve their houses and environment since 2003. First, the micro-credit savings groups were organized in communities, and through these groups the communities acquire financial support and loans to secure land tenure or ownership groups. The cornerstone of the program is the principle of community-based financial mobilization enabled by savings groups. To obtain BM loans, communities develop housing in a collective way, and must save 10% of the amount they borrow in a community savings account for the community cooperative to qualify for a loan. CODI provides housing loans to community cooperatives at a 4% annual interest, and allocates a grant to each community of 20,000 baht (\$570) per family. Cooperatives then on-lend to members, usually adding a margin on the interest rate to create a fund to cover cases of unsteady loan repayments and to fund other community activities, expenses, and some welfare programs (Bhatkal and Lucci 2015).¹³ In 2015, 19 communities in the NSCDO joined the BM program.

(4) Community Construction Team “Chang Chumchon”

Community networks in many cities have started to make a list consisting of local masons, carpenters, plumbers, electricians, and skilled construction workers who live in these communities. These individuals are called upon whenever there are any building or construction needs. CODI has managed to enable the state to provide over 68,000 baht/unit subsidies directly

to the people. The total budget is \$46 million covering 1,010 communities nationwide. The people can decide for themselves who to hire and work with.

The self-build network is a technical support mechanism, but it is also a kind of job creation scheme and a collective business. Much of this expertise is being channeled into community construction groups, who are taking on jobs with other communities, as well as small contracting jobs on the outside. These teams are now called “Chang Chumchon” (“Guilds of the Commune”). Occasionally, communities hire Chang Chumchon like a contractor to build everything, and sometimes they merely help out with the heavy work of laying foundations in communities that want to do most of the work themselves. At times, they provide the labor force, and at other times they are asked to provide specific technical expertise to work out problems of drainage, structural engineering, or house design. Not all BM housing projects were built by Chang Chumchon because houses and apartment buildings over two stories high typically required more specialized work (CODI webpage, “The Guilds: a Self-Build Community Network”).²⁷ Still, communities that are joining the BM program in the NSCDO establish this Chang Chumchon in their communities. Wages to members of the construction team are set at 300 baht per day, which is the average wage without consideration of skill level. Therefore, theirs is somewhat voluntary activity.

4-3 Adaptive Capacity and Activities in the 2011 Mega Flood

Next, we try to identify the adaptive activities observed in the 2011 mega floods in the NSCDO. Each adaptive activity, as well as their resources and social network through which access to resources was enabled, are summarized in Table 2. Additionally, each adaptive activity is divided into the categories of “get by” and “long-term disaster management”. “Get by” is defined as to manage to survive/live during a disaster and “long-term disaster management” is defined as to manage to mitigate the impact of a future disaster and to manage to recover from the damage of a disaster.

In 2011, Nakhon Sawan Municipality was seriously hit by a mega flood. However, houses that had been renovated or constructed with concrete materials mainly through the BM program were less affected. Therefore, renovation/construction of houses with concrete materials can be recognized as an effective adaptive activity and is a long-term adaptation of disaster. To renovate/construct houses in the BM program, various resources are required, such as funds, construction skills, and money-saving systems. The fund is not only saved money in a savings group, but also a loan from the program. Further, construction teams support the renovation or construction of some houses, and they are subsidiaries of CODI, as previously mentioned. Construction team members obtained their skills from on-the-job training. Therefore, funds, human resources for construction, construction skills, and the BM program’s system itself are resources for the renovation/construction of houses with concrete materials. Funds and the BM program are obtained through CODI. Human resources and skills are obtained through the community and neighborhood communities ((1) in Table 2).

The improvement of community infrastructure such as paving roads is also an adaptive activity, and most of these are realized by the BM program. In addition, such an adaptive activity is a long-term adaptation to disaster as well. Therefore, resources and social networks through which resources are obtained are the same as those noted as required for housing renovations ((2) in Table 2). In addition, when the flood was approaching, information teams of

the community network updated flooding information daily by cooperating with the neighborhood community networks and local authorities. This is short-term adaptation to “get by.” Resources to these adaptive activities are information of floods and human resources to collect and distribute the information ((3) in Table 2).

From before the flood and during the recovery stage, communities conducted collective activity for preparation, protecting against the flood, evacuating, and recovery of affected houses and infrastructure by cooperating with the municipality office. These are also short-term adaptive activities. Human resources as well as some funds and supplies came through the NSCDO and the municipality office. During and after the mega flood, the NSCDO received donations and relief supplies such as food, drinking water, and boats from NULICO and CODI. Members of NULICO who were not affected by the flood have agreed to contribute 30 baht (approximately \$1) each to help those who were affected. These and other funds that have been raised will be managed by the community network in order to aid flood relief activities. These donations and supplies were utilized for evacuating and protecting communities at relief centers and for recovery. These funds and supplies came through NULICO and other hierarchical networks as well as CODI ((4) in Table 2).

During and after the mega flood, two relief centers were launched and operated by thirteen communities in the NSCDO, two of 13 relief centers in the city municipality. In total, 1,839 people received benefits from these relief centers. During the mega floods, the tasks of the two relief centers did not only provide supplies, kitchens, and sleeping spaces, but also provided skill improvement programs. This is the unique feature of these two relief centers, which provide job opportunities and training courses so that the affected people are capable of earning income during and after flooding catastrophes. Funds and relief supplies are donated from NULICO and CODI. Such activities, including launching and managing relief centers and offering job training, are also short-term, adaptive capacities to “get by” ((5) in Table 2).

After the mega floods in 2011, the NSCDO played a key role in supporting the affected communities. First, the network launched a campaign to clean and to recover the greenery areas of the communities. Second, it made a survey to check the level of damage, and they found that two houses were totally destroyed. Thus, the network made a consensus among members and consequently two houses were re-built by the construction team of the network. Third, the flood devastated many essential items in the agricultural sector, such as seeds, working tools, and equipment. In this case, the community network provided seeds for farmers. These activities are both short-term and long-term adaptive activities. Funds for these activities came from the “disaster fund,” which was established with contributions from savings groups, NULICO, and a seed fund from the ACHR. This social network with the ACHR is an example of linking social capital at the international level. Human resources and the skill of the construction team are the key resources of these activities ((6) in Table 2).

During and after the catastrophe, the NSCDO gathered data and information about the flood severity and its damages to plan future disaster responses and to respond to the current disaster. This is reflective of long-term adaptation, and human resources are necessary to collect data and information ((7) in Table 2).

After the flooding disasters in 2011, a rehabilitation program, supported by the World Bank and implemented by CODI (both of which display linking social capital), provides financial support for small infrastructure projects and housing repairs for flood victims still struggling to recover. This program also provides income support for community members to carry out

needed construction work themselves (The World Bank website, Thailand's Flood Victims on Track to Recovery and Resilience).²⁸ Six target communities were selected from the community network with a recommendation by CODI, and held a public hearing to decide on what projects to take up in their communities. Most of the communities decided to develop infrastructures such as road pavement, water drainages, and so on. Water pumping was decided as necessary to construct within the affected communities: two communities shared the budget to construct the center of water pumping that covered the affected areas. A total budget of approximately 1.2 million baht was allocated to the communities, but this was not enough for the required project. Then, the city municipality subsidized part of the budget ((8) in Table 2).

Upper left: Foods provision for affected people
Upper right: Kitchen in the relief center
Lower left: Big cleaning day after the mega floods

Figure 3. NSCDO's Activities during and after the Mega Floods in 2011

Source: provided by NSCDO

Table 2. Adaptive capacity/Activity and its resource and social capital thorough which NSCD network obtained them

No.	Timing	Adaptive capacity/activity	Resources	Social Capital
(1)	Before	Renovation/construction of houses with concrete materials (Long term)	-Fund -Human resources -Skills of construction -BM program system	NSCDO (Bonding SC at local level) communities (Bonding SC at local level) Saving groups (Bonding SC at local level) CODI (Linking SC at national level)
(2)	Before	Improvement of community infrastructure (Long term)	-Fund -Human resources -Skills of construction -BM program system	NSCDO (Bonding SC at local level) communities (Bonding SC at local level) Saving groups (Bonding SC at local level) CODI (Linking SC at national level)
(3)	Before -During	Update flood information (Get by)	-Human resources -Flood information	NSCDO (Bonding SC at local level) Neighborhood community network (Bonding SC at local level) Municipality office (Linking SC at local level)
(4)	Before -After	Collective activity to prepare, protect, evacuate and recovery (Get by)	-Fund -Human resources -Relief supplies (Food, Boat and Sand Bag etc.,)	NSCDO (Bonding SC at local level) NULICO and other community networks (Bridging SC at national level) Municipality Office (Linking SC at local level) CODI (Linking SC at national level)
(5)	During	Establish and manage two relief center by communities and give vocational training (Get by)	-Fund -Human Resource -Relief Supplies (Food and equipment etc.,)	NSCDO (Bonding SC at local level) NULICO (Bridging SC at national level) CODI (Linking SC at national level)
(6)	During -After	Rebuild affected houses, improve community environment and provide seeds to farmers with disaster fund (Long term)	-Fund -Human resource -Construction skills	NSCDO (Bonding SC at local level) NULICO (Bridging SC at national level) CODI (Linking SC at national level) AHCR (Linking SC at international level)
(7)	During -After	Collect information and data of the flood for future planning (Long term)	-Human resources	NSCDO (Bonding SC at local level)
(8)	After	Development of small infrastructure (Community-based Livelihood Support for the Urban Poor Program) (Long term)	- Fund -Human resources	NSCDO (Bonding social capital at local level) City Municipality (Linking SC at local level) CODI (Linking SC at national level) World Bank (Linking SC at international level)

Figure 4. Timing and term of adaptive activities and type and level of social capital

Figure 4 summarizes the timing (before/during/after the mega flood) and term (short-/long-term) of the adaptive activities, as well as the type (bonding/bridging/linking) and level (local/national/international) of social capital through which resources of adaptive

activities are obtained. Many scholars point out that bonding social capital allows low-income communities to “get by” during and just after catastrophes, but without linking social networks to the extra-local organization, they face difficulty in long-term recovery (Woolcock et al. 2000, Dahal et al. 2008, Elliott et al. 2010).^{14, 25, 26} In this case study, a small-scale adaptive activity for the long term was conducted exclusively by the NSCDO ((7) in Table 2), while middle- and large-scale adaptive activities for both the short term and the long term are carried out by a combination with the NSCDO and bridging and linking social capital at various levels. This case study has the same result as previous researches. However, it can be said that bonding social capital is the basis of all adaptive activities for both the long term and short term.

Most of the activities are conducted by a combination of bonding social capital at the local level and bridging social capital at the national level, and/or linking social capital at national and international levels. Especially, bridging social capital and linking social capital at the national level, namely CODI and NULICO, play an important role at all times. Paradoxically, as adaptive activities that can be conducted by local-level social capitals are very small, communities that do not have a social network with bridging and linking social capital can perform the limited adaptive activity in the face of disaster.

A characteristic of this case study is that there is bridging social capital at the national level, which is NULICO. NULICO played a very important role for both “get by” and long-term adaptive activities. This is because communities in regions that are not affected by flooding can support communities in affected areas. The main objectives of this multi-layered community network are to secure land tenure and improve the houses and living environment, but this system is effective for disaster management as well.

So far, there are limited numbers of researches that deal with adaptive activities from a normal period to during and after a disaster. In a normal period, nine communities renovate or build their houses with concrete materials and improve community infrastructure through the BM program. Thus, bonding social capital and national-level bridging and linking social capital play significant roles for this long-term adaptive activity.

Outline of organization that associated with the NSCDO are summarized in Table 3.

Table 3. Outline of NSCDO and organization associating with NSCDO

	Establishment year	No. of staffs (people)	Main financial resources	Main Goal
NSCDO	1995	No full time staff	CODI (through BM project) Interest of loan to members Profit from 'Chang Chumchon'	1) To develop livelihoods of an urban community such as housing, disaster, debt and welfare by using a saving group 2) To enhance the community network by working with both municipalities and government authorities
CODI	2000	Staff :282 Project officer: 57	Thai Government (252 million baht/year)	To build a strong societal base using the collective power of civil groups and community organizations
NULICO	2006	No full time staff	CODI	1) To solve the problems of community organizations of the poor in cities; 2) To collectively push forward policy changes with the state.
ACHR	1988	Office staff: 5 Field coordinator:3	Donors (depend on a project)	To solve Asia's urban poor housing problems using Asia's greatest resource: People

Data source: Interview with NSCDO, CODI and ACHR (Sep., 2016), webpage of CODI (<http://www.codi.or.th>) and ACHR(www.achr.net) and Archer (2010)²⁸

5. The Process of Developing Social Capital

The first social capital is bonding social capital among communities to tackle with the land tenure problem. The demonstration for land tenure was conducted by ten communities in 1993, and it was the first opportunity in which the communities worked collectively. They now build bonding social capital between communities ((1) in Figure 5).

As the communities worked collectively against land tenure problems, they increased their presence and became familiar with some staffs in the Nakhon Sawan Municipality office. Finally, the municipality office started to support them and helped to organize the Women's Group. In this way, the communities developed linking the social capital with the municipality office and through the social capital ((2) in Figure 5).

This linking social capital gave the Women's Group a chance to develop linking social capital with UCDO, a national-level organization and former organization of CODI. By networking with UCDO, the Women's Group was reformed to the NSCDO ((3) in Figure 5). Further, this linking social capital with CODI led to develop bridging social capital with multiple levels of community networks, including NULICO. This social networking with community networks is considered as bridging social capital ((4) in Figure 5).

By joining these community networks and the BM program by CODI, the NSCDO can receive Thai government subsidies through CODI and NULICO. CODI also connected the NSCDO with the international NGO, ACHR, and could thus receive some part of disaster funds. This relationship with ACHR is a display of linking social capital ((5) in Figure 5).

After the mega flood in 2011, six communities in the NSCDO were selected to join the World Bank's program, and they improved infrastructure in their community with financial support from the World Bank. This linking social capital with the World Bank was led by CODI.

CODI recommended these communities for the program ((6) in Figure 5).

Figure 5. Social network between NSCDO and other institutions

6. Discussion and Conclusion

This research reveals that bonding social capital is the basis of all adaptive activities for all periods. However, this type of social capital must link with other organizations at the local, national, and international levels. As it is essential to link connections with other organizations, especially national-level organizations, we can say that low-income communities that do not have such connections are extremely vulnerable to natural disasters. To connect with national-level organizations, uniting within a community is the first step, followed by the next step of collaborating with the neighborhood community. Then, networks should connect with the local organization in order to establish connections with national-level organizations, which in turn leads to connections with other national level and international-level organizations. Therefore, a connection at the local level is the essential step to establish “wires” with other organizations and to create social capital. Paradoxically, low-income communities that do not unite or have a good connection with neighborhood communities are vulnerable to natural disasters, and thus must be looked after.

This case study of the NSCDO illustrated how to connect with multi-layered, low-income community networks. This developing community network in Thailand does not aim for disaster management. However, as a result, this network system was effective for disaster management because, in the case of disaster, communities in regions that were unaffected by a disaster could offer support to communities in affected regions. Therefore, this system has the possibility to function well in other countries. However, it is also important to note that we must always be aware of low-income communities outside of the network.

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