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The Role of Social Capital and Local Institutions in Coping with Climate Stresses: The Case of Krapum Chhouk Commune in Rural Cambodia

Va Dany

Institute of Sustainable Development and Architecture, Bond University,
Email: dva@bond.edu.au

Michael Regan

Institute of Sustainable Development and Architecture, Bond University
Email: mregan@bond.edu.au

Ros Taplin

The Australian Centre for Sustainable Mining Practices, The University of New South Wales
Email: r.taplin@unsw.edu.au

Bhishna Bajracharya

Institute of Sustainable Development and Architecture, Bond University
Email: bbajrach@bond.edu.au

ABSTRACT

Social capital is a central requirement for a successful climate change adaptation, especially in Cambodia where formal institutions are still poorly developed. Collective action and not-for-profit bonding are important for climate change adaptation; however, these are not easily developed. This study examined the local institutions vital for the livelihoods of citizens who live in flood-prone Krapum Chhouk commune in rural Cambodia. Through observations and in-depth interviews with the local community, it investigated social capital in terms of the dynamics of relationships, relations of trust, and social norms and practices. This study found that most networks were profit-oriented. Traditional practices such as community assistance for either agricultural works or social welfare have been diluted, and relations of trust were an issue in some villages. The connections between local institutions were found to be lacking; cross-membership across institutions was limited. Overall, many indications of weakness were found in community institutions, which may have negative implications on addressing climate change.

Keywords: social capital, local institutions, local livelihoods, climate stresses, Cambodia

JEL classification: Q54

INTRODUCTION

Cambodia is a tropical and underdeveloped country with a population of 13.4 million people, 80.5 percent of them living in rural areas. The 2007 census data indicate that 30.1 percent of the population lived under the poverty line, the highest rate among Southeast Asian countries. The 2007 Cambodian Socio-Economic Survey shows that 77.5 percent of rural labor was in the agricultural sector, which includes crop production, livestock, farming, and fishing, occupations that are highly climate sensitive (Royal Government of Cambodia [RGC] 2008a).

Cambodia has a relatively low adaptive capacity to climate change compared with other Southeast Asian countries (Yusuf and Francisco 2009). Building community resilience is critical, especially because the country lacks a climate change adaptation plan (RGC 2011). The World Bank (2009a) supports this, arguing that not only government institutions play an important role in climate change adaptation, but also community institutions and civil society organizations. This notion is reinforced by Storbjork and Hedren (2011) who identified weak vertical administrative function and networking capacity as barriers to sea-level rise adaptation in a Swedish coastal management project. Additionally, Nooteboom (2007) notes that due to limited presence of formal institutions, developing countries require social capital for local development, even though this type of capital is based on personal trust and thus tends to be fragile. In a broader context, the literature (Adger 2003; Brooks 2003; Turner et al. 2003; UNFCCC 2006; Lebel et al. 2009; Preston and Stafford-Smith 2009; Veraart and Bakker 2009) underscores that taking social determinants into consideration is imperative in addressing climate change adaptation.

Social capital is central to climate adaptation strategies (Adger 2003; World Bank 2009a)

because it is an important medium of economic transaction and collective action when natural resources are scarce (Adger 2003). Paavola and Adger (2005) refer to social capital as the flow of information and density of networks; it thus plays an important role in providing and obtaining access to these resources for individuals and societies (Adger 2003). The resilience of societies and communities relates to ecological resilience (Adger 2000). More importantly, social capital built for non-economic purposes in a community as well as family bonds is often helpful in coping with extreme conditions (Adger 2003). Adger (2003) views adaptive capacity as an ability to act collectively, noting that adaptation efforts can be enhanced through building relationships, trust, and exchange. Additionally, collective action in conjunction with appropriate institutions is a driver of successful adaptation at the community level (Adger 2003; World Bank 2009a).

This paper is part of a wider study on building community resilience toward emerging climate disasters in Krapum Chhouk commune, Koh Andet district, Takao province, Cambodia. The study focused on the livelihoods of the locals in Krapum Chhouk commune and changes in the commune's natural resources by mapping out the means and natural resource requirements of the local livelihoods as well as their sensitivities to climate variability and change. The underlying causes of changing livelihoods over time were scrutinized. Social capital and local institutions were also mapped to improve understanding of local rules and customs in an environment where livelihoods are under climate and development pressures. This paper presents an analysis of the social capital and local institutions examined in the study.

THEORETICAL FRAMEWORK

In a broad sense, social capital means almost everything related to connections between people; it refers to a micro-level relationship that is nongovernment and voluntary and, thus, can be viewed in terms of relationships and outcomes (Nooteboom 2007). It is a form of investment in social relations with expected profits, according to Lin (1999, 2001). This notion presents two perspectives. First, as with human capital, the return from social capital is to individuals, therefore it relates to how much individuals devote to social relations and how they can capture the growing resources. Furthering this idea, Fukuyama (2002) notes that social capital is a private good, not a public good. Second, it is a collective asset that is available for every member of a group (Lin 1999, 2001; Nooteboom 2007). Collective action stemming from social capital provides the group members opportunities to enhance their achievements; thus, social capital is also a process that a group can maintain to produce collective assets. Nooteboom (2007) adds that although social capital is not imposed by government, certain government agencies may play a role in its development and operation. In more practical terms, social capital is a bond among individuals in a social group developed and maintained through sharing information, knowledge, financial risk, or reciprocity, especially in times of crisis, and synergizing between the state and civil society (Adger 2003).

Social capital can also refer to the density of networks and flow of information (Paavola and Adger 2005). Lin (1999, 2001) cites four empowering factors that legitimize social capital: information, social credentials, influence, and reinforcement. Firstly, social capital as a form of network facilitates information flow, which is a useful function, especially in an imperfect market situation.

Secondly, social credentials are acknowledged relations that reflect an individual's added values in connection to resource accessibility that can provide benefits to an organization. Thirdly, connections to powerful people in any related decision-making process is a social tie that can be used to provide or exert influence. Lastly, social relations are likely to reinforce recognition and identity through a collective interest and sharing resources, which is critical in promoting resources' entitlements (Lin 1999, 2001). Similarly, Nooteboom (2007) points out that social capital is characterized by the structure, composition, content, type, and strength of ties, trust, rules, and norms. However, long-duration relationships may reduce cognitive distance, and thus lessen innovation.

A practical way to build social capital is at the micro-level—for example, in a village, firm, or government department—where relationships among members have common causes (Fukuyama 2002). According to Nooteboom (2007), this entails investment in the sense of sacrifice and effort; if not maintained, the relationship may weaken over time. Moreover, in building social capital, trust needs to be developed over time as relationships grow. Voice and openness are the basis of trust between people. If solved properly by taking into account the views and opinions of members, conflicts do not necessarily break down trust but may even deepen it (Nooteboom 2007).

Reciprocity and exchanges also promote trust (Pretty and Ward 2001). Trust is improved through repeated social interactions (Adger 2003). There are two types of trust: personal trust, where people trust someone they know, and social structure trust, where people trust someone even if they do not personally know; him or her because they have confidence in the social structure represented by that someone

(Pretty and Ward 2001). Trust takes time to build but can be easily broken (Pretty 2003). It enhances cooperation (Lin 1999, 2001), which is unlikely to happen when distrust is prevalent in a society (Pretty and Ward 2001; Pretty 2003). Nooteboom (2007) submits that building mature understanding, trust, agreement, and coordination needs investment on relationships; these elements takes time to develop.

Norms, structural features, sanctions, and trust are central in sustaining collective actions (Lin 1999, 2001); Nooteboom (2007) refers to these as institutions. In addition to the technical requirements necessary for work to be completed, institutions are products of interactions and adaptation wherein values are infused; for this reason, they promote stability of work (Scott 1987). Normative, regulative, and cultural cognitive aspects are key elements of institutions (Scott 2008) as well as ingredients of social capital (Pretty and Ward 2001; Adger 2003; Pretty 2003). Common rules, norms, and sanctions reflect the social agreement that individuals control their own behavior in collective actions; these give individuals confidence in investing in collective or group actions (Pretty and Ward 2001; Pretty 2003). Administrative procedures are necessary to implement rules, and a bureaucracy's inadequacies in implementing an agreement may result in the agreement's fragility (Menard 2011). Similarly, because a collective asset is a public property, it is dependent on individual efforts and good will (Lin 1999, 2001). Formal rules (e.g., laws and regulations) are set by authorities, while informal ones are those used by individual group members to direct their everyday actions. Rules stipulate behaviors with positive and/or negative sanctions. On the other hand, norms are culturally accepted standards that inform individuals how they should act (Pretty and Ward 2001). Sanctions are used to ensure that those who do not respect the rules will be punished (Pretty 2003). Staveren (2003)

underscores that to be effective, social capital requires an agency.

Legal and formal institutions play an important role in strengthening social capital (Adger 2003). Nooteboom (2007) argues, however, that the existence of social capital is based on either formal or informal institutions as well as trust, and that as a source of reliance social capital connects institutions. Fukuyama (2002) submits that social capital supports institutions and the rule of law, while Jutting (2003) avers that institutions have an indirect effect on the stock of social capital and that both institutions and social capital influence income and growth.

Traditional institutions use social capital to manage environmental resources (Paavola and Adger 2005). Institutional capacity can be considered as one of the criteria in selecting climate response actions (Willems and Baumert 2003; Willems 2004). However, Jutting (2003) emphasizes that the institutional environment can be either favorable or unfavorable for development efforts and that it is influenced by historical events and culture. Incentives, disincentives, and power distribution influence the behavior of actors and, as a result, determine the outcome of institutional arrangements and strength of the stock of social capital (Jutting 2003). The experience with a coastal zone climate change adaptation project implemented in Sweden discussed by Storbjork and Hedren (2011) demonstrates that the ability of political administrative systems to address institutional conflicts is critical in mainstreaming climate change adaptation into coastal zone management plans.

The World Bank Institute (n.d.) observes that resource shortfall and the insufficient transfer of power from central to local institutions are critical challenges for adaptation. It emphasizes the "bottom up" approach as the most favorable solution for institutional development. This is because local institutions are seen as more

effective because they facilitate “the carrying on of daily lives” with minimum cost; thus, they facilitate cooperation (Pretty and Ward 2001). The capacity of institutions to effectively use resources and execute actions is important and needs to be properly assessed before authorization of any action with regard to flood risks management (Lebel, Nikitina, and Manuta 2006).

A community will be able to work collectively if the following are present: good knowledge of local resources; appropriate institutional, social, and economic conditions; and processes that encourage careful deliberation are utilized (Pretty 2003). Effective governance, strengthening local institutional capacity, and building local awareness facilitate the implementation of adaptation strategies and actions as well as building local resilience (World Bank 2009b). When institutions are weak, the intermediaries that emerge from social capital may be critical in fostering reliance and trust among stakeholders. These intermediaries may be important for developing nations where formal institutions are poorly developed (Nooteboom 2007).

METHODS

A component of the study specifically focused on mapping the formal and informal local institutions that played important roles in local livelihoods and development in the study area. The study tried to understand the rules and norms of the community and to obtain a sense of the relations of trust among key players within and between the networks and institutions. The selected institutions covered in this study included a local government, a local market, microfinance institutions, information networks, a communal charity effort, and a water user group. The water user group has been functioning for over a decade in the community; therefore, it was examined in great

detail to uncover and document its history and processes, with emphasis on success-driven factors and challenges encountered.

Data were collected in April and May 2010 using in-depth interviews and observation, as recommended by the World Bank (2009b). A group of 35 informants took part in this study, consisting of representatives from the Provincial Department of Agriculture, District Office of Agriculture, District Office of Water Resource Management, local authorities, water user committee, local elites, village elders, and farmers from all villages of Krapum Chhouk commune. The selection of informants was channeled through the commune governor, using purposive sampling.

The interviews were conducted in an iterative manner. The initial interviews generally took about an hour. Additional interviews were conducted with some key informants, especially from the water user committee and officers of the district offices of Water Resources Management and Agriculture. These offices were closely involved in implementing the irrigation network. The purpose of holding more interviews was to obtain additional information and to clarify aspects of the initial interviews.

Observations were made during the interviews and field visits with regard to irrigation infrastructure and villages, especially the operation and maintenance of the irrigation system, and natural water reservoirs. Conversations with many informants were held during the visits to improve understanding of the processes of implementing the irrigation system and particularly to sense trust relations among stakeholders. The research team also spent three days in the field living with locals in Beng village. The brief immersion allowed the researchers to obtain insights on the local institutions and people that helped in the analysis of trust relations. The study area was

Krapum Chhouk commune, which is located in a flood-prone area in Takeo province. It had 13 villages with a total population of 9,587 people (RGC 2008b). The population density was relatively high at 237 people per square kilometer (people/km²) compared with 75 people/km² nationwide. Takeo, one of the few leading Cambodian rice producing provinces, is highly vulnerable to flood and drought (RGC 2008c).

FINDINGS

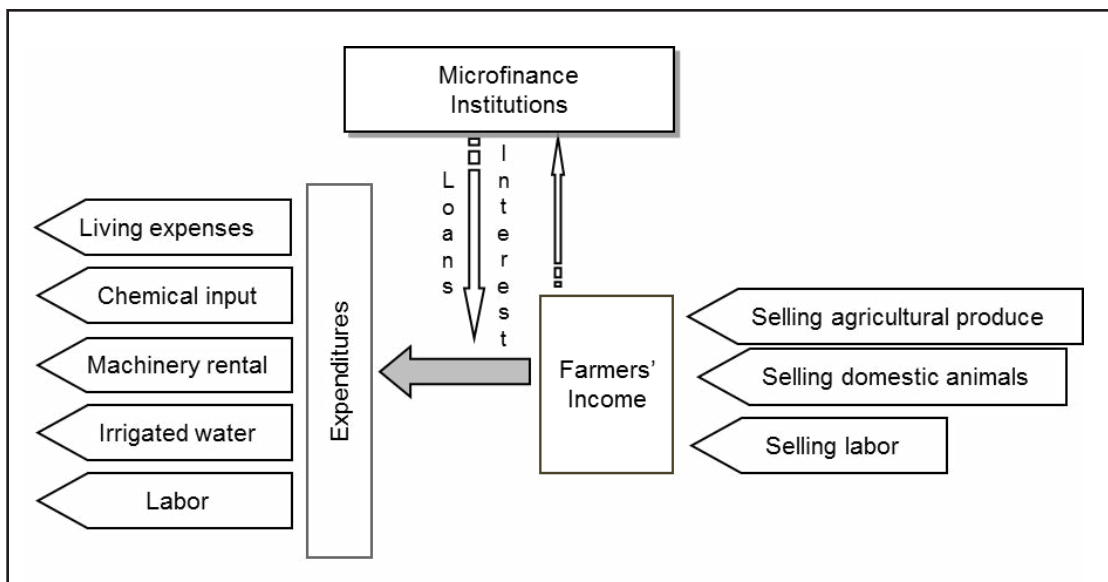
The research findings are presented in three sections: local livelihoods, local institutions, and the water user group. The section on local livelihoods provides background information on the study area, including key livelihoods and associated challenges. The local institutions section maps out the institutions that closely relate to local livelihoods and development, reflecting on climate change resilience and adaptive capacity. The final section presents the story of the water user group, which has been managed by the local community and is facilitated by a water user committee. This

section shares the experiences and lessons learned about the process of establishing and maintaining a community-managed irrigation system.

Local Livelihoods

The local livelihoods were found to be climate sensitive and highly dependent on natural resources. According to the informants, current livelihood sources included rice cultivation (the most common); fishing; cattle, pig, and poultry raising; and vegetable production. The commune authority informant reported that approximately 95 percent of the households were dependent on rice farming, 15 percent on river fishing, 5 percent owned small businesses, a few families planted vegetables, and a few others had household-scale fish farms. Moreover, rice fields, waterways (rivers, canals, and ponds), fish, and grazing lands are the prime natural resources on which local livelihoods depended. The geography of the study area and the livelihoods in the community make it highly vulnerable to climate-related stresses.

Figure 1. Local cash flows



Dry season rice was the leading source of farmers' incomes. Figure 1 shows the cash flow of the farmers in the study area. Rice is generally sold soon after harvesting; cattle and pigs are sold only during times of hardship. Poor families also work as hired labor for additional income. Fishing is commonly done during periods of flooding, mainly for household consumption and selling in the community. Raising poultry and gardening are additional non-cash food subsistence activities. Expenditure on agricultural input is the biggest share of a family's budget. Unlike wet season rice, dry season rice needs vast amounts of inputs (e.g., chemical fertilizer, pesticide, seed, machinery, water, and labor), which require considerable investment. Informants mentioned also that though the market demand for rice has increased gradually, it has not kept up with the increasing costs of the required chemical inputs. Farmers need to meet also the costs of labor, agricultural machinery rental, and irrigated water. Therefore, it was common for farmers to obtain loans from microfinance institutions and private moneylenders in the beginning of the planting season, which they paid back after rice harvest. Loan repayment was the main reason why farmers sold their produce right after harvest, a practice which may limit the market price that they could obtain for their produce.

Local Institutions

Local administration

The local authority plays a key role in administration and local development. Being the lowest administrative unit in Cambodia, the village authority facilitates local development activities and administrative requirements in connection with the commune authority. Village-level development councils operating under the auspices of the village authorities have been established nationwide to facilitate development work. The council consists of:

a representative of the village authority who generally is a village deputy head; a village elder; a religious leader; and an influential member of the community. The village authority informants reported that cooperation among members of a development council as well as between the council and local authority significantly affects work outcomes. In villages that claimed to have good coordination and cooperation, high-quality work on local governance and development was cited. On the other hand, in the few villages where cooperation and coordination were reported to be difficult, development work was reported to be messy due to lack of participation and commitment. Generally local authorities in Cambodia did not have clear terms of reference for their job, which may have had a bearing on their participation and commitment.

Perceived unequal distribution of benefits from projects implemented by nongovernment organizations (NGOs) was suggested to be a cause of poor cooperation. There are NGOs in many villages that assist in local development via different sectors such as education, health, credit, and agriculture. These NGOs usually had more resources for development projects than the local authority and could cover certain logistics costs, such as local transportation and meal allowances, which the local authorities could not pay for. These motivate the local community, local authorities, and development councils to take part in NGO-organized events (e.g., training or awareness-raising activities). However, not all villagers had received these types of opportunities. Moreover, some observers claimed there was a lack of transparency and accountability in the process of selecting participants in the events, leading to a perception of inequality. It was also observed that the presence of NGO-organized events has discouraged community participation in local authority-organized events.

Local market

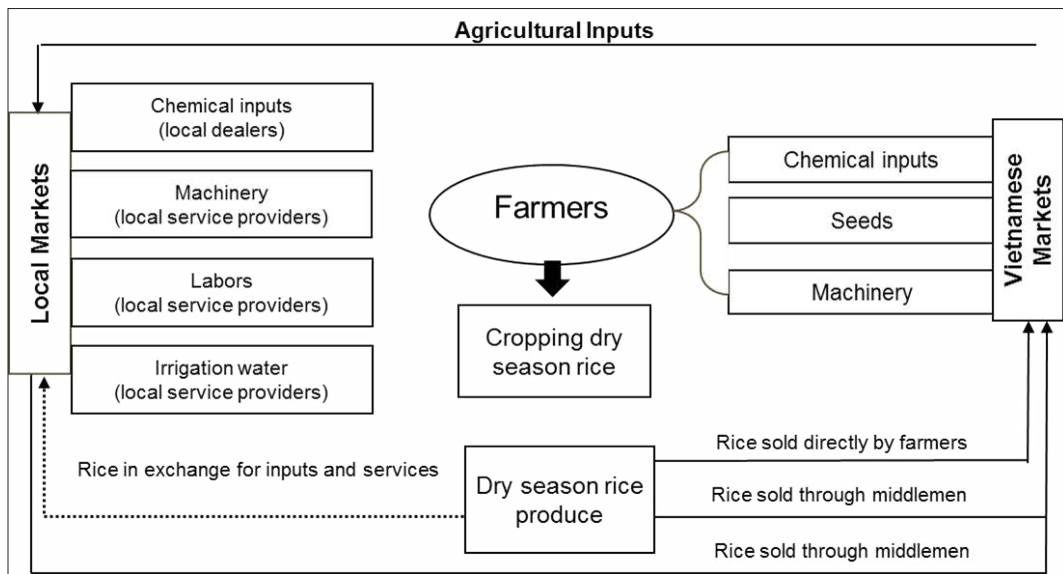
Informants explained that their market for dry season rice was highly dependent on Vietnamese customers. As Figure 2 illustrates, the market chain for agricultural produce follows a cycle from the local marketplace to Vietnamese markets, where rice is generally traded in cash in exchange for agricultural inputs. These inputs include seeds, fertilizers, and pesticides for dry season rice cultivation, which are generally obtained from Vietnamese dealers in border villages either directly or indirectly via local dealers. The Ministry of Agriculture, Forestry, and Fisheries also provides rice seeds, though rice varieties are limited. Only the few farmers who can afford to pay immediately in cash use local dealers. Other farmers use Vietnamese dealers, who allow payment for goods at a later date but with interest charges on the cash costs of the inputs. In the same way, the farmers usually sell their produce to Vietnamese markets, either through middlemen who come with trucks to collect the harvest right at the rice

fields or via direct transport to the Vietnamese border, where customers line up to purchase Cambodian produce. Although they can get a slightly higher price at the border, farmers generally sell their produce to middlemen due to the lack of transportation means. According to the informants, the prices of rice quoted by the different middlemen are not significantly different. There is no local market for the produce and the farmers themselves do not consume dry season rice due to a perceived unpleasant taste and high amount of chemicals used in production. Therefore nearly all the produce is sold soon after it is harvested.

Microfinance

Farmers obtained credit from three sources, according to the informants. These were the formal microfinance institutions (bank), private moneylenders, and relatives and neighbors. At the time of the study, only formal microfinance institutions and private moneylenders were active.

Figure 2. Agricultural commodities exchange in Krapum Chhuk commune, Koh Andet district, Takoa province, Cambodia



Nearly all farmers had borrowed money from formal institutions, which offered lower monthly interest rates (approximately 3%) than private moneylenders (approximately 10%). However, microfinance institutions usually have some requirements for obtaining loans, such as the deposition of land titles (with approval from local authority) and an agreement to make regular repayments. The loan process usually takes several days.

Farmers used private moneylenders during critical times, despite their much higher interest rate, because generally they do not have any requirements and the process is quick. Private moneylenders are rich local families. When experiencing financial hardship, some farmers reported taking out loans from moneylenders to pay their bank loans because if the bank payments were not made as scheduled, the farmers could lose their properties.

The informants reported that many of the farmers were in debt to either formal institutions or private moneylenders. The microfinance institutions that were reported to operate in the study area were local banks and NGOs such as the Association of Cambodian Local Economic Development Agencies (ACLEDA), Prasac, Amret, Angkor Mikroheranhvatho Kampuchea (AMK), Village Bank, Chamroen Chiet Khmer Organization (CCK), and Vision Fund. Additionally, although agricultural chemical dealers are not considered moneylenders, they also allowed farmers to buy chemical inputs on credit, to be paid later with interest.

The third source of credit, though not so significant, was relatives and neighbors, where loans have low interest rates.

Communal charity

According to the local informants, a religious ceremony (*bon sangkahaktien*) is generally organized in many villages to collect donations from community members to help

families experiencing hardship, especially critical ill health. The donations are usually in the form of money or rice. The event is normally initiated by a religious leader who is a member of the village development council, in cooperation with the local authority. The donations are given directly to the target family during a religious event (e.g., the one where people pray for better health for those who are sick). When more support is required, a series of events can be organized. The informants indicated that they highly appreciate this traditional practice; they expressed willingness to both participate in the ceremony and protect it for future generations. Informants from a few villages where the religious ceremony was not practiced reported that when a family undergoes hardship, the village authority usually seeks support from the provincial authority via the commune and district authorities. In a few other villages, support is requested from the provincial Red Cross Office through the Red Cross village volunteers.

Information networks

The community had not received sufficient climate-related information, according to the informants. Flood-related information was generally transmitted via the Vietnamese media and through word of mouth from Vietnamese neighboring villages. Although Khmer is the native language in Cambodia, most of people in this community understood the Vietnamese language, at least at a basic level. Since Krapum Chhouk commune is downstream from Vietnam, local people use upstream hydrological conditions to predict what is likely to happen in their locality. Only a few informants claimed to have received information from the local media.

On the other hand, agricultural chemical inputs and market information were received through various means, particularly chemical companies and dealers, middlemen, and

neighboring farmers. Informants said farmers had considered changing pesticide products as well as fertilizer products and increasing their amount when rice plants were not growing well. New pesticide products were selected mainly based on suggestions from dealers. On the other hand, new fertilizer products were chosen based on observations and information from neighboring farmers. In-country media programs were confirmed to also provide relevant information, especially on cropping techniques and chemical inputs. Rice market information was usually obtained from middlemen and then shared among farmers.

Water User Group History

Irrigation networks are necessary for dry season rice cultivation. Based on observations and the interviews, many old irrigation canals, especially those constructed in Pol Pot's time, still exist but need restoration. In 1996, with financial support from the European Union (EU), the Ministry of Water Resources and Meteorology (MOWRM) in cooperation with Prasac, an NGO, assisted Krapum Chhouk to restore a 57-kilometer (km) canal. It is now known as Prasac Canal. The canal, which runs across three districts of Takao Province: Borey Chhulsa, Koh Andet, and Kirivong, can irrigate 500-600 ha of ricefields in each district. The restored canal was handed over to the community. To ensure the long-term management of the canal, Prasac facilitated the establishment of a local water user committee (WUC), called Banteay Thleay Water User Committee. This project is in line with the National Strategic Development Plan Update 2009–2013, and Strategy for Agriculture and Water 2010–2013, which encourages local participation in irrigation infrastructure development (RGC 2010a).

Water user committee

The WUC is composed of one committee leader (the commune governor), two deputy leaders (one each for operation and maintenance work, respectively), and one accountant. Group and sub-group leaders are elected as vertical line units of the committee; they work directly with farmers in their respective locations. The formation of the committee and associates was initiated during the construction stage of Prasac Canal. It started with farmers electing the group and sub-group leaders, which then elected the committee representatives. The roles and responsibilities of the committee as well as the group and sub-group leaders are stated in Declaration No. 175, Endorsement of the Banteay Thleay Water Users Committee, which was approved by MOWRM on 1 October 2002 (RGC 2002). The group and sub-group leaders have two primary roles: to facilitate communication between the committee and farmers and to collect the water tariff in their respective locations. The term of office of the committee members is three years; thus, an election is to be held every three years. However, according to the WUC informants, the initial committee members, who were elected in the late 1990s, are still in place due to financial constraints and because the local community has not felt the need to change them.

Implementation

Based on Declaration No. 175, the intention was for the committee to facilitate the supply of water to farmers. However, to irrigate the rice fields using water from Prasac Canal, smaller connecting waterways were needed. Investment for such waterways was not mentioned in the declaration. The WUC interviewees said that the local service providers paid for the construction of almost 100 waterways. The construction work included restoring former waterways connecting Prasac Canal to the rice paddies.

The irrigating surfaces are generally divided into rectangles and waterways are constructed as straight parallel lines across the paddies, with 50 meters between each waterway. During the dry months when water in the main canal is shallow, a pump is needed to take water from the main canal to the waterways, thus increasing operational costs. Those who wanted to invest in the irrigation system had to submit their application forms to the WUC. Once applications were received, the committee organized a members' meeting to decide on the applications. All applicants were selected based on the high demand for irrigated water supply.

The operational costs of the irrigation system were to be paid through funds obtained from water tariff, support from government and development partners, community income and taxes, and fines collected. The water tariff was to be calculated by using a formula given in the MOWRM's policy on sustainable irrigation, Circular No. 1 (RGC 1999). Based on the policy, the government was expected to subsidize 80 percent of the cost of community-based irrigation in the first year, 60 percent in the second year, 40 percent in the third year, and 20 percent in the fourth year. Yet, in practice the operation of the Banteay Thleay water user group has depended solely on money obtained from the water tariff, with almost no financial support from the government and development partners. Farmers can pay their water tariffs in cash or in kind (i.e., rice after harvest). For the latter, the service providers generally charge 600 kilograms (kg) of rice per hectare (ha) of paddy per planting season. Of this amount, the service providers pay 140 kg (approximately 23%) to the WUC for the operation and maintenance of the main canal. However, some flexibility has been exercised in the water tariff payment, depending on the agreement between the service provider and individual farmers, according to the distance of the paddy from the main canal. A few farmer informants said that

because their paddies were very far from the main canal, not only did they pay a higher tariff, but they also received less water, especially during the second rice planting for the year when the water level in the canal is low. Based on WUC informants, exemptions generally were made for farmers whose productivity was heavily affected by climatic stresses.

Challenges and constraints

Some informants reported that a few service providers in the study area were getting water from different sources to supply farmers but using different water tariffs. This had led a few farmers to swap from one provider to another to get a better deal, which created conflicts between service providers as well as between farmers and service provider, especially when water availability was limited. It was observed that more irrigation networks had developed within the community and in neighboring communities, and this required appropriate coordination mechanisms between authorities to systematize governance approaches and avoid potential conflicts.

Prasac Canal receives water from Kampong Ampil River, which collects runoff rainwater and is fed by Mekong River. The changes in Mekong River's hydrological levels due to either climate variability or human-induced climate change processes are expected to affect water level in the canal; the informants reported that the canal had received less water lately. Additionally, since Kampong Ampil River is located on the Vietnamese border, the operation of hydrological dams upstream in Vietnam causes some fluctuations in the river water level. Less water and unexpected changes in the canal's water levels have caused local plantations to suffer, making it hard to predict what will happen in the future.

DISCUSSION

Even though dry season rice has high yields, its cultivation requires considerable investments of time, labor, and capital, which may result in emerging social (e.g., increasing dependency on loans) and environmental consequences (e.g., pest resistance and increasing chemical dosage and application). Many informants reported that farmers had become poorer since they started to rely on dry season rice. A local expression, “*Theu IR yu toeu*,” has become common among farmers, which means “If you continue to plant IR rice, you become poorer.” IR stands for “intensified rice,” referring to dry season rice.

Some informants admitted that in the past, with the richness of natural resources, their lives were more prosperous than today. For instance, one informant said, “in the past, we could always catch fish in the river and collect fruits from the forest, and those foods had favorable taste, unlike foods at the present day.” He added that if he had a choice, “I would like to live life as in the past.” On the other hand, the better-off farmers who owned large paddy areas, were irrigation service providers, and chemical inputs dealers had a different perspective. They viewed the villagers as better off today than in the past. This may indicate that the more well-off families have built stronger human capital than the poorer ones, thus capturing more profits from collective assets during the change (Lin 1999, 2001). This disparity in opinion and sense of prosperity may undermine community spirit and weaken collective action, which is a foundation for local resilience and adaptive capacity for climate change.

Informants observed that the interest rates of loans and chemical inputs were very high, which made it difficult to improve current living standards. Unlike in the past where farmers were mainly self-subsistent, these days they relied on loans. The informants noted also a reduced importance placed on helping each other, unlike

in the past. This can be seen in the dilution of traditional practices, such as neighbor and community assistance in agricultural work and social welfare. Such changes are noteworthy and may indicate the weakening of community spirit. Only the traditional religious ceremony seemed to be the remaining activity contributing to community spirit. The waning of traditional practices is of concern, since as Adger (2003) indicates, non-profit relationships are critical in addressing climate vulnerabilities.

The flow of climate and agriculture information to the community was observed to be up-to-date, although accuracy is a significant concern as most of the information came from chemical company advertisements and word of mouth. The informants did not find the weather and climate-related information helpful in rice cultivation, because it was not a long-duration forecast. Decisions on planting rice are generally based on the future availability of water in the canals, but this kind of information was not available to the farmers. An increasing number of chemical products available at markets provide farmers with more options for purchasing; however, information on these products’ social and environmental impacts was almost nil. The selection and application of chemicals are based primarily on advice from suppliers, commercial advertisements, and neighbors. District agricultural extension workers conducted training and demonstrations on cropping techniques and safe application of chemicals, but the informants found these sessions insufficient. Representatives of the District Agriculture Office confirmed that the number of agricultural extension staff was inadequate; staffing was similarly an issue at the provincial level, as reported by a representative of the Provincial Agriculture Department. According to interviewees from the Provincial Agriculture Department, there were only 28 agricultural extension workers for the entire Takao province. This concern

is in fact articulated in the national *Strategy for Agriculture and Water 2010–2013* (RGC 2010b).

The water user group is a binding, collective action wherein individuals share resources, information, and benefits. The literature (Cernea 1987; Pretty, Thompson, and Kiara 1999) indicates that involving well-organized groups of people in the planning and implementation stages of a project and taking into account their knowledge are very important in sustaining activities after project completion. This approach was applied in the establishment of the Banteay Thleay WUC. However, due to limited support and lack of monitoring and evaluation activities from the government, the group's effectiveness appears to have weakened gradually. In addition, the involvement of service providers that enabled the implementation of the irrigation system shifted the WUC from being a community-managed system to a 'hybrid' model. The hybrid model, successful in many countries (Menard 2011), can be a good way of implementing local resource mobilization. Due to the unequal distribution of profits among involved parties in the study area, however, it was observed that farmers who received less developed feelings of lack of entitlement and isolation. This may have undermined the community's spirit and collective action. A similar experience was observed in agricultural areas in India, where irrigation water was managed by a private entity (Pretty and Ward 2001). Whether the community-based approach or the hybrid model would work better for rural Cambodia is a topic that needs to be further investigated, taking into account the availability of social capital and local institutions.

Observations and conversations with many informants suggest that social bonding in the water user group had not matured. Pretty and Ward (2001) observed that there is a link between a group's maturity and social capital,

which undergoes three transformations stages: reactive-dependence, realization-independence, and awareness-interdependence. During the first stage, the group works to achieve outcomes in a manner that responds to crises or threats or with facilitation from external agencies. The group is fearful of change and tends to look backwards rather than forward. These situations were observed in the Banteay Thleay WUC, especially in the fact that no election had been organized to vote for a new committee, even though the community is supposed to do so according to Declaration No. 175 (RGC 2002). According to an informant, "if we elect a new committee, they may not be as good as the current committee." On the other hand, most of the initial WUC group and sub-group leaders had resigned due to limited benefits received from their participation; thus, their units no longer function. As Pretty and Ward (2001) explain, even if a group in the realization-independence stage had achieved its original aims, it may still break down if it does not invest further to set and achieve new goals. But when a group reaches the final awareness-interdependence stage, it is unlikely to revert to a previous stage because in the process of working as the group, the members will have fundamentally changed their worldviews, philosophies, and practices. Therefore, they are much more aware of the group's values and able to promote and transfer new technology to other groups as well as initiate new groups themselves. At this stage, the group is strong enough to resist external threats and powers and will want to link up with external agencies and networks (Pretty and Ward 2001).

The Banteay Thleay WUC was observed to have functioned with minimum administrative support from the district authority. Based on observations and interviews, however, this may not be because trust relations within the group have been built or due to related power or fear, but rather because options were limited in terms

of water suppliers and alternative livelihoods. With an increasing number of irrigation networks constructed, the group is likely to further weaken if water tariffs become competitive and proper coordination mechanisms are not in place. Paavola and Adger (2005) maintain that if the group has only a small membership, it is more effective in terms of maintaining transparency and interactions. Moreover, a group with a large membership tends to increase transaction costs and undermine collective actions unless trust has been built firmly. Similarly, if there is strong social capital, the issue of heterogeneity may be tackled; otherwise conflicts may arise and individual interests may need to be addressed (Paavola and Adger 2005). Over-optimism about a local group and its capacity to deliver economic and environmental benefits can jeopardize a situation because change within and between communities can result in damage to services delivered and outcomes (Pretty 2003). To ensure effective implementation, monitoring and evaluation are important to provide feedback and make any necessary adjustments or further innovations to the selected technologies (UNFCCC 2006; Linham and Nicholls 2010); however, these mechanisms appear to be missing in the implementation of the irrigation system and associated management committee. According to Linham and Nicholls (2010), learning and improving are important, thus, indicators should be developed for monitoring and evaluation. Further, it is important to maintain a monitoring system over a long period of time to assess ongoing effectiveness.

The study also found that the main challenges for local authorities were the lack of financial resources and the lack of cooperation between members of the local authority as well as among the local authority, development council, and local community. This reflects the finding of Lebel and Sinh (2005), identifying as a major challenge the local authorities'

inadequate ability to mobilize enough funds to implement plans for protection measures, recovery, and rehabilitation. The informants also cited inequality as a concern, with some pointing to the lack of transparency and accountability in local governance processes. The perceived inequality had weakened the community's participation in local authority-organized events and cause poor cooperation. A similar experience was also found by Lebel et al. (2009) in a flood management project in Thailand, where ethnic minorities, migrants, and women were treated as second-class citizens and, thus, disadvantaged in terms of accessing rehabilitation and relief services and resources. Fukuyama (2002) puts forward that crises of trust happen when cultural conditions create two kinds of moral structures: one toward the family and close friends, and the other toward people in general; thus, inequality can be perceived. On the other hand, the informants reported that influential local people with good social credentials potentially could help address conflicts, although conflicts always prove difficult to solve. This may indicate an underlying need for an intermediary who has emerged from local social capital processes. This is reinforced by Nooteboom (2007), who mentions the important role of the intermediary in such a process.

CONCLUSIONS, POLICY IMPLICATIONS, AND RECOMMENDATIONS

This study investigated the local institutions vital for the livelihoods of residents in flood-prone Krapum Chhouk commune in rural Cambodia; it examined social capital in terms of the dynamics of relationships, relations of trust, and social norms and practices through observations and in-depth interviews with the local community.

Generally, it found that collective actions (e.g., savings and cooperative loan) and a

traditional religious event were practiced in the community; however, these actions were limited and showed only unhealthy community bonding. With the exception of the religious event, the existing networks were profit-oriented and not strong for addressing climate change adaptations (Adger 2003). Also good traditional practices, such as neighbor and community assistance in agricultural works or social welfare, were observed to have been practiced less often. This may indicate an erosion of social and cultural norms and practices, the foundation of social capital, and may reflect an unhealthy state of institutions in the community. In addition, there was a lack of connections within local institutions and limited cross membership between institutions. Figure 3 maps the key actors in the community and existing nodes. Vertical connections between community and external agencies were generally found to be one way. Local connections and connections between individuals within the community were also limited. As noted by Pretty and Ward (2001), the more connections the better. A two-way connection is also better than a one-way one.

Future development assistance to the community should pay greater attention to strengthening social capital and institutional connectedness, taking into account the community's assets and experiences. Social capital is self-reinforcing and reciprocity increases connectedness between people, leading to greater trust, confidence, and capacity to innovate (Pretty and Ward 2001; Pretty 2003). The act of forming a water user group per se is not enough; policy reform and implementation also need to be provided (Pretty and Ward 2001). Also, as noted by Lebel and Sinh (2005), participation needs to go beyond informing the public or shifting the responsibilities for actions onto the community.

Consistency in irrigation arrangements and water tariffs may need to be coordinated, within

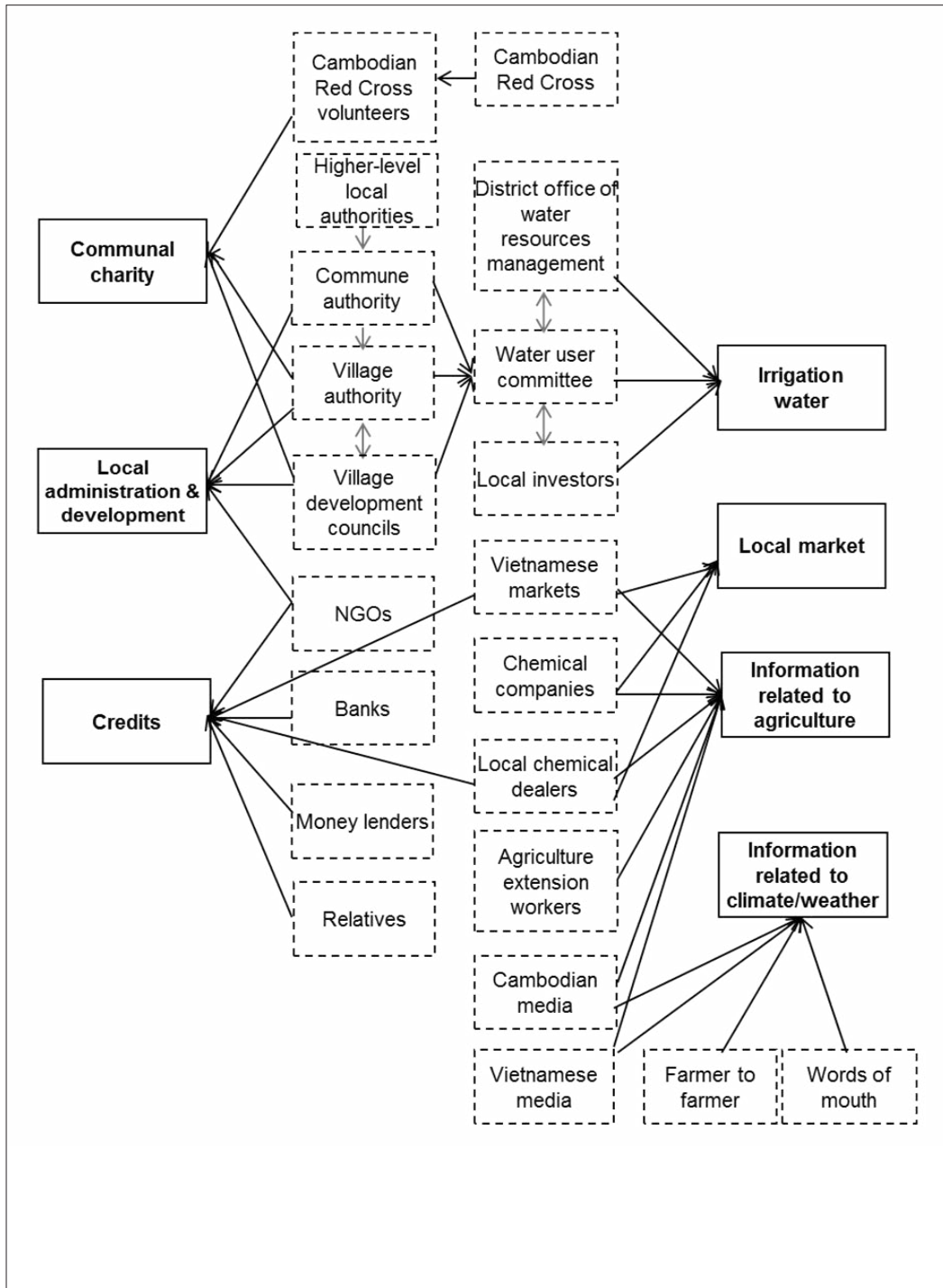
and among the neighboring communities where main irrigation canals exist, to avoid discord that can undermine collective actions and community spirit. Such coordination may only be possible with the assistance of the MOWRM, which has a key role in implementing irrigation policy. In addition, Cambodia's policy on sustainable irrigation networks should be reinforced, especially as regards subsidies for community-based irrigation system because, as indicated by Lebel and Sinh (2005), the gaps between policy and implementation can contribute to increased vulnerabilities.

Given that the need for more financial capital to maintain current livelihoods coincides with very high interest rates, the development of a well-functioning savings and cooperative loan scheme may be a promising mechanism to assist the community in helping itself. The current initiatives in Krapum Chhouk commune were minimal and weak. It may prove helpful to investigate the characteristics of local microfinance institutions to identify more appropriate mechanisms that can benefit the development of the local community. Some successful models of microfinance schemes to learn from include Bangladesh's Grameen Bank; the Proshika organization, which helped developed local credit groups where members can obtain credit when they need them (Pretty and Ward 2001); and the revolving fund system and community banking developed for livelihood recovery after disasters in Thailand, with support of NGOs and the private sector (Lebel and Sinh 2005).

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Figure 3. Key actors and connections of local institutions



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