

Chapter 11

Local Adaptation to Climate Change: A Case Study Among the Indigenous Palaw'ans in the Philippines

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Abstract Different cultural, economic, political and social forces shape adaptive capacity. In addition, spatial and social differentiations occurring at sub-national levels also result to differences in levels of vulnerability in one country. One social group often excluded in the discussion of climate change is the indigenous peoples. Traditionally subsisting and living on very minimal assets, they shape and are being shaped by the different ecosystems that they live in and depend on. A group of indigenous Palaw'ans in Palawan, Philippines exhibit social-ecological dynamics with their ancestral domain, part of which is declared a protected area under the Mount Mantalingahan Protected Landscape. Through research data from qualitative methods of key informant interviews, focus group discussions, and participant observation, this paper takes a look on how Palaw'ans perceive climate change and ascertains their adaptive capacity based on their transformability, resilience, and adaptability as well as on their local institutions as social networks. The research finds that the several local adaptations to climate change of Palaw'ans are a function of their transformability, resilience, adaptability, and, to a certain extent, to the social learning gained from their local institution.

Introduction

Traditionally, scientific and policy perspectives on climate change have focused on mitigation rather than adaptation (Füssel and Klein 2006). However, in recent years, adaptation has been receiving increased attention as a response to climate change impacts. Several developing countries with high vulnerability and limited adaptive capacity have already made climate change adaptation a priority. The Philippines, known as a climate hotspot (UNU-EHS 2011), stipulated adaptation as a priority in its National Framework Strategy for Climate Change for the years 2010–2022.

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It is important to note, however, that there is no standard level of vulnerability for the different strata of governance and society in one country. Kelly and Adger (2000) point out that, within one country, enormous differences in levels of vulnerability can occur. This is related to what Saunders (1990 as quoted in Marino and Ribot 2012) says that bio-physical changes in the earth system is not only received by various geographies but also by different social strata. Thus, country-level analyses fail to capture not only spatial but also social differentiation of vulnerability occurring at sub-national levels (Adger 2006).

At the heart of social stratification discourse in climate change are those who subsist and live on very minimal assets; they are said to be most at risk due to their proximity to the threshold of disaster (Marino and Ribot 2012). One group in most societies that subsist and live on very minimal assets are indigenous peoples. They and other traditional peoples are often excluded in academic, policy, and public discussions on climate change, in spite of the impacts that they are and will further be experiencing from climatic change (Salick and Ross 2009). Studying indigenous peoples in light of climatic changes is of interest, not only because there is a need to address lack of research on vulnerable social groups and social-ecological systems (Adger 2006) but also due to the active role indigenous peoples play in shaping the very same environment that shapes their day-to-day living. Indigenous peoples are not only victims of climate change but also primary actors in climate change monitoring, adaptation, and mitigation due to their active and significant roles in different ecosystems (Salick and Ross 2009).

The complex social, ecological, and political dynamics existing in the research site make for an interesting case study for climate change adaptation and resilience of social-ecological systems (SES). Situated on a tropical archipelago, the main island of Palawan is highly dependent on ecosystem services from both terrestrial and coastal ecosystems (Tompkins and Adger 2004). Due to the island's high biodiversity, it has also been declared as a United Nations Educational, Scientific and Cultural Organization (UNESCO) Man and Biosphere Reserve in the year 1990. The high migration rate of non-indigenous peoples are affecting both the ecology and sociology of the area, resulting to increased marginalization of the indigenous peoples traditionally living on the island (Novellino 2000). Lastly, the research site is constituted by cross-scale boundaries. The approval of the ancestral domain claim of the Palaw'ans in the village (*Barangay*) Panalingaan has been given in the year 2009, and part of this land has been declared as a protected area under the Mount Mantalingahan Protected Landscape (MMPL).

This study aimed to gain insight into the vulnerability of indigenous Palaw'ans in the village of Panalingaan by looking into the interrelationships of the ecosystem services in the research site, the community's perception of environmental change and their corresponding responses, and the approval of the ancestral domain of the Palaw'ans, which happened on the same year that Mount Mantalingahan was declared a protected area. The research focused on the adaptive capacity aspect of vulnerability, while discussing exposure and sensitivity to some extent. These allowed the research to make empirical assessments of several statements on resilience and vulnerability such as the one of Adger (2006) which says that

country-level analyses fail to take into consideration the spatial and social differentiation of vulnerability at sub-national levels and the local conditions that affect adaptive capacity.

The Village of Panalingaan, Rizal, Palawan

The study was conducted in the village of Panalingaan in the municipality of Rizal in Palawan (Fig. 11.1), located at the foot of Mount Mantalingahan. It is part of the ancestral domain of the Palaw'ans, which has been approved in July 2009 under Certificate of Ancestral Domain Title (CADT) number R04-RIZ-0709-129 and has been formally awarded in October 2012. The ancestral domain area covers 69,735.23 hectares and includes the villages of Panalingaan, Taburi, Latud, and portions of Canipaan and Culasian under the municipality of Rizal. The population of indigenous Palaw'ans in this ancestral domain is 7,651 as of the approval date of the ancestral domain. They are one of three main indigenous groups living on the main island of Palawan, mostly concentrated in Southern Palawan (Cayron 2011). There are several settlements along the coast, but the arrival of Muslim groups from the Sulu archipelago as early as 1700s caused the coastal Palaw'ans to move inland (Cayron 2011; Macdonald 2003). The Palaw'an community in *Barangay* Panalingaan are two distinct sub-groups of *netibo* or natives and Panimusaan, which are cross-bred Muslim Palaw'ans. Most of the Muslim Palaw'ans live below the mountain area, while the rest of the Palaw'ans live in the mountains. The two sub-groups interact, albeit the *netibo* seem to be more reserved than the Panimusaan. In this research study, the *netibo* and the Panimusaan will be collectively called Palaw'ans.

The Palaw'ans mainly subsist on upland agriculture, where rice is grown along with other crops such as *kamoteng kahoy* or cassava (*Manihot esculenta*) (Cayron 2011; Macdonald 2003). Macdonald (2003) points out that rice is the most valued type of food by the Palaw'ans but they also subsist on other cultigens and root crops such as cassava. Cayron (2011), likewise, states that rice is the main crop, with cassava, corn, and vegetables as supplementary crops. From interactions with the Palaw'an community, they mention that when there is no rice, they eat cassava.

Methodology

The research made use of a qualitative approach, which employed key informant interviews, focus group discussions, and participant observation. These enabled the identification of processes and captured interdependencies of the different units of analysis, namely, multi-level governance, social-ecological dynamics, and local perceptions of environmental change.

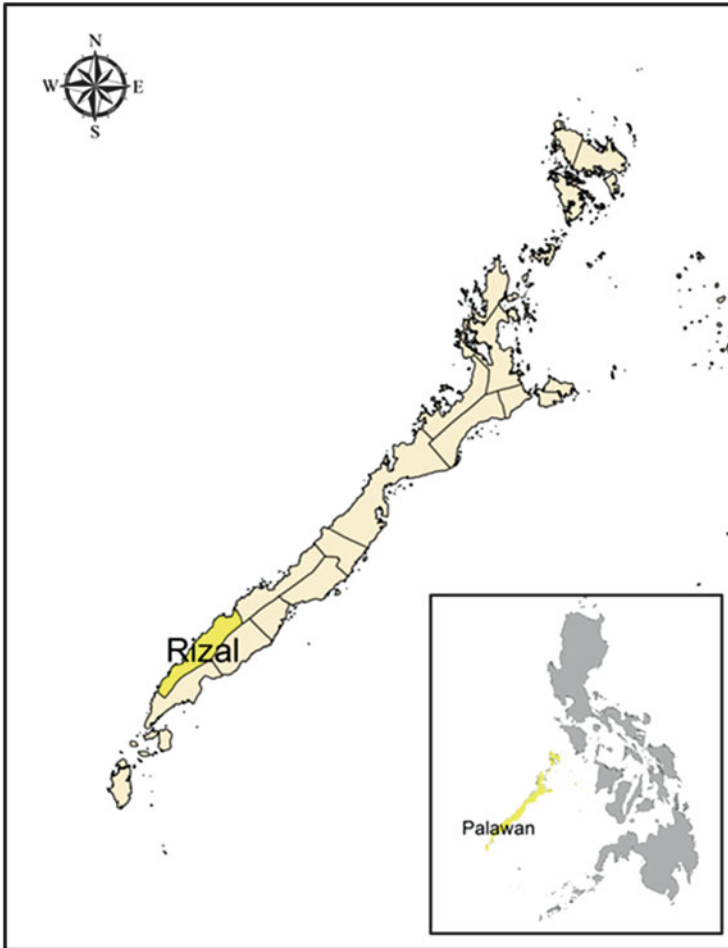


Fig. 11.1 Map of Rizal, Palawan, Philippines (Data source: GADM 2012)

The study employed both primary and secondary data collection. Primary data collection entailed field visits in the year 2012 that used the methods of key informant interviews, focus group discussions (FGD), and participant observation. Field visits were done in three locations: Manila (the capital of the Philippines), Puerto Princesa (the capital of the island of Palawan), and the research site (*Barangay Panalingaan*, province of Rizal, southern Palawan).

Key informant interviews were conducted with relevant institutions from the national, regional, and local levels. Upon commencement of key informant interviews, referral (or chain) sampling was employed, where interviewees were also consulted in identifying other relevant interviewees. Interviews were held with relevant officials and personnel of the national level Department of Environment and Natural Resources (DENR) Protected Areas and Wildlife Bureau (PAWB),

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), National Commission on Indigenous Peoples (NCIP), regional level Palawan Council for Sustainable Development (PCSD), DENR—Provincial Environment and Natural Resources Office (PENRO), DENR—Protected Areas Superintendent (PASu), Conservation International—Philippines (CIP), and local level town (*barangay*) council, indigenous people's organization (PO) Bangsa Palaw'an Philippines, Inc. (BPPI), and field level CIP.

Three FGDs were requested from the community. One FGD was done per gender group of men and women and one FGD of mixed genders was done at the end of the researcher's stay in the community. Separate FGDs for men and women were done to allow for in-depth discussion and avoid male dominance in discussion as the Palaw'an community is culturally patriarchal. The separate FGDs also allowed a more comprehensive inquiry into the socio-ecological dynamics of the community, as each gender had different roles in the management of their natural resources. The final FGD was a validation discussion, where initial results of the study were presented to the president and board member of the BPPI, field staff of CIP, and to some Palaw'an Panimusaan community members.

Secondary data collection was done through desk-based archival and documentary research and meetings and correspondences with relevant organizations. Relevant laws, published studies and grey literature were accessed through desk-based research and correspondences with relevant organizations and persons. The international non-government organization (NGO) International Union for Conservation of Nature (IUCN) Commission on Ecosystem Management (CEM) assisted with identifying literature on ecosystem-based adaptation and indigenous peoples. Important biodiversity and climatology documents for use in the research study were identified through several visits to the government offices PAWB and PAGASA. Internal documents related to the research site were accessed through visits to CIP national and local offices.

The study only included analysis of present-day adaptive capacity (as opposed to speculating on future adaptive capacity) of the Palaw'an community and was limited to examination of exposure and sensitivity, which are other components of vulnerability. The study was not meant to predict future biophysical or social changes in the community and their area. Individual household surveys and interviews were not carried out due to the short research timeframe. As a consequence, the research results contain limited demographic data on the Palaw'ans in the research site. The research site was only limited to Sitio Cadulan, which is only a part of the ancestral domain and of the Mount Mantalingahan Protected Landscape. The study was conducted in the national language of the Philippines, Filipino (Tagalog). Translations from the indigenous language, Pinalawan, were facilitated by other community members when a respondent does not speak Filipino.

Results

Local Perceptions of Climatic Change

The key informant interviews and the gender-specific FGDs (historical timeline and seasonal calendar) asked members of the local community if they have noticed any changes in the season or their environment throughout these past years. Caution was exercised not to use the term “climate change” during the inquiry. However, some of the community members, especially those who are part of the BPPI BOT, already heard of the term and articulated the term as a response to the inquiry, “Did you notice any changes in the season during these past years?” This may be attributed to their attendance in a climate-related seminar conducted by CIP in late 2011. Nonetheless, two common answers from the community point to a changing climate: there is not good enough heat anymore for preparing their swidden plots due to erratic weather patterns and, incongruously, there is increased intensity of heat and rain.

Increased Intensity of Heat and Rain

During interviews with the PASu and the CIP field officer, they already referred to a changing climate by citing extreme and out-of-season weather events. The PASu mentioned that the changing climate is certainly felt in the area and that the weather pattern has changed. She mentioned that the seasons are no longer being followed, saying that when it is supposed to be rainy season, it will be dry. Similarly, during the dry season, there will be sudden episodes of rain.

The community articulated the same observations with regards the changing weather patterns and extreme weather. They mentioned that the heat of the sun has become unbearable, with one woman (in her late 40s) saying, “In the years before, I can work in the fields until noon. Now, the heat has become unbearable that I can only work until 10:00 in the morning. The sun is already very painful on the skin at around 09:00 in the morning.” She added, as an example, that she planted *kamoteng kahoy* or cassava (*Manihot esculenta*) working under the sun for three days and, as a consequence, became sick for one week. She concluded her narrative by saying that, “Maybe the earth is just really old.” Another member of the community (male, in his 40s) said that, “Now, when it rains, it really pours very hard. And when the sun is shining, it is very hot and stinging your skin.” Other members of the community say the same, recalling that the sun has not been that harsh on the skin in the earlier days.

The women also shared that every summer, the deep water wells dry up. However, during the summer seasons of 2011 and 2012, the deep water wells no longer dried up. This may also be related to the next section on abandonment of swidden practices as local adaptation to climate change. As one woman (in her 40s) in the FGD shared, she abandoned her swidden plot in the year 2011.

Decreasing Forest Products Productivity

The PASu and the PCSD chief officer of the ECAN-PRD mentioned that the changing climate has decreased productivity of forest products such as wild fruits, honey, and agricultural products. The PCSD chief officer even went on further to recount their hypothesis that climate change is affecting flowering plants, which the honey bees visit. The concern of the PASu and the PCSD ECAN-PRD chief officer on decreased forest products productivity included the loss of commercial opportunities of these forest products. The PCSD chief officer mentioned that there is an international demand for the honey and their office is interested in finding the chemical composition of honey in order to satisfy the international organic market. The CIP field officer, on the other hand, mentioned that the decrease of honey production depends on the area. The Palaw'an community, however, only mentioned the decreasing production of honey when they were asked about it during the final FGD. Most of the time, they would mention the decreasing productivity of swidden crops and associated this with increased pest infestation.

Local Adaptation to Climate Change

Key informant interviews with CIP staff led to discussions on the swidden practices of the Palaw'ans. One CIP staff mentioned the swidden cultivation is prohibited especially within the limits of the protected area. It was, however, stressed that indigenous peoples are still allowed to practice swidden cultivation in old plots, but opening up of new plots is prohibited. A discussion with another CIP staff, on the other hand, revolved around the productivity of the swidden cultivation of the Palaw'ans. It was mentioned that in recent times, there has been a lot of pests attacking the cultivated crops, specifically rice, of the indigenous peoples. It was narrated that, prior to pest infestation, the IPs did not use insecticides.

Separate informal narratives from the community confirmed that swidden cultivation is no longer productive and is no longer worth the effort of long preparation of the soil for planting. Most of their reasons stem from the lack of proper heat needed to burn the plants that were cleared or "slashed." They related this to unpredictable weather patterns, with one of the community members (male, in his 60s) saying that, "The season does not seem to have any direction anymore." This may be related to what another community member (male, in his 30s) says that more weeds seem to grow now in their swidden plots, thus their amount of work in cultivating their plots is more than what is needed before.

The chieftain (male, in his 50s) and the head of the host family (male, in his 60s) explained the seasonal calendar of their swidden practice. They narrated that their swidden cultivation starts in January. They spend 2 weeks in cutting the understory and then another 2 weeks in cutting the bigger plants. Two weeks in the month of February would be spent in burning the plants that were cut down. Reminiscent of

bioenergetic agriculture, the chieftain mentioned that they await the appearance of seven stars in the sky (referred to as *marupuro*) prior to the commencement of burning. The months of March and April are spent planting (*panggas*), where the man punches a hole on the soil with a stick and the woman follows with planting the seeds. The seeds are placed in a small basket called *baka-baka*, which they explained as the appropriate size for bringing seeds since it is not too heavy. By the month of May, planting is finished and weeding or “grass” removal is the next occupation in the swidden plots. The chieftain said that if by the month of May, they have not commenced with planting (e.g. due to wet conditions), it would no longer be possible to have a successful harvest of good-tasting rice. They allow 4 months of cultivation before they harvest in August. The chieftain added that after harvesting, they first offer the harvested products to the gods through a ceremony before consuming the produce.

The women also described the challenges associated with practicing swidden cultivation in recent times. One of the women present during the FGD (aged 48) mentioned that in the year 1975, there were no weeds if they plant in swidden plots or no water lilies if they plant in paddies. Now, she added, apart from having more weeds, there are also pests. The women mentioned that in order to increase productivity of their cultivated plants, they need to apply both fertilizers and insecticides. They narrated that a sack of chemical fertilizers that they call “1620-triple-40-complete” and “urea” cost around PHP 1,500 up to 2,500 (EUR 30–50) per sack. They mentioned that among all crops, only *kamoteng kahoy* or cassava (*Manihot esculenta*) and *kamoteng baging* or sweet potato (*Ipomoea batatas*) are the ones that do not need any fertilizers. However, they mentioned that these are also in need of insecticides, which are applied to the above-ground portion (leaves) of the root crops.

The head of the researcher’s host family mentioned that the arrival of the non-indigenous peoples and the commencement of mining operations brought different changes to their practice of swidden cultivation and to their harvests. He mentioned that the indigenous peoples have their own way of doing swidden cultivation, which the non-indigenous peoples have modified through damaging practices such as overturning the soil (tillage). He said that other indigenous peoples copied this practice until they lost the knowledge of the traditional way of doing swidden. The women, on the other hand, mentioned that abandonment of swidden cultivation led to paddy farming or tillage, which also has its costs. While paddy farming is rain-fed, tillage entails rentals of tractor and carabao, which costs PHP 1,500 (EUR 30) per hectare of tillage and PHP 200 (EUR 4), respectively. Usually, they borrow money in order to pay these costs. They pointed out that should there be proceeds from the harvest, these are just enough to pay the debt they incurred in obtaining inputs and services.

The commencement of mining operations at the other side of the mountain is associated with the arrival of pests that are eating the crops in their swidden plots. The community as well as the former and current presidents of BPPI believe that the black bug (*Scotinophara coarctata*), one of the first pests feeding on rice crops, was brought by one of the ships of the mining company. They believe that the black bug

was attracted to the light of the ship and went all the way with the ship to the Philippines. Someone in the community (male, late 60s) identified the ship as coming from Japan. Since then, the community has had its share of different pests that were infesting crops and food sources. They have identified several insect pests (specific species unknown), mammalian pests such as rats, amphibious pests such as the bullfrog (scientific name unknown), and invertebrate pests, such as the golden *kuhol* or the golden apple snail (*Pomacea canaliculata*) and earthworms (specific species unknown). One member of the community (male, in his 30s) lamented that all their crops have their respective pests, even the root crops *kamoteng kahoy* or cassava (*Manihot esculenta*) and *kamoteng baging* or sweet potato (*Ipomoea batatas*) which did not have any pests before.

The spread of pests or invasive species was consulted with the PENRO, who mentioned that there have yet to be scientific studies on the invasive species in the area and whether these are alien species. He suggested that land use change may be driving the proliferation and distribution of the invasive species, citing that the current increase in palm oil plantations in the province may be encouraging these pests. The former president of the BPPI surmised that rats live within the palm oil plantations. Whether it is a changing climate or land use change driving the proliferation of invasive species in *Barangay* Panalingaan is a research question that urgently needs to be addressed. While this research need arises from the current research, it is, however, beyond the scope of this research.

The chieftain and other members of the community recalled how life before was easy compared to their lives now, which one member of the community (male, in his early 30s) attributed to “constant hunger.” One of the women (in her late 30s) shared that now they go deeper into the forest in search for food. She stated that she would go and look for root crops like *gabi* or taro (*Colocasia esculenta*) despite the itchiness that the plant brings. She further added if she is not able to find food, she would just stay at home hungry instead of stealing from other people’s food supply.

The chieftain also mentioned that life was “abundant” up until the birth of his third child (between 20 and 25 years old). He also narrated that during the time when cutting trees or *rattan* palm (*Calamus* spp.) were still not widespread, produce from his swidden plots could fill his *kamalig* or storage area with a height of an arm span and a half. Likewise, the women recalled that the amount of rice they harvested from their swidden plots in 1975 could surpass the height of an average man. Now that swidden is no longer productive, they have turned to other means (see Fig. 11.2). One is rain-fed paddy-rice farming (rented paddies) or tilled swidden, which some women say is better because the soil is softer and weeding is easier. Yet another option is to subsist on root crops or to buy food, if there are any financial resources at hand. In order to have income, some of them are engaged in copra-making or selling native agricultural products on weekly market days called *tabuan*.

From the narratives of the community, it was during the 1970s when their life completely changed for worse. Prior to 1975, they narrated that they were still engaged in a barter system, where the terrestrial and coastal members of the group would exchange commodities without any monetary valuation. One member of the

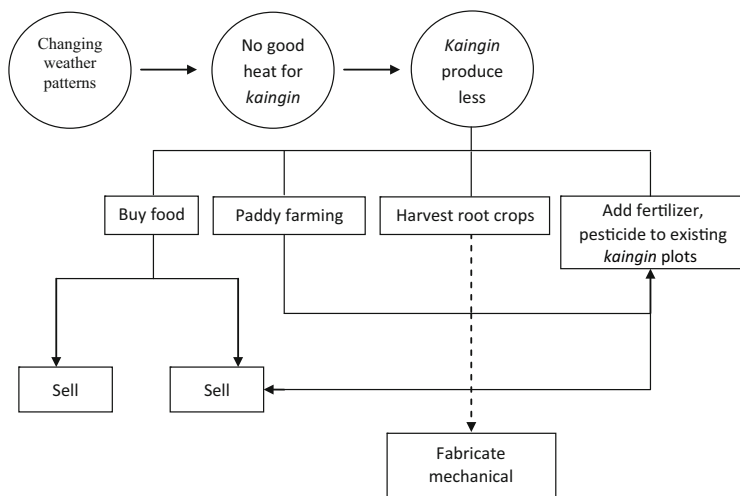


Fig. 11.2 Impact of changing climate on subsistence and local responses

community recalled that it was in 1975 that they became aware of what money is. According to the community, this is also the year that the mining company at the other side of the mountain started their operations. The community recalled that exploration began in the year 1967.

Along with their integration to the monetary system is their exposure to unnatural products, such as chemically-processed foods like canned goods or soy sauce. The chieftain recalled that one of their elders in the earlier times cannot eat meat seasoned with salt or soy sauce. Likewise, the BOT member of the BPPI noticed that their life expectancy has lowered compared to the average age of 100–120 in the earlier days. He attributed this to their consumption of unnatural food, which they still continue to do so despite this awareness.

Discussion

Transformability, Resilience, and Adaptability

Ecological, economic, and socio-political factors have affected the living conditions of the Palaw'ans. Ecologically, a changing climate coupled with the invasion of pests has made their indigenous practice of swidden agriculture impractical. Economically, their former system of trade or barter is no longer honoured especially with non-indigenous peoples. The Palaw'ans have then shifted to a current undesirable state of constant hunger. While they have been in this state or basin of attraction (Walker et al. 2004) for a number of decades now, the Palaw'ans have shown they have the capacity to find new ways of making a living. An example

would be their plan of fabricating a mechanical cassava grinder as narrated in the results section. As the Palaw'ans have long lived on subsistence and have only in recent times explored copra-making or paddy rice farming as a means of livelihood, selling cassava flour is a completely new way of living. When ecological, economic, or socio-political conditions of a system make it unsustainable, a fundamentally new system may be created if there is the capacity to do so (Walker et al. 2004). This capacity is called transformability, which introduces new mechanisms and ways of making a living (Walker et al. 2004). The Palaw'ans have demonstrated their transformability through their plan for the cassava grinder.

Despite this, the resilience of the SES of the Palaw'ans in *Sitio* Cadulan remains to be seen. The study's focus on adaptability or capacity of the Palaw'ans to influence the resilience of their ancestral domain can only give a limited view of the overall resilience of the area (Walker et al. 2004). In the same vein, some Palaw'ans seem to have influenced the resilience of their SES by using agricultural inputs such as chemical pesticides and fertilizers on their swidden plots. This coping strategy may sustain their swidden cultivation for the short-term, but a longer-term study is needed to ascertain whether this will succeed in bringing back the productivity of their subsistence agriculture. This is in line with what Lal (2008) states that soil degradation, water pollution, and air contamination result from the indiscriminate use of chemicals and excessive tillage, both of which are being practiced by the Palaw'ans albeit in a non-indiscriminate and non-excessive way. Whether these chemical pesticides and fertilizers are suitable adaptation strategies in the long-term or not, the social network of the Palaw'ans provides an atmosphere conducive for social learning. The social network plays a role in the transformability of the Palaw'ans. In addition, the social network also shapes the local perceptions of change through collective thinking processes.

Local Institutions as Social Networks

Currently, Palaw'ans in the three *barangays* that the CADT covers are organized by the PO BPPI. This brings to mind what the current president of the BPPI said, "If we were not organized and did not have any system of leadership, we would not have this CADT today" [Japson RL (2010) President, Bangsa Palaw'an Philippines, Inc. (BPPI). Formal interview. Barangay Panalingaan, 28 May 2012, Personal communication]. He stressed the importance of a leader in organizing and unifying the community. He referred to other IP groups in Palawan, saying that they are in a more difficult situation because they do not have any system of leadership. BPPI typifies an informal network that developed in a bottom-up process, with no formal linkage to formal governance and management regimes (Pahl-Wostl 2009). BPPI also demonstrates the limitation of an informal shadow network, which is weak influence on policy and real implementation despite having an autonomy that increases their ability to self-organize, innovate and think creatively (Pahl-Wostl 2009).

The community constantly mentioned the lack of assistance from governmental bodies despite requests from the community. The BOT member repeatedly shared that it was his retirement pay a couple of years back that paid for seedlings of fruit-bearing trees such as coconuts that have been distributed to his fellow Palaw'ans for planting. They are now benefiting from these trees both for subsistence and livelihood. This BOT member serves as both "maven" and "connector" in the community, where his altruistic nature and influence on fellow Palaw'ans go beyond information-sharing (Gladwell 2000 as quoted in Folke et al. 2005).

The community members themselves support each other for job generation, an example of which is copra-making. The working relationship is not strictly on employment terms but that of giving assistance to both sides. While the Palaw'ans do not have a strong network of engagement with governmental bodies, they seem to have a significant capacity for collective action. A more recent demonstration of collective action is their maintenance of the water system from a sub-grant from the CIP. The Palaw'an community in *Sitio* Cadulan have formed themselves into a local water users' association called *Danum na Buwal et Mundugen*, which agreed on terms and actions on maintenance of the water system (CIP 2012). They have a monthly tree planting activity that aims to plant fruit-bearing trees as markers along the water pipes. They also specified a cleaning schedule for the water tanks.

The community's social memories on water availability and water quality helped in their self-organization as well as demonstrating framed creativity in the creation of maintenance mechanisms (Folke et al. 2005). On water availability, the women shared that, during the summer season prior to 2011 and 2012, the water wells would always dry up and it was always a race among families to the water well in the morning. Conversely, the water-related deaths in April 2011 of fellow Palaw'ans, while not believed to be caused by faecal contamination, still served as a reminder to the community about the importance of water quality.

Tompkins and Adger (2004) suggest that collective action and its preconditions may increase the resilience of a community to changes. The case of the Palaw'an community in *Sitio* Cadulan demonstrates the three principles for collective action. These principles state that there is a greater chance of success in smaller groups than in larger groups, an equitable distribution of entitlements lead to greater success and alternative institutional designs overcome failures of collective action (Tompkins and Adger 2004). In addition, the Palaw'an community demonstrate social learning in terms of turning subsistence sources (cassava) into potential livelihood sources. The Palaw'an community, as well as the BPPI, have exhibited sustained development of attitudinal and behavioural change since their direct application for CADT. The success of the cassava flour grinder is yet to be seen, as Adger (2001) points out that important subsistence farming systems do not have "developed hedonic markets." There is a possibility that the income the Palaw'ans would generate may potentially be less than what the product is really worth. One of CIP's field staff mentioned that during market days, the agricultural products of the IPs are usually bought at a price lower than the market price. This is a potential hurdle for the Palaw'ans, but this may also be a point for social learning of the community. Knowledge gained from social learning may be able to guide future

decisions of the community. Having a knowledge bank or a developed social memory reinforces the adaptive capacity of the community. Apart from the knowledge gained, the process of social learning itself is important in the community's ability to respond to any changes.

Conclusion

Social networks, bridging organizations, and the demonstration of transformability by the Palaw'ans reinforce their adaptive capacity to some extent.

Transformability

Despite being in an undesirable state of poverty and hunger, the Palaw'ans have shown that they have the capacity to find new ways of making a living. The plan of the Palaw'ans to fabricate a mechanical cassava grinder reflects the transformability of the community, which seems to be able to introduce new mechanisms and ways of living. Transformability increases the adaptive capacity of the Palaw'ans. The indigenous PO (BPPI) serves as a local institution that serves as a social network among the Palaw'ans. Through social learning, knowledge that may be able to guide future decisions of the community is gained and having a knowledge bank or a developed social memory reinforces the adaptive capacity of the community. Apart from the knowledge gained, the process of social learning itself is important in the community's ability to respond to any changes.

As part of their adaptation strategy, the Palaw'ans have started using chemical pesticides and fertilizers as agricultural inputs to their farming practices. This may have an influence on the resilience of their ancestral domain's SES. It may be able to sustain the productivity of their swidden or rice paddy plots, but potential positive feedbacks may arise that will keep them in a cycle of pests and chemical agricultural inputs. The increasing number of pests, along with the loss of biodiversity in the area, has the potential to bring a regime shift that will alter the landscape and the social-ecological dynamics in the research site. If the present undesirable state of hunger and poverty reverts to a more undesirable state, it will be difficult for the Palaw'an community to persist. Nonetheless, their demonstration of transformability is a positive reinforcement of their adaptive capacity.

Social Networks and Bridging Organizations

The BPPI, as a local institution of the Palaw'ans of the ancestral domain covering three *barangays*, serves as a social network. Despite having a weak influence on policy and real implementation, being a social network enabled the BPPI to have an autonomy, which increases their ability to self-organize,

(continued)

innovate, and think creatively. This seems to have increased the adaptive capacity of the community.

Social connectivity has been observed in the relationship of the Palaw'ans with CIP, which created room for communication, coordination and common agreement that may facilitate understanding of laws or prohibited acts. In addition, CIP can be considered a bridging organization for their work on establishing the MMPL and their current livelihood projects with communities living within the MMPL. The trustworthy relationship of CIP with the local institution of the Palaw'ans such as BPPI serves to increase the adaptive capacity of the Palaw'ans.

Future Prospects

Community transformability, social networks and bridging organizations have contributed to the strengthening of the adaptive capacity of Palaw'ans. However, these have been identified based on a scenario in a given space and time. Transformability, social networks and bridging organizations are also subject to the dynamism of times and how the indigenous Palaw'ans cope with changes in the status quo should also be looked into. The effects of climate change are varied and interventions should take differences in adaptive capacity into consideration. Indigenous peoples such as the Palaw'ans would benefit from further strengthening of their ability to adapt to climate change and its impacts.

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