

A Triple Focus on Climate Change Vulnerability at Catchment and Commune Level

Background

Cambodia has been repeatedly hit by natural disasters, mainly droughts, floods and windstorms. The area considered most affected is the Tonle Sap region, where both the frequency and intensity of climate-related hazards have steadily increased, confirmed by the findings of our previous research (Chem and Kim 2014). These environmental shocks are expected to have serious adverse impacts on local livelihoods due to high exposure to flood and drought, increased sensitivity (degradation of key ecosystem services and changes in local landscape), and relatively low adaptive capacity (Chem and Kim 2014).

We hypothesise that both climate change and human activities have caused changes in water availability in the Tonle Sap catchment. Climate change has led to uncertain rainfall patterns and higher temperatures. Agricultural intensification, industrialisation, infrastructure development and urbanisation are changing hydrological processes in the catchment, affecting the availability of a sufficient quantity and quality of water. Changes in the timing of the flow, quantity and quality of water have implications for farmers and other water users. The result is water shortages and greater risk of flooding, i.e. too much or too little water, in critical localities at critical times. Therefore, understanding the implications of stream flow and water availability changes for livelihoods is crucial.

Understanding of the possible impacts of hydrological changes on livelihoods and the level of vulnerability to climate change impacts at commune and catchment level must consider the three components of vulnerability: exposure, sensitivity, and adaptive capacity (MRC 2010: 5). The study applies these terms as defined by the Intergovernmental Panel on Climate Change (IPCC 2001):¹

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¹ "System" refers to both human and natural systems.

Exposure: "The nature and degree to which a system is exposed to significant climatic variations." (p. 987)

Sensitivity: "The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise)." (p. 993)

Adaptive capacity: "The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences." (p. 982)

Consultation with stakeholders at local and subnational levels should therefore focus on these three components. Before carrying out a detailed assessment at the commune and household level, it is necessary to identify the most vulnerable communes through consultation and participation processes involving relevant provincial technical departments and district authorities.

This article summarises the results for the first of a series of three participatory assessments, which aim to identify the communes that are most vulnerable in three catchments of the Tonle Sap Lake—Stung Chrey Bak in Kompong Chhnang province, Stung Pursat in Pursat province, and Stung Chinit in Kompong Thom province. The specific objective of this initial assessment study was to better understand communities' vulnerability to climate change impacts through a triple focus on exposure, sensitivity and adaptive capacity. Another aim was to collect secondary data and information about natural disasters and disaster preparedness and planning at subnational and local level. It also served to introduce the district authorities to the research team and the proposed project activities in their districts.

To obtain specific information, we used the guiding question: Which communes are the most vulnerable in the three catchments—Stung Chrey Bak, Stung Pursat and Stung Chinit? This was

followed by additional questions to look into the frequency and scale of hazard impacts and the economic and social damage they cause, and the extent of sensitivity and adaptation capacity to those hazards at the local or community level.

Note that not all of a district's administrative communes lie within the catchment boundary; those communes located outside the catchment were excluded from the assessment.

Method

This assessment was based on consultations with government technical agencies in the provinces of Kompong Chhnang, Pursat and Kompong Thom, including the provincial departments of Water Resources and Meteorology, Environment, Rural Development, Public Works and Transport, and Agriculture, Forestry and Fisheries. Also consulted were the Fisheries Cantonment, Forestry Cantonment, subnational disaster management committees, and the district governors of districts within the three catchments.

Secondary data and information, especially reports regarding natural disaster risk reduction and management planning, from the provincial technical departments and district authorities were reviewed and used in the analysis.

The consultations captured comprehensive information on exposure (to flood, drought, storm, disease epidemic and insect infestation), sensitivity, and adaptation capacity. Questions to assess exposure focused on the communes affected, types of disasters, frequency, scale of impacts (loss of cropland and/or crop damage in ha or percentage), and economic and social costs. Those aimed at determining sensitivity centered on population density, changes in key ecosystems (wetlands, fish sanctuaries), changes in forest cover in ha or percentage, and perceptions of the implications of population growth. Questions to evaluate adaptive capacity looked at local people's awareness of past and present climate-related events, and what they thought would happen in the future.

The research team, through the consultation process, gained deeper understanding about the availability and the effectiveness of climate change information dissemination activities, the integration of climate change issues into development planning, the effectiveness of existing community-based organisations in terms of climate change adaptation

and natural resource use and management, and the capacity and capability of provincial technical departments in supporting and helping local communities and people affected by weather-related natural disasters.

Information and data collected from the consultations were cross-checked with reports and development plans provided by the participants and against the commune database (MOP 2010) to identify the communes that are most vulnerable to the effects of climate change in the three catchments.

Results

Stung Chrey Bak Catchment, Kompong Chhnang Province

Exposure: Flood and drought are the main risks in the Stung Chrey Bak catchment. Major floods occurred in 2002 and 2011, while drought happens almost every year. Three communes are affected by drought and all communes affected by flood in Tuek Phos district. Five communes are affected mostly by drought in Rolea B'ier district. Two communes, Kbal Tuek in Tuek Phos district and Kouk Banteay in Rolea B'ier district, are the most vulnerable in terms of flood and drought risk, and recommended for detailed assessment.

Sensitivity: Poverty is still high in the province as a whole. The population in the province is reported to be increasing, resulting in rapidly rising demands for ricefields and water. Ecosystem services are being degraded. Forest cover is reported to have decreased noticeably, from 213,942 ha in 2002 to 210,682 ha in 2010 (MOP 2010). This is due to logging and land conversion in natural forest, national parkland and protected areas by local people and land concession companies. Deforestation is a major cause of increased soil erosion and water run-off.

Adaptation capacity: People who live in the uplands are less likely to be aware of climate change. Those living in the lowlands, an area mostly affected by drought, know how to manage water for dry season rice cultivation. There is a subnational committee for disaster management (CDM), composed of provincial department officers and chaired by one of the vice-governors, which is represented at village-level by volunteers. The CDM has an emergency disaster preparedness plan, but low capacity and limited financial resources mean that emergency response is not sufficient or quick enough to meet urgent needs. Feedback

from the participants noted that when faced with an emergency, disaster agencies have to share the budget and sometimes borrow equipment such as tractors and trucks from a private owner. Despite the training and awareness-raising activities to promote drought-resistant crops provided by the Provincial Department of Agriculture, Forestry and Fisheries, very few changes have been observed.

Figure 1 shows the districts and communes within Stung Chrey Bak catchment.

Stung Pursat Catchment, Pursat Province

Exposure: Thirteen communes in the four selected districts have been identified as highly vulnerable, particularly to floods and droughts in 1996, 2000, 2001, 2013 and 2014. Anlong Reab and Pramaoy communes in Veal Veang district, Samraong commune in Phnum Kravanh district, and Snam Preah commune in Bakan district are the most vulnerable and recommended for further study. Communes in Bakan and Kandieng districts are

affected by both flash flooding and river flooding (from the Tonle Sap Lake). Participants also reported severe storms and disease outbreaks. In 2000–01, storms destroyed about 200 ha of ricefields in Pramaoy commune, and a storm in 2014 destroyed nine houses in Anlong Reab commune.

Sensitivity: There were reports of losses of forest cover, which had resulted in soil erosion and water-run off. The population of Pursat province has increased, especially in Bakan district, so sensitivity is high. Population growth has led to rising demands for ricefields and water. Also reported were a growing number of conflicts over water demands for dry rice cultivation in Stung Pursat irrigation scheme, particularly in Bakan district.

Adaptation capacity: Communities in Phnum Kravanh and Bakan districts are more aware of climate change and are well prepared for natural disaster. They have requested the building of a water storage structure, the so-called “giant pot”, to secure a water supply during the dry season. People

Figure 1: Districts and Communes Located in Stung Chrey Bak Catchment



Note: The communes most vulnerable to climate change impacts are Kbal Tuek and Kouk Banteay

living in Bakan district are well prepared for river flooding, and they look out for information about water levels along the Mekong River: if the water level at Kratie recedes, the river water in Bakan district will rise within the next three days.

Importantly, there is a provincial CDM, which is chaired by one of the vice-governors and comprised of provincial department officers, and there are volunteer members at village level. The CDM has a document titled “Plan for Preparedness and Emergency Response to Disaster” (Khoey 2013). There are 29 farmer associations (supported by both the government and NGOs), fishery communities, farmer water user communities, and seven forestry communities located in Pursat province; their strong social network is critical in helping to build resilience.

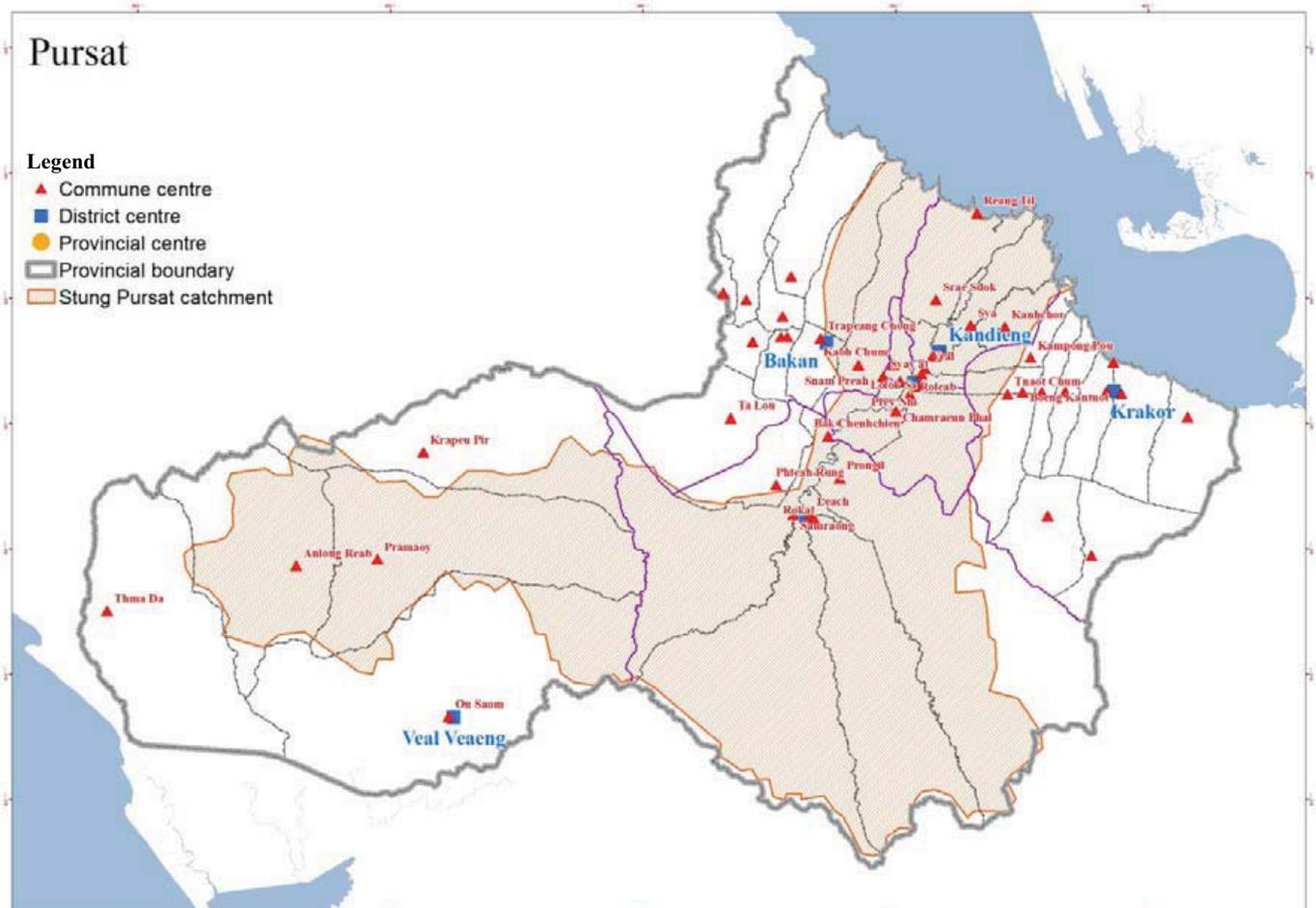
Figure 2 illustrates the districts and communes within Stung Pursat catchment and their proximity to the Tonle Sap Lake; those furthest from the Lake are situated in the uplands.

Stung Chinit Catchment, Kompong Thom Province

Exposure: More than ten communes in Baray and Santuk districts have been severely affected by flood and drought. These communes are exposed to the risk of flash floods, flooding from rivers (including the Stung Chinit), streams and the Tonle Sap Lake when swollen by the Mekong River. Major flooding happened in 2000, 2006, 2007, 2011 and 2012, with drought occurring in 2003. There was also report of a storm in 2012. Flooding in 2006 damaged 97 ha of rice and 30 ha of other crops in Baray district, and the 2000 and 2011 floods destroyed almost all of the ricefields in Santuk and Baray districts. In Santuk district, floods in 2006 and 2007 damaged 133 ha of rice and 566 ha of other crops.

Chong Doung and Tnaot Chum communes in Baray district, and Kakaoh, Chroab, Tang Krasang and Pnov communes in Santuk district, have been identified as the most vulnerable and need to be investigated in more detail.

Figure 2: Districts and Communes Located in Stung Pursat Catchment



Note: The communes most vulnerable to climate change impacts are Anlong Reab, Pramaoy, Samraong, Snam Preah

Sensitivity: In 2010 there were 194,819 people (99,736 women) living in Baray district and 97,164 (49,098 women) in Santuk district (MOP 2010). These high population densities, particularly in Treal commune, result in high sensitivity. Deforestation is widespread and caused by both local people and land concession companies. Significant loss of forest cover will occur within the next five years, according to the Kompong Thom Forestry Cantonment. Santuk district (Boeng Lvea commune) is the most affected by deforestation. There were also claims of upstream mining activities causing pollution in downstream areas, though the technical agency concerned did not confirm any such reports.

Adaptive capacity: Similar to the other two provinces, there is a CDM and a plan for disaster preparedness and emergency response. There is also a provincial Red Cross, which is considered the main disaster agency as it reacts more quickly than others. The Red Cross uses radio (102 MHz), loudspeaker and telephone to broadcast

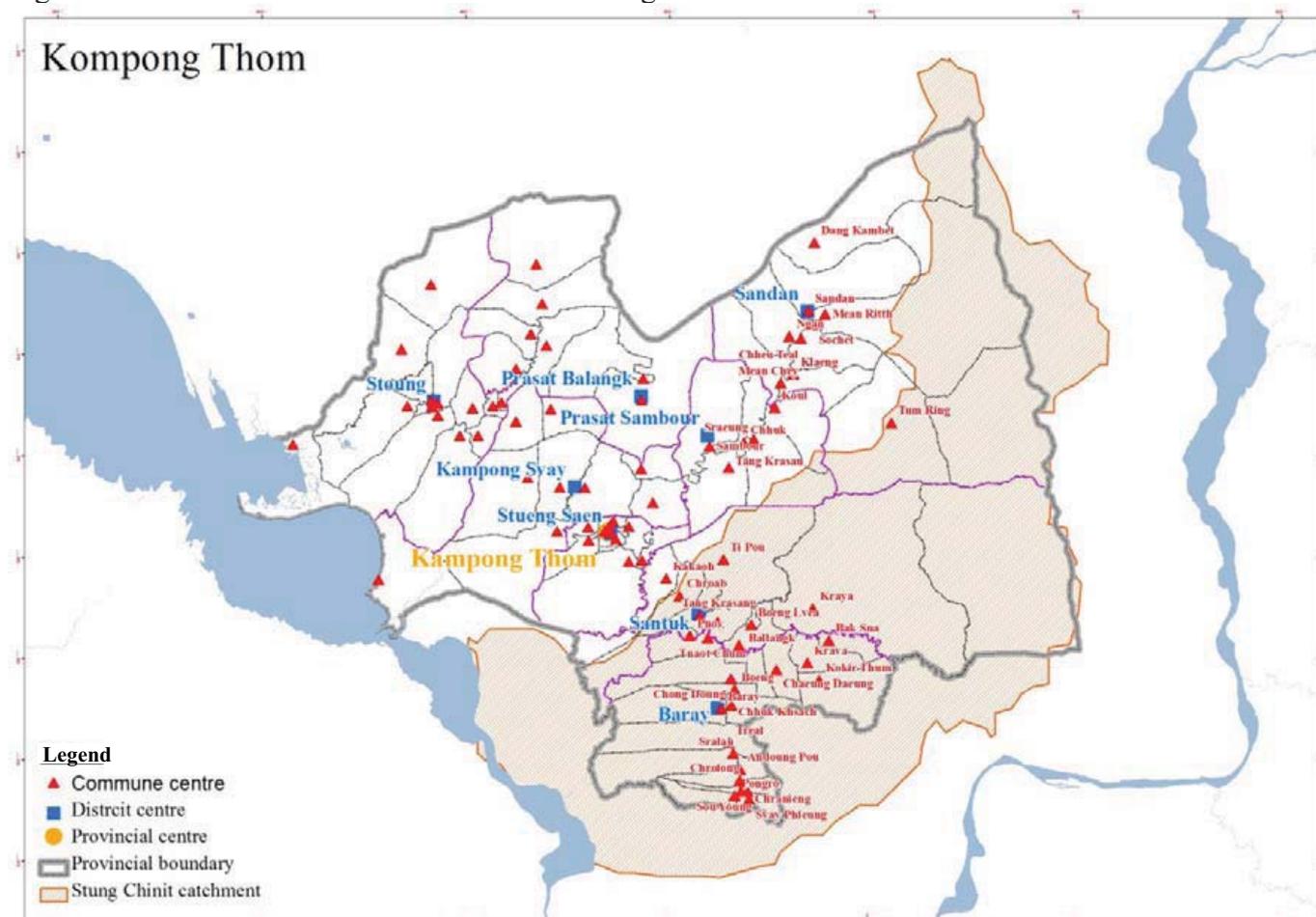
warnings to local people. The CDM uses official letters to communicate with district and commune authorities but in an emergency they telephone the district authorities directly and then the commune councils.

Local authorities have conducted a campaign to raise local people’s awareness of flood risk management and to promote hygiene and sanitation. There are other organisations (Srae Khmer, UNICEF, Oxfam and CAVAC²) that help local people with disaster preparedness planning and water and sanitation provision.

Although there are mechanisms in place, participants reported that work on the ground with communities is still absent due to lack of financial and human resources, materials and equipment. There is no proper safe place. When a flood is imminent, particularly river flooding during the rainy season, people move their livestock and make temporary shelters along National Road No. 6. Lack of water is not a problem in Stung Chinit because there is a large irrigation system. But there is a big

² Cambodia Agricultural Value Chain Programme.

Figure 3: Districts and Communes Located in Stung Chinit Catchment



Note: The communes most vulnerable to climate change impacts are Chong Doung, Tnaot Chum, Kakaoh, Chroab, Tang Krasang and Pnov

problem with pest invasion and soil quality, so it is hard for people to cultivate rice or other crops in the irrigation compound. In this case, local farmers have to move down to the area near the mouth of the Lake during the dry season, where the soil is fertile and where vast areas of inundated forest have been cleared for dry season farming.

Figure 3 shows the administrative borders of the districts and communes within Stung Chinit catchment, and the areas from the highest to the lowest land at the mouth of the Tonle Sap Lake.

Conclusion and Suggestions for Further Fieldwork

Similar to our previous findings (Chem and Kim 2014), most participants referred to exposure as the most prominent component of climate change vulnerability, specifying the serious flooding in 2000 and 2011 in all three catchments. Communes in the upland areas only experience flash flooding when communes located downstream close to the shore of the Tonle Sap Lake are affected by both flash and river floods. Drought has occurred almost every year in all three catchments. There were also reports of storms, lightning strikes, and human and livestock disease outbreaks.

Twelve communes, two in Stung Chrey Bak catchment (Kbal Tuek and Kouk Banteay), four in Stung Pursat catchment (Anlong Reab, Pramaoy, Samraong, Snam Preah), and six in Stung Chinit catchment (Chong Doung, Tnaot Chum, Kakaoh, Chroab, Tang Krasang and Pnov), are the most severely affected and require a more detailed appraisal. However, this identification, based solely on exposure, seems to overshadow the two other components of vulnerability—sensitivity and adaptive capacity.

It appears that although local people recognise their communities are exposed, at that level of stakeholder participation, only a few understand the implications of climate change impacts and the extent and variety of environmental threats. This makes it very difficult to both identify disaster losses and to standardise data to compare sensitivity between communes. People who live in downstream areas seem to have higher adaptive capacity than those living in upstream areas.

Likewise, even though there are mechanisms in place at subnational level, i.e. specific emergency disaster management plans and policy, in practice

the physical equipment, materials, financial and human resources, and preparedness to implement disaster reduction and recovery plans are absent. All three provinces have a subnational committee for disaster management with volunteer members at village level; however, when disaster strikes, agency members have to share resources and sometimes borrow equipment from private owners in order to respond to urgent need.

Following this first fieldwork and assessment study, it is suggested that the research team dig deeper into climate change vulnerability by continuing to focus on the triple components of exposure, sensitivity and adaptive capacity. To overcome the difficulties encountered in imparting the concepts of sensitivity, and adaptive capacity, and to get beyond the ways that local people initially frame their problems, the team should conduct interviews and focus group discussions in detail with local people in the communes identified as the most vulnerable. In this way, we stand to find out more about the challenges local communities face in adapting to climate change. The findings can then be used to inform adaptive intervention mechanisms at catchment and commune levels.

References

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