

■ Executive Summary ■

Climate Change Vulnerability and Adaptive Capacity of Communities: A Case of Nakhon Phanom Province, Thailand

Concepts of Vulnerability, Adaptive Capacity and Adaptation

All three concepts are interrelated and refer to the context of human-environment dimensions of global change. The study also refers to the IPCC (2001) conclusions that the vulnerability of any system to an external stress (or collection of stresses) is a function of exposure, sensitivity, and adaptive capacity; human and natural systems tend to adapt autonomously to gradual change and to change in variability; human systems can also plan and implement adaptation strategies in an effort to reduce potential vulnerability or exploit emerging opportunities even further; and the economic cost of vulnerability to an external stress is the sum of the incremental cost of adaptation plus any residual damages that cannot be avoided. The term vulnerability has sometimes been used to describe the estimated net or residual impacts (initial impact costs minus net adaptation savings). Vulnerability is usually taken as the “starting point” rather than the “end point” that can be measurable based on attributes or determinants selected. The expected application is that adaptation efforts should be directed to those areas with the greatest exposures or least adaptive capacity.

Moreover, adaptive capacity varies significantly from system to system, sector to sector and region to region. The determinants of adaptive capacity include a variety of system, sector, and location specific characteristics, including the range of available technological options for adaptation; the availability of resources and their distribution across the population; the structure of critical institutions, the derivative allocation of decision-making authority, and the decision criteria that would be employed; the stock of human capital including education and personal security; the stock of social capital including the definition of property rights; the system’s access to risk spreading processes; the ability of decision-makers to manage information, the processes by which these decision-makers determine which information is credible, and the credibility of the decision-makers, themselves; and the public’s perceived attribution of the source of stress and the significance of exposure to its local manifestations (IPCC, 2001).

Adaptation usually refers to a process, action or outcome in a system (household, community, group, sector, region, country) in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity. Specific definitions include “adjustments in a system’s behaviour and characteristics that enhance its ability to cope with external stress” (Brook, 2003); “adjustments in ecological-socio-economic systems in response to actual or expected climatic stimuli, their effects or impacts” (Smit et al., 2000); and “adjustments in individual groups and institutional behaviour in order to reduce society’s vulnerability to climate” (Pielke, 1998). Based on their timing, adaptations can be anticipatory or reactive, and depending on their degree of spontaneity they can be autonomous or planned (Fankhauser et al., 1999; Smit et al., 2000). All refer to environment-society coupled systems that specify the role of human adaptive responses.

Case Study of Tha Uthane District, Nakhon Phanom Province

Overview of the Area

Nakhon Phanom Province is located in the north-east of Thailand, about 750 km from Bangkok, and bordered by the Mekong River to the east. A significant waterway passing the province is the Songkram River flowing within the district of Tha Uthane as a tributary of the Mekong River. The elevation of the mouth of the Songkram River and that of the Mekong River show no big difference, allowing water from the Mekong River to flow back into the mouth of the Songkram River, particularly during the wet season, flooding the Songkram River and nearby communities. According to FEI (2007), a climate change modelling scenario study, increasing CO₂ by 1.5 and 2 times the current level during the wet season would increase the level and duration of floods. At the same time, the floods would come earlier than under normal circumstances. This would have significant implications on the livelihood of communities located on the banks of the Mekong River and along the Songkram River, especially those in the Tha Uthane District.

Approach of the Study

The study takes the above FEI (2007) study as the scenario of climate induced floods and looks at the impacts of climate induced floods on communities within human systems and human–environment systems. The focus includes the natural resource systems upon which communities depend, and the applications relating to the vulnerability and adaptive capacity based on different physical, social, political and economic perspectives. The conceptualisations of flood risks and their manifestation as disasters identify the environmental stresses of hazards and the progression of social forces that contribute to vulnerability, including those relating to adaptive capacity. It indicates the view of environment–society coupled systems that specify the role of human adaptive responses. It is to estimate the degree to which modelled impacts of climate change scenarios could be moderated or offset or mitigated by “adaptation to the impacts”.¹ It aims at initially identifying the processes, determinants or drivers of adaptive capacity and vulnerability as they function in each system. Also, it provides an analysis to address the policy and decision-making processes that deal with the conditions that can alter adaptive capacity and vulnerability. It is assumed that the output — indications of the relative vulnerability or adaptive capacity — will have application in policy and decision-making, in contributing to practical adaptation initiatives.

The study applies a participatory vulnerability assessment approach. The system of interest in this case is the community. It requires active involvement of community stakeholders which begins with an assessment of current exposures, sensitivities and current adaptive capacity, employing in-community methods (including such tools as questionnaires, household survey, focused group discussions and interviews, and participatory rural appraisal (PRA) techniques, semi-structured interviews, and community observation) as well as insights from local and regional decision-makers, resource managers, scientists, published and unpublished literature, and other available sources of information. The aim of this analysis is to identify and document the conditions or risks (current and past exposures and sensitivities) that people have to deal with, and how they deal with these, including the factors and processes that constrain their choices (current and past adaptive capacity).

In assessing vulnerability at the community level, a risk perception is identified as a key factor, operationalised at the individual level because individuals who perceive a risk or vulnerability are more inclined to act in ways that will mitigate the risk. Heightened risk perception is linked to community readiness for

adaptation. Risk perception is connected to adaptive capacity as a trigger for action and mitigation strategies. Once relevant conditions have been identified, and future livelihoods considered, information from other scientists, policy analysts, and decision-makers are integrated into the analysis to identify potential future exposures and sensitivities (what conditions or risks the community may be facing) and future adaptive capacity (in what ways the community may potentially plan for or respond to these conditions).

Vulnerability Assessment and Adaptive Capacity

Generally, a system or a community that is more exposed and sensitive to a climate stimulus, condition or hazards will be more vulnerable, while one that has more adaptive capacity will likely be less vulnerable. Vulnerability, its elements of exposure, sensitivity and adaptive capacity, and their determinants are dynamic, varying over time by type and they are place and system specific. The study takes into consideration the physical, social, political and economic dimensions of indicators derived from the published literatures and the focused group sessions, as follows.

1. Physical dimension: This included measures of current and future risks of floods, along with data describing the perceived impacts on the community and environmental risks. Physical indicators were measured at this level. These indicators were measured by household questionnaire surveys asking community respondents the degree of impact floods have had on their community and the nature of the impacts (positive or negative). Communities especially experienced diminished access to important places particularly schools, markets and hospitals during flood, due to floods on roads as all these physical structures were flooded. People therefore use boats for transportation when roads are inaccessible. They feel that this is very inconvenient, and is another added expense on families who do not have boats. Also, after the flood recedes, the roads in and out of the village are left with huge potholes, making transportation difficult for weeks or months afterwards. This is especially a problem when someone needs to seek medical care far away.

Notably, the structure of local houses illustrates a traditional adaptation to flooding patterns. Traditional house designs consisted of two stories, elevated above the ground, and made of wood. The first floor is usually an open space used as a communal area for family members, with a floor of tiles or compacted soil. There are rustic tables and chairs which can be easily moved and are flood resistant. Flood waters tend to cause minimal damage if they do not reach the second floor. The family sleeps in the second floor which is elevated higher than normal

¹ terms used by Parry, 2002; Mendelsohn et al., 2000; Fankhauser, 1998.

maximum flood levels. The house has a high ceiling and many windows to allow air to circulate during the hot, dry season. People used to build this type of house in the past because wood was plentiful and cheap. Nowadays, most families build houses from concrete in a rustic or Western style of just one storey. This is partly influenced by the price of wood which is now prohibitively expensive, and by the perception that brick and cement houses are cooler. Although these houses are only one story they are often built on land that has been filled and elevated above low flood lines. Some people have been known to buy many round oil tanks to make a raft and stay on it when there is a flood. Those people who live in inundated and flood prone areas are not always more vulnerable to flooding than those who live on higher lands. Most of them live in a traditional-style house and are well prepared in coping with floods. All seem to have at least one boat and feel used to living with water and floods. In terms of rare severe storms, there have been many families that have suffered from damaged houses resulting from rain. Most houses are not designed to cope with these types of events and are built with cheap building materials. However, there had been assistance available from the local government and Tambon (Sub-district) Administration Organisations (TAOs) to the victims in helping them to fix houses and build temporary shelters in the event of such an occurrence. People within the villages also help each other and donate money to the victims. The integration of both physical information and risk information from community residents under this dimension offered the possibility of a more holistic approach to understand the physical dimensions of flood threats.

2. Social dimension: This included factors such as poverty, family well-being, health, education levels and property rights as they are clearly linked to vulnerability and provide a foundation for assessing the capacity of communities to respond positively to significant stressors. For this purpose, we used an existing socio-economic index that assesses human economic difficulties, crime, health and education, as well as children and elderly at risk. The reduction in yield leaves many families with some degree of food shortages. Since it is the main indicator of food security for most families in the northeastern region, any shortages of rice lead families to feel they have insufficient food. Villagers noted that this leads to greatly increased expenses for their families, since they have to buy rice and other food and sometimes trade rice with fish. Aside from rice damage, the loss of non-rice crops also affects families. However, the majority of villagers grow vegetables for home consumption only, so these losses do not affect their income. Even with these impacts, fish are widely available. Families

whose main livelihood is fishing benefit from flooding. They are able to catch a greater quantity and variety of fish and other aquatic resources, which they then sell in the market. The only thing that they have to buy is rice, which is the most important. In some years, families do not collect adequate amounts of rainwater. They then have to buy drinking water. Community members earning their alternative living through fishing have developed a wide range of equipment that is appropriate to the conditions in the rivers and other wetlands. For example, when the water level is high, they use traps or fishing hooks. When it is low, they use mong and uan tap taling, a type of net that is anchored along the riverbank. If the water is flowing quickly, they use traps, nets, and other equipment that is specially designed for those conditions. Similarly, when water flows slowly, they use only fishing hooks. Villagers said that using equipment tailored for the season and environmental circumstances helps them catch more fish. It greatly supports the villagers' flexibility and resilience in response to floods and other climate related risks. Additionally, families with more dependent children and elderly are more vulnerable.

3. Political dimension: Participants in focused group interviews identified competent and responsive local and national political institutions as key components of adaptive capacity, and identified heightened levels of risk awareness as being positively associated with proactive political action. The political dimension was measured from evaluations of access to the decision-making process, community trust in local leaders (Village Headmen and TAOs), and satisfaction with flood related management efforts, as well as risk perception data collected in the questionnaire survey. The vulnerability assessment incorporates a risk component into the political dimension. Heightened risk perception in the communities places negative pressure on vulnerability, but the awareness may offer an incentive to develop adaptation strategies. Unlike other indicators of political vulnerability (low levels of trust and moderately low levels of satisfaction with government's management efforts), community risk awareness seemed to be relatively high across all communities, and this awareness translates into greater adaptive capacity. Although the study identified awareness and trust as key components of political capacity, it takes into account that such measures are somewhat indirect or perhaps less important than measures of institutional change or collective action.

The management of the early warning system does not sufficiently prepare communities with risks and impacts; however, more interestingly, they would normally rely on their indigenous forecasting methods (e.g. ants removing eggs from the nests can signal rain; an itchy feeling on the skin can signal rain; changing of

tamarind leaves could indicate the march of seasons; fewer mushrooms growing means there will be less water available; a dark-coloured tail on a certain type of lizard means a flood is likely to occur that year. If the tail is grey, a drought is likely, etc). Data were closely linked with issues of trust and the potential for collective action and institutional mobilisation. In terms of the political capacity of communities, they had moderate degrees of political capacity, expressed as high risk awareness and moderate satisfaction with management efforts but low levels of trust in political organisations.

4. Economic dimension: The economic dimensions of vulnerability derived from the published literatures and in the focused group discussions. This included economic diversity, the dependence of the local economy on major income from farming and alternative income generation (fisheries, forests, plantations) available to the community, and existing finance and loans. From the study, it was discovered that the cropping calendar has also been affected. Being a predominantly agricultural region, communities are greatly dependent on the seasons. It affects their livelihoods and their sense of community through cultural activities. People mark the calendar by the change of seasons, and they base livelihood decisions on when rains start, when they end, and the effects on the environment around them. For example, if the rain comes early or late, it affects the cropping calendar for rice. If the rain comes early, the people are able to plant sooner. Some villagers choose flood-resistant varieties if the rains come early since they believe that this may lead to flooding. On the other hand, if it comes late, they must delay planting. The delayed rains do not give the rice enough time to grow. The inability to predict seasonal shifts, or to adapt their activities to new climate conditions, often negatively affects their livelihoods.

Furthermore, focused group interviews indicated that the diversity of resources and different seasonal non timber forest products offered a more secure income for communities over the long term. Economic diversity, a measure of the uniformity of employment across all sectors of the economy, was calculated by dividing the portion of total personal income derived from one sector by the total income from all sectors. This provides an assessment of the ability of a community to absorb economic shocks through employment income from more than one economic sector. Income dependence was calculated with an economic base methodology that determines the proportion of employment income in a community that is derived from the agricultural sector. Communities with a higher proportion of employment income from the agricultural sector (rice growing) are more vulnerable to economic shocks within that sector.

In short, the floods were not negative events in general. The majority of community members felt that floods are good. People can catch more fish, and therefore they have more income and more food to eat. Although many paddy fields are damaged, those families with fields in areas that escaped flooding are able to command a better price for their yield. Communities have developed a number of ways, developed through years, to deal with floods, most significantly by diversifying or altering their livelihood activities. A range of coping mechanisms employed by households affected by floods exist. Households generally use a combination of these strategies at any one time to maintain the family's basic needs, mostly considered "cultural adaptation" (human ingenuity including technological innovation and long-range planning) in light of predicted climate change and its anticipated impacts.

Adaptive capacity was analysed via thresholds and "coping ranges", defined by the conditions that a system can deal with, accommodate, adapt to, and recover from (de Loe and Kreutzwiser, 2000; Jones, 2001; Smit et al., 2000; Smit and Pilifosova, 2001, 2003). Most community members can cope with or adapt to normal (business as usual) climatic conditions and moderate deviations from the norm, but not exposures involving extreme events that may lie outside the coping range, or may exceed the adaptive capacity of the community. The adaptive capacity and coping range are not static. They are flexible and respond to changes in economic, social, political and institutional conditions over time. The coping range (to deal with floods) can increase over time or decrease, for different reasons. Two consecutive years of high level floods which are not beyond the limits of the normal coping range present a little problem in the present but require drawing on stored resources, and the consumption of these resources may subsequently narrow the coping range until they can be built up again, so a third and fourth year of floods of the same magnitude may well exceed the now smaller coping range. A wet year may be an ideal year for crop production and lead to high yields. However, subsequent years of wetter conditions can perhaps encourage more pest and fungal outbreaks and excessive water and actually decrease yields, and thus the coping range is reduced. The increasing and intensified climate induced flood events beyond the limit of the coping range may permanently alter the system's normal coping range if it is not able to recover from it. A very wet year and longer duration, far beyond the normal conditions may lead to higher level of floods (beyond the second floor of the house), and thus the previous coping range cannot be returned to in a subsequent normal year.

Adaptive capacity significantly constitutes a set of adaptations. Adaptations, or changes in the system to better deal with problematic exposures and sensitivities, reflect adaptive capacity. The study concludes many forms and “levels” of adaptations, including by timing relative to stimulus (anticipatory, concurrent, reactive), intent (autonomous, planned), spatial scope (local, widespread) and form (technological, behavioural, financial, institutional, informational). It is also possible to differentiate adaptations according to the degree of adjustment or change required from (or to) the original system. For an agricultural/cropping system facing excessive water exposures, a simple adaptation might be to use what local communities here call “risking rice” (growing rice where communities take a chance if they will get a yield or not) (or more drought resistant cultivars for water shortage). A more substantial adaptation might be to shift away from crop farming to pastoralism (growing a variety of crops – cash crops and farm crops, etc). An even more substantial adaptation might be to abandon farming altogether. The determinants of adaptive capacity are not independent of each other. The presence of a strong kinship network also increases the adaptive capacity by allowing greater access to economic resources (e.g. borrowing money from relatives before, during or after flood period), supplying supplementary labour or equipment. Individual determinants cannot be isolated; adaptive capacity is generated by the interaction of determinants which vary in space and time. The determinants of the adaptive capacity exist and function differently in different contexts - a strong kinship network may play an important role in this society.

One of the key components of this study is public risk perception. Risk information was used to complement the other data associated with exposure to climate induced floods, and it showed a disconnection between the extent of physical exposure and perceived impacts on the community. Furthermore, focused group discussions revealed that community members make a direct link between the flood and changing climate. Heightened perception of impacts on communities not yet frequently and severely affected by floods - a sense of vulnerability owing to an awareness of the link between climatic change and floods - is observed rather high. The results also show a strong connection between community members’ assessments of the magnitude of impact and the type of impact. It also suggests that residents are preparing themselves for significant negative impacts in the near future by building on information that extends beyond a strict physical assessment of flood exposures.

Additionally, communities usually respond to extreme events before they respond to gradual changes

to the normal circumstances (business as usual). Vulnerability and adaptation recognises that the environments are changing from day-to-day, month-to-month, year-to-year. It shows that changes in the normal conditions defining those environments can actually be experienced most noticeably through changes in the nature and/or frequency of changing conditions that can be observed across short time scales and that adaptation necessarily involves reaction to this variability. The study provides better understanding on the coping ranges, not necessarily fixed over time, where the consequences of experienced conditions become significant. Adaptive capacity then depends critically upon defining a coping range and understanding how well the coping strategy might be expanded by adopting new or modified adaptations.

It also provides opportunities to gain some understanding of the multidimensional nature of risks and vulnerabilities to climate induced floods and represents a high level of physical risk tempered by political and key economic factors. They had higher levels of physical risk with respect to flood levels, duration and the time the floods come, and perceived impacts, lower awareness and access to official flood related information and had lower economic diversity and social well-being, all of which suggest that they are relatively vulnerable communities. These factors were worsened by high levels of risk perception and moderate trust in district and provincial governments. However, with the cultural, individual and collective adjustment (adaptation) through years, and the availability of alternative income resources, these factors indicate that the community is in a reasonably good position to manage risks and impacts and outcomes from floods to a certain level (at the point of their experiences with extreme flood events in the past). However, increasing and intensified floods due to climate change would require a systematic and holistic approach and measure to effectively build and strengthen these existing assets and capitals. Furthermore, the study provides concrete information about levels of exposure and adaptive strength and weakness, and such information can be used as a direct input to more targeted investment strategies at the community level. In this context, community based vulnerability assessments can provide an important tool for communities to explore and focus their adaptive strategies.

Conclusion

The community assessment reveals community resilience, which concluded that greater economic diversity, community autonomy and leadership, combined with lower dependence on the large industry, contributed to greater community resilience. Community capacity, defined as the ability of a community to 'respond to external and internal stresses; to create and take advantage of opportunities; and to meet the diverse needs of community members, and the community's ability to respond and positively adapt to a variety of circumstances exists as "the collective ability of a group (the community)" to combine various forms of capitals within institutional and relational contexts to produce desired results or outcomes. This can also be seen through their social and kinship network (in seeking finance before, during and after the flood events and the exchange of products (fish, rice) among community members, etc.). Other existing resources grouped into physical capital, economic capital, social capital and human capital are available to the community and are linked to capacity within the community and help increase and strengthen it. These are seen to be sufficient for them to cope with what's currently within their coping ranges. For further capacity outside their current range, assistance with significant political and financial support from the external sources (governments, NGOs, other organisations) would have significantly contributed to have increased adaptive community capacity to changes and shocks in a longer term.

National policy to respond to climate change impacts has to put highest focus and attention on community assessment and capacity. In terms of national policy contribution, the study reveals several reasons why vulnerability assessment at the community level can promise better understanding of the contextual nature of vulnerability and for attempts toward reducing vulnerabilities. First, it focuses on conditions that are important to the community rather than those assumed by the researcher or for which data are readily available. It employs the experience and knowledge of community members to characterise different conditions, community sensitivities, adaptive strategies, and decision-making processes related to adaptive capacity or resilience. It facilitates the decision-making processes into which adaptations to climate change can be integrated, which is sometimes called a "bottom-up" approach in contrast

to the scenario-based "top-down" approaches. Second, community analysis indicates variations in vulnerability that might otherwise be lost in national or larger scale studies. National-level assessments often use similar categories of dimensions such as political, social and economic dimensions, but community-based assessments are able to indicate important differences in vulnerability at the provincial and community scales. Third, community assessment facilitates opportunities to link research work with actions to mitigate vulnerability. With vulnerability assessments undertaken for a country or continent, the linkages to specific adaptive actions are rather weak. In contrast, community-based vulnerability assessments facilitate links to actions that can be more easily established through the jurisdictions and social units where actions towards adaptation will be taken, as also supported by Parkins J. and MacKendrick N., (2007). Forth, adaptive capacity is context-specific and varies from country to country, from community to community, among social groups and individuals, and over time. It varies not only in terms of its value but also according to its nature. The scales of adaptive capacity are not independent or separate: the capacity of a household to cope with climate risks depends to some degree on the enabling environment of the community, and the adaptive capacity of the community is a response of resources and processes influenced by the national scale. Adaptations are manifestations of adaptive capacity, and they represent ways of reducing vulnerability where assessment at the community level can be brought up to the larger and national scale.

Lastly, it is crucially important for "mainstreaming" adaptation into development patterns and policy agenda. The whole point of the work is to have risks (and opportunities) associated with climate change (or other environmental changes) actually addressed in decision-making at a practical level. Fundamentally, it is concluded by the study that it is extremely unlikely for any types of adaptive actions to be taken in light of climate change alone.

This executive summary is part of a research project entitled *Climate Change Vulnerability and Adaptive Capacity of Communities: A Case of Nakhon Phanom Province, Thailand*, implemented by the Heinrich Böll Stiftung. This document summarises the results of a study carried out at the outset of the project. The reference list for this summary can be found in the full-length study of the same name, available at: www.boell-southeastasia.org.