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Vulnerability Assessment of Climate Risks in the Lower Songkhram River Basin, Thailand



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List of Tables and Figures

Table 1: Sources of Income in Study Villages.....	4
Table 2: Average Landholdings and Household Size	4
Table 3: Preparedness Measures for Flood and Drought in Study Villages.....	16
Figure 1: Map of the Regions of Thailand.....	4
Figure 2: Impacts from Climate-Related Hazards in Thailand (1966-2002).....	5
Figure 3: Community Views on Flood Frequency in the Past 10 Years (%)	11
Figure 4: Community Views on Flood Severity in the Past 10 Years (%)	11
Figure 5: Community Views on Drought Frequency in the Past 10 Years (%)	11
Figure 6: Community Views on Drought Severity in the Past 10 Years (%)	12
Figure 7: Community Views on Rainy Season Shifts in the Past 10 Years (%)....	12

Table of Contents

1 INTRODUCTION.....	1
2 BACKGROUND.....	1
3 METHODOLOGY.....	2
4 STUDY AREA.....	3
4.1 LOWER SONGKHRAM RIVER BASIN	3
4.2 STUDY VILLAGES	4
5 CLIMATE HAZARDS.....	5
6 VULNERABILITY TO CLIMATE HAZARDS.....	6
6.1 HOUSEHOLD IMPACTS OF FLOODS	7
6.2 HOUSEHOLD IMPACTS OF DROUGHT	8
6.3 GENERAL IMPACTS FROM CHANGES IN CLIMATE	9
6.4 COMMUNITY PERCEPTIONS OF CLIMATE TRENDS	10
6.5 OTHER ELEMENTS OF CLIMATE VULNERABILITY.....	13
7 COPING STRATEGIES FOR CLIMATE HAZARDS.....	14
7.1 EARLY WARNING AND PREPAREDNESS	14
7.2 APPROPRIATE FISHING EQUIPMENT	15
7.3 APPROPRIATE FARMING PRACTICES	16
7.4 ALTERNATIVE LIVELIHOOD ACTIVITIES.....	16
7.5 EXTERNAL ASSISTANCE	16
8 NATIONAL DEVELOPMENT STRATEGIES	17
8.1 THAILAND'S DEVELOPMENT STRATEGIES	17
8.2 EFFECTIVENESS OF COPING MECHANISMS UNDER CLIMATE CHANGE.....	18
9 CONCLUSION	19
10 RECOMMENDATIONS.....	19
REFERENCES	22
ANNEX A: VULNERABILITY ASSESSMENT TEAM MEMBERS.....	23

1 INTRODUCTION

As a part of the GEF funded, Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP)*, a joint programme of the four governments of Cambodia, Lao PDR, Thailand and Viet Nam, managed by the United Nations Development Programme (UNDP), the World Conservation Union (IUCN) and the Mekong River Commission (MRC), IUCN has participated in a dialogue focusing on water and climate change in the Lower Mekong Basin. The ongoing dialogue aims to infuse climate change concerns into the decisions made by water managers and policy makers, and to help local communities cope with and adapt to increasing climatic variability. Assessing vulnerability is a key component of this initiative.

The Thai assessment is one of three case studies that aims to assess the potential consequences of climate change on wetlands communities and livelihoods. As in the other studies conducted in Cambodia and Laos, initial attention is given to understanding vulnerability and adaptations to current climate variability.

2 BACKGROUND

Geography—Thailand has a total land area of approximately 513,000 km². The country is divided into five distinct geographical regions: North, Northeast, Central, East, and South. Low mountains, with an average altitude of 200 meters, characterize the Northern region. The Central region is “the rice bowl of Asia” and most of it is below 50 meters above sea level, leaving it prone to annual flooding. The East is a fertile region for growing tree crops and much of the country’s industrial activity is located here. The Southern peninsula stretches down towards Malaysia as a strip of land between the Gulf of Thailand and the Andaman Sea. The Northeastern region, the focus of this study, is on a high plateau of dry land. The area is commonly called the *Isaan* region.

Socio-economic profile—Thailand has 62 million people, and the growth rate from 1990-2001 was 0.9%. Life expectancy is 69 years at birth, and the adult literacy rate is one of the highest in the region at 95%. Women make up 46% of the labor force, compared to 37% in nearby Malaysia and Hong Kong. The gross national income per capita is US\$1,970 (World Bank, 2003). Almost half of GDP is generated through services, but the majority of labor is employed in the agriculture sector. Major industries include tourism, textiles and garments, agricultural processing, beverages, tobacco, electric appliances, computers, furniture, and plastics. Agricultural products include rice, cassava (tapioca), rubber, corn, sugarcane, coconuts, and soybeans.

Climate conditions—The mean annual temperature across Thailand is between 22°C and 32°C, with a peak in April. The dry season lasts six months, and there is very little, if any, rain. It is influenced by the northeast monsoon, which brings relatively cool weather between the middle of October and the middle of February. The air will then grow steadily hotter through March and April. During the wet season, the rain starts from the middle of May until the middle of October. This is due to the southwest monsoon, which brings moisture into the region.

It is recognized that extreme climate events, including floods, are likely to become more frequent and/or severe with future climate change (IPCC, 2001). This would pose a great threat to the communities in the Lower Songkhram River Basin area. This study seeks to understand how climate risks currently threaten communities, coping

strategies, and how villagers perceive their climate to be changing. The coping mechanisms employed both by individual households and the community will provide insight to new ways to promote preparedness. Therefore, the study was commissioned to establish a dialogue on current household and community vulnerability to floods, droughts, and seasonal shifts in the Lower Songkhram River Basin in northeast Thailand. In particular, the objectives are:

- To document the frequency and intensity of floods and droughts, and record perceived changes in these patterns
- To identify the impacts of floods and droughts on rural livelihoods
- To identify local coping strategies
- To consider the viability of current coping strategies under changing climate conditions

3 METHODOLOGY

Partners—The Asian Disaster Preparedness Center (ADPC) worked closely with the IUCN Asia Regional Office in Bangkok and the Rajabhat Institute in Sakon Nakhon in developing the methodology for the study and for the implementation of activities. The Rajabhat Institute acted as the national partner to coordinate various activities throughout the assessment, including a consultative workshop in June 2003. START/SEA in Bangkok also provided input for the conceptual development and methodology. Annex A shows the team members involved in the study design and implementation.

Site selection—The initial selection criteria for choosing the three study sites were: 1) The villages are vulnerable to climate risks, 2) One village would have families that rely primarily upon rice farming for their livelihood, another would have families that rely primarily upon fishing, and the third would have families engaging in both rice farming and fishing, and 3) The villages represent different levels of development. Following the consultative workshop in June 2003 and a planning meeting in August 2003, team members chose Na Dok Mai, Ka, and Pak Yam villages.

Background information—This dialogue draws on work carried out by IUCN, ADPC, and partners on poverty, climate change and variability, and vulnerability. The Rajabhat Institute provided a brief summary of findings from the survey and focus group discussions. IUCN previously conducted a number of complementary studies in the Lower Songkram basin, such as the participatory poverty assessment (PPA), a nutritional assessment, an institutional assessment, and others, which have provided background information on wetland resources and other factors affecting rural livelihoods. Other inputs include national documents, interviews with government and IGO representatives, interviews with villagers, and reports on Thailand's climate and development.

Study design—A planning meeting was held in June 2003 in Sakon Nakorn. Several village representatives attended the meeting, during which project partners shared the study objectives. Members of the START/UNEP office provided a background on climate change and projected changes for the Isaan region. ADPC and IUCN presented on climate-related risks and a short summary of the Participatory Poverty Assessment (PPA) that was conducted in the region earlier. Representatives of government agencies, NGOs, and academia also participated in the workshop.

Following this meeting, ADPC prepared a survey with input from partners. The survey was first tested in two of the three selected villages in August 2003, and then modified based on feedback from community members. The full survey and other activities to support the dialogue on climate risks was carried out in September and October 2003¹.

This field study had three main components:

- 1) Household surveys—The team administered the survey to the heads of 100 households in each study village. The survey covered the following issues:
 - a. Background information on income, household members, livelihood activities, etc.
 - b. Household impacts from floods, perceptions of changes in the last ten years, and coping strategies.
 - c. Household impacts from droughts, perceptions of changes in the last ten years, and coping strategies.
 - d. Community and household disaster preparedness, including development needs.
- 2) Focus group discussions were held in each village. The groups consisted of 5-10 people and were led by 1-2 members of the team. Separate discussions were held to gather the perspectives of each of the following groups: fishermen, rice farmers, women, elders, and leaders of the village.
- 3) A community workshop was held in each village following the survey phase to share preliminary findings with villagers and to fill in remaining gaps. Approximately 100 people per village attended these meetings.

4 STUDY AREA

4.1 Lower Songkram River Basin

The Songkram River is an important branch of the Mekong River in the Sakon Nakhon basin in Northeast Thailand. The Songkram River Basin covers an area of about 12,700 km², or about 8 million rai. It flows through four provinces: Sakon Nakhon, Udon Thani, Nongkhai, and Nakhon Panom.

The Lower Songkram River Basin is a flood-plain area with freshwater swamp forests, swamps, marshlands and small streams. The swamp forests provide livelihood for people living in this area. These wetlands and the people using wetland resources benefit greatly from the climate cycles throughout the year. The river basin is important for the Isaan region's biodiversity. During the wet season, the aquatic resources within the basin increase significantly. Several species of fish from the Mekong River swim up into the Songkram River to spawn. During the dry season, plants within the flooding perimeter will start to grow again.

¹ Please see Annex B for the survey instrument.

Figure 1: Map of the Regions of Thailand



Another benefit of the floods is that the soil is very fertile due to nutrients carried in each year. This has led to the land near the river to become an important rice growing area. The Songkram River Basin contributes greatly to the region’s food production. It is vital for maintaining the communities’ way of living, and has supplied one of the main sources of nutrition for villagers. The fish caught and bred in the wetlands are a simple and low-cost source of protein. The production of fish from the Songkram River is also exported throughout Isaan, providing a steady

source of income for families.

4.2 Study Villages

As mentioned above, the villages were chosen based on the livelihoods of its members. Pak Yam village is located in Nakhon Panom province, with 140 villagers who are mostly engaged in fishing. Ka village is in the same district in Nakhon Panom as Pak Yam. Ka is the largest village in the assessment with almost 700 people, and they are mostly farmers. Na Dok Mai is located in the adjacent province of Sakon Nakhon, and it has approximately 300 people living there. Approximately half of them are engaged in fishing while the other half are farmers. All three villages have access to markets and roads, which lead to the capitals of both provinces. Tables 1 and 2 include further background information on the villages.

Table 1: Sources of Income in Study Villages²

	Ka	Na Dok Mai	Pak Yam
Fishing	12	69	75
Farming (rice and other crops)	84	85	71
Wage labor	29	46	36
Making products for sale	10	21	19
Trading	13		
Support from children	4		
Other	3	26	19

Table 2: Average Landholdings and Household Size³

² Out of 100 survey participants per village. Some participants indicated more than one source of income.

³ Out of 100 survey participants per village.

Landholdings (rai ⁴)	Ka	Na Dok Mai	Pak Yam
0-1	0	0	4
1-5	25	9	1
6-10	28	21	4
11-15	10	20	7
16-20	10	16	13
21-30	12	16	16
31 or more	4	9	15
No answer	11	9	40
Household Size (people)			
1-2	10	40	6
3-4	47	23	50
5-6	27	12	28
6 or more	15	23	16
No answer	1	2	0

5 CLIMATE HAZARDS

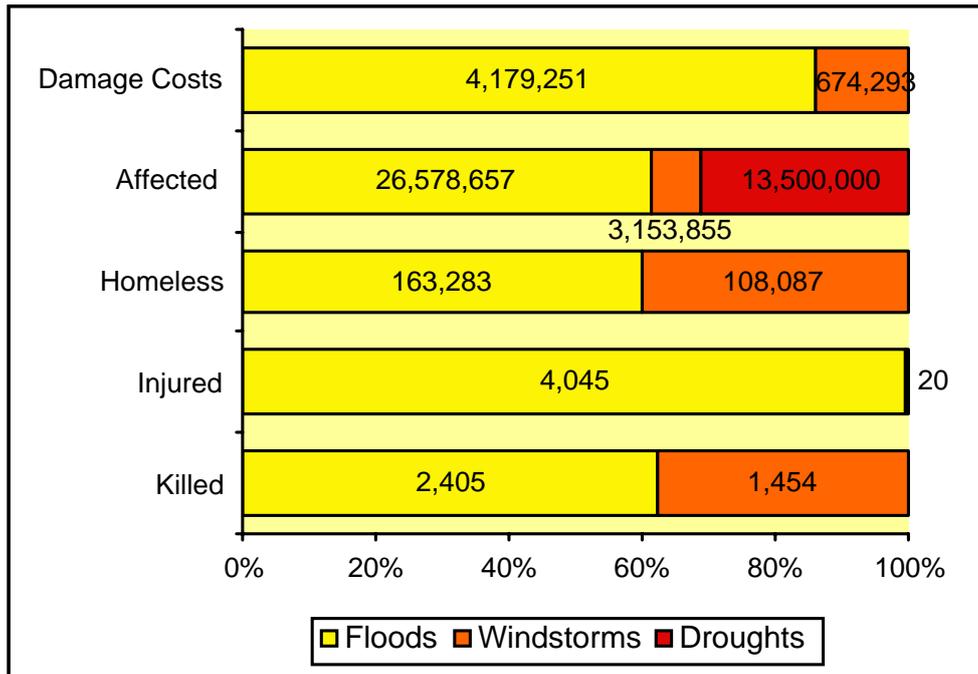
Floods, droughts, and windstorms, cause numerous disasters each year in Thailand. From 1966-2002, 66 disasters resulted in at least 10 deaths, 100 people affected, or an appeal for international assistance (CRED, 2003). Climate-related hazards cause the vast majority of disaster impacts in Thailand; they contribute to 84% of deaths and 99-100% of injuries, homes destroyed, the total number of people affected, and damage costs from recorded disaster events. Figure 2 shows the distribution of impacts from each type of climate-related hazard in Thailand.

Floods do not often lead to deaths, considering that they make up almost all of the climate-related disaster events. However, they do cause a large amount of damage (86%) to housing, paddy fields, equipment, and other losses that can have longer-lasting impacts on household's well being. The cost of these events is likely underestimated since it is difficult to assign a monetary value to many household assets. According to CRED, over 650,000 people were affected on average in each climate disaster. This masks the number of people affected in the numerous smaller disasters that are not reported in the international database. It also does not include secondary impacts such as health and sanitation problems in the weeks after a flood.

Figure 2: Impacts from Climate-Related Hazards in Thailand (1966-2002)⁵

⁴ One *rai* equals 1600m²

⁵ Damage Costs are shown in USD ('000s). In the "Injured" bar, 20 people were injured due to windstorms.



It is also important to note that, although droughts show up only in the “affected” category of Figure 2, the impacts from these disasters has a great impact on communities. This is particularly true in the Isaan region, which experiences a very severe dry season. The Songkram River basin has a tropical savannah climate. In a year there will be a dry season alternating with a wet season, with distinct differences. The majority of precipitation in Isaan is due to depressions, which move into the region from the South China Sea in the east around August to September each year. Approximately 3-4 depressions move into Isaan per year. During those years with less than three depressions, the climate will tend to be drier than normal. During years with more than four depressions, there tends to be flooding.

The Songkram River basin has a higher amount of rain than other areas of Isaan, at approximately 1,800 mm/year compared to 1,400 mm/year. Within the basin, the average is about 1,300 mm/year in the southwestern part, and this increases to 2,700 mm/year in the northeastern part near the Mekong River. This area often experiences widespread flooding due to the extremely flat terrain—for 200 km from the juncture between the Songkram River and the Mekong River, the land rises at an average of only 3-4 centimeters per kilometer! The incline between the riverbank and the bed of the Songkram River is only two meters. This causes the water from the Songkram River to flow very slowly into the Mekong. Furthermore, when the Mekong River rises during the rainy season, the water can backflow into the Songkram for up to 170 km. In some years, as much as 5-600,000 rai has flooded in the Lower Songkram River Basin for as long as 2 or 3 months.

The following sections present the results of the dialogue on household impacts to floods and droughts. They also review some of the factors that reduce vulnerability to climate-related hazards, at both the household and community levels.

6 VULNERABILITY TO CLIMATE HAZARDS

6.1 Household Impacts of Floods

6.1.1 Rice Yield and Paddy Field Damage

In all three villages, people cited damage to the paddy fields and rice crop as the worst impact of flooding. In Na Dok Mai, a few families participating in the survey said they own approximately 60 *rai* of land in the floodplain, and sometimes the whole 60 *rai* has been damaged. Villagers estimate that around 10% of Na Dok Mai residents lose their entire crop during particularly severe floods. However, the majority of the people (80%) have rice paddies both in the floodplain and at higher ground. Although the rice in the floodplain may be damaged, the fields at higher ground can still produce something. The families are then able to rely on this rice for their household consumption. The remaining 10% of people in Na Dok Mai have all of their rice paddies located at higher ground. Therefore, when flood occurs, they are not affected.

In Pak Yam, villagers said the flood level reaches 2-3 meters above the rice plants. This will last 2-3 months, causing the plants to die or the yield to dramatically decrease. It is a similar situation in Ka, where they also experience decreased rice yields. People noted that 1995 brought the most severe floods in recent memory, when yields decreased 50-100%. Only those families with fields located at higher grounds are unaffected by flooding. One woman in Pak Yam said that her family plants only one rice crop per year because she does not want to risk a flood wiping out the second crop.

6.1.2 Insufficient Food and Drinking Water

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 Isaan 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. Aside from rice damage, the loss of non-rice crops also affects families. However, the majority of villagers grow vegetables for home consumption, so these losses do not affect their income (only 1% of families grow vegetables for sale).

Even with these impacts, aquatic resources 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. One villager in Ka said, "Floods maintain the abundance of food in the Songkram River Basin. The only thing that will be less is rice, which is most important. Then we have to buy more when flooding is bad."

Finally, in some years, families do not collect adequate amounts of rainwater. They then have to buy drinking water, which villagers said costs 100-120 baht per container.

6.1.3 Damage to Housing, Livestock Shelters, and Equipment

Na Dok Mai village is situated on the highest ground in the surrounding area. One villager remembered that, "In [1966 and 1995], the worst flood years, the village became an island." Fortunately, the floodwaters did not rise into the village, so the dwellings were not damaged. However, people said that in both years, the corral where they shelter water buffalos, oxen, and chicken coops were flooded. Around 90% of people in Na Dok Mai own cows and water buffalos. Due to the inundation in the area, livestock did not have enough land for grazing. In Ka, people said they normally let their livestock roam around the rice paddies. They experience the same problem of a shortage of grazing area for their animals and lack of shelter.

Pak Yam village is located at lower ground, and some of the family homes suffer more damage during heavy floods. In some years, the water reaches to just under the house, approximately 2-3 meters inside the village. This causes damage to equipment and household goods stored under the house, such as containers for *pla ra*, an important condiment in Isaan food. In addition, villagers also reported losing some of the utensils that they were not able to move in preparation for floods, including pots, pans, fishing equipment, etc.

6.1.4 Difficulties with Transportation

People 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. They also said that 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.

6.1.5 Illness

Illnesses following floods have struck both livestock and people. Some of the illnesses affecting people include pink eye, gastro-intestinal diseases, flu, hemorrhagic fever, and fungal infections on the feet. For livestock, villagers mentioned infections in the feet and mouths of cattle. People in Pak Yam said that smaller animals, such as chickens and ducks, frequently die.

6.2 Household Impacts of Drought

6.2.1 Decreased Rice Yield

The majority of the people plant wet season rice (*na pee*), and droughts significantly affect their rice yields. Approximately 10% of the village has lost half of their crop during dry years, including the majority of those whose fields are located at high ground. Another 10% can grow rice even during a drought. These households usually plant dry season rice (*na prang*) near rivers and/or use irrigation pumps. Most of the people in Pak Yam plant *na prang* due to their proximity to the river.

Villagers explained that drought affects the growth of rice shoots, or young rice. The people who have ponds or water pumps can still produce healthy rice according to the cropping calendar. About 80% of the people in the village, those who have paddy in both low and high ground, can maintain a “medium” annual yield.

6.2.2 Insufficient Food and Drinking Water

Similar to rice shortages caused by floods, shortages caused by droughts also impact the family’s food security. Rice yields decrease, but unlike during floods, families cannot turn to wetland resources for alternative food sources. In Ka, people mentioned that the NTFPs gathered from the forest, such as mushrooms and bamboo shoots, are more difficult to find. The fish and other aquatic animals that people normally rely on are also scarcer during droughts. This in turn leads to increased expenses because people must buy food, rather than catching it themselves in the wetlands. In Pak Yam, a predominantly fishing community, people said that their fish catches are less productive on all fronts during droughts—the amount, variety, and quality of fish all decreases.

Finding a steady supply of drinking water also becomes difficult. In Na Dok Mai, there are three artesian wells, but these have dried up or the water has fallen to very low levels during past droughts. People reported that they have to buy drinking water, which increases their expenses. Aside from drinking water, villagers also said they must pump water to irrigate their crops. However, the Royal Irrigation Department is not able to meet the demand for pumps in the village. People said they must take turns using the pumps, and this has caused some conflicts.

6.3 General Impacts from Changes in Climate

6.3.1 Increased Expenses

People felt that extreme climate events increase their financial burdens. For farmers who can save their rice, they often must pay higher wages for labor so they can harvest the crop in time. This then decreases their profits and income. In addition, when rice yields are low, people must buy enough to support the household, and the prices are generally high at that time. Villagers reported that expenses incurred in growing rice, for example buying fertilizer and agriculture equipment, increase following floods and droughts. Sometimes they also have to pay to have ponds dug or to rent irrigation pumps.

Expenses on transportation also rise during disasters. People in Pak Yam said they have to spend money for fuel for boats (to travel and catch fish). Those who do not own boats must pay fees for their transportation. Fishermen also have to buy new equipment to replace the items lost during floods, or because conditions in the fishing grounds require different types of nets, traps, and other equipment.

Aside from disasters, unexpected changes in the weather and seasonal shifts increase household expenses. Villagers said that particularly cool periods mean they have to spend more money to buy clothes, skin lotion, and wood for heating. In very hot periods, they must spend more on electricity bills to run fans and to buy drinking water.

6.3.2 Health Concerns

When the weather changes, either to hot or cold temperatures, people become sick. They also believe that eating habits are altered, and this affects people's health, especially children's, because the body cannot adjust properly. In Ka, a few villagers mentioned that weather changes cause them to become listless, and they cannot work effectively. They feel weak, contract colds, suffer headaches, and otherwise get sick easily. One explanation offered for the frequent illnesses when the weather becomes colder is that some families do not have adequate clothing, particularly for chilly nights.

6.3.3 Cropping Calendar

Being a predominantly agricultural region, the people in the Lower Songkram Basin 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 families choose flood-resistant varieties if rains come early since they believe that may lead to flooding. On the other hand, if it comes late, they must delay planting. One woman in Ka said that 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.

6.3.4 Wetland Resources

One man from Pak Yam said that from April to June 2003, he noticed that the river level near his village rose at a significantly slower rate than normal. This has had several impacts on the wetland area and the resources villagers use. For example, a certain fish species was not able to lay its eggs due to the excessively dry conditions. In the rainy season, if the rain is late, the fish will not come to spawn and they will be smaller than normal. A “good” rainy season will bring more rain and with it a greater quantity and variety of fish. These include *pla sawai* (catfish), *pla tapien*, *pla kow* (white fish), *pla chon* (snakehead), *pla kod* (catfish), etc.

6.4 Community Perceptions of Climate Trends

Several of the questions on the survey attempted to solicit the individual's perception of flood and drought risk in the past ten years. This can shed light on the how various climate hazards affect the household livelihood activities.

6.4.1 Flood Risk

Figure 3 and Figure 4 show villagers' opinions on the frequency and severity of floods. The assessment team found that most people in the three villages believe that floods have occurred less often in the past ten years. In Pak Yam village, 61% of those surveyed feel this. This relatively high percentage, together with discussions in focus groups and various meetings, indicates that the fishing activities of the people in Pak Yam and Ban Na Dok Mai are important for their living. Several people mentioned that one of the benefits of floods is that fishing productivity rises. With less frequent flooding, this has a negative impact on the primary livelihoods activity of Pak Yam village. Similarly, most of the people in Ka village said rice farming is their most important activity. Reduced flooding would be an overall benefit for them, although they are still affected.

People in the three villages believe that floods in the past 10 years have been less severe, as shown in Figure 4. People in Na Dok Mai reported that they have experienced less paddy damage in the last ten years. Furthermore, they have relatively diversified livelihood activities, through growing rice, raising cattle, and fishing. When a flood hits, they have been able to rely more heavily on the unaffected (or less affected) source of livelihood.

Figure 3: Community Views on Flood Frequency in the Past 10 Years (%)

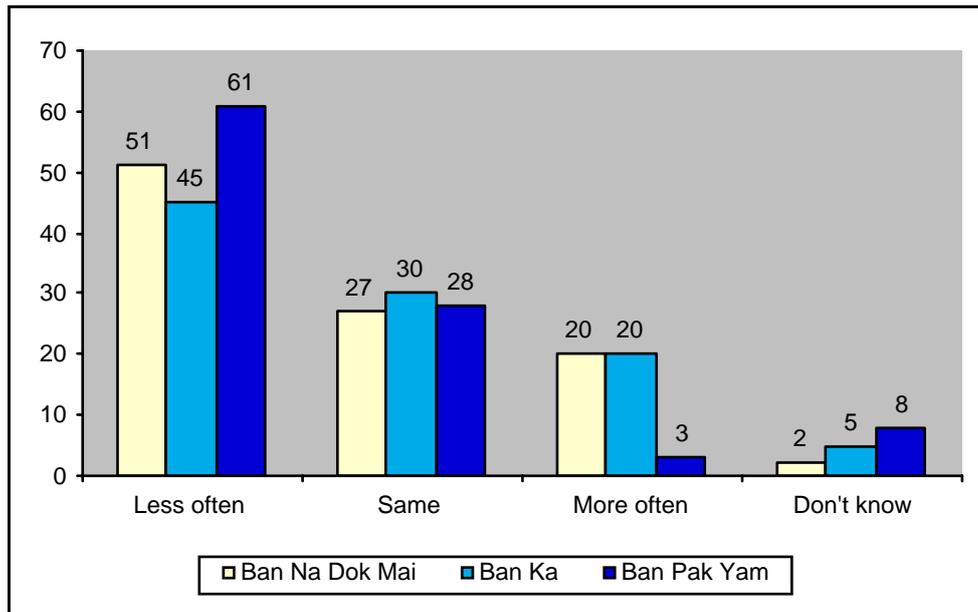
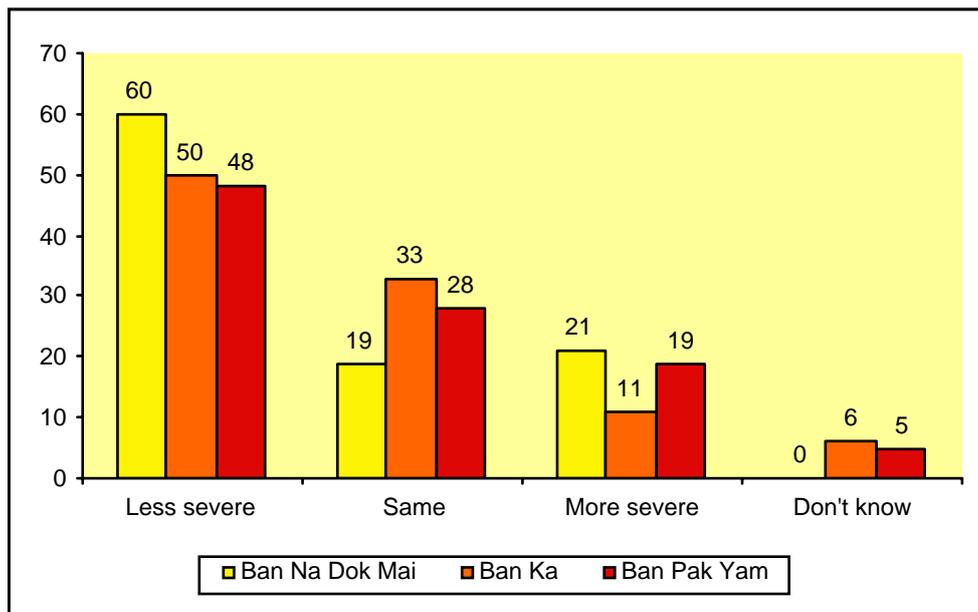


Figure 4: Community Views on Flood Severity in the Past 10 Years (%)



6.4.2 Drought Risk

Figure 3 and Figure 4 show the community perceptions of drought frequency and severity in the past ten years. The frequency of drought does not appear to have changed significantly, but people in Pak Yam said that events have become more severe. This reflects on their fishing livelihoods, where the low water level in ponds and rivers hampered their catches. In Na Dok Mai and Ka, people agreed that a drought occurred in the current year (2003), and there has been less rain in general. Even with the drought, they feel it has not affected their livelihood significantly.

Figure 5: Community Views on Drought Frequency in the Past 10 Years (%)

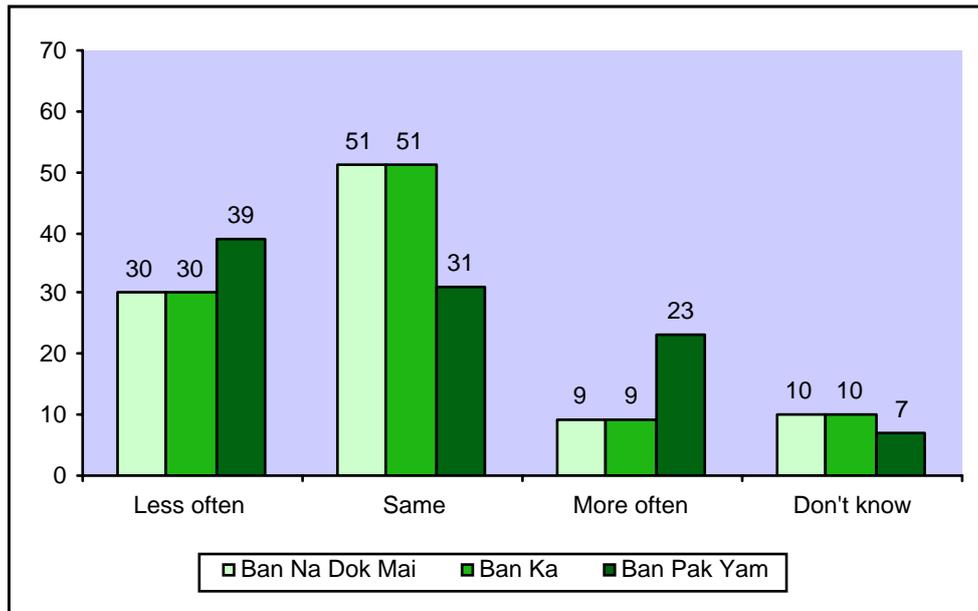
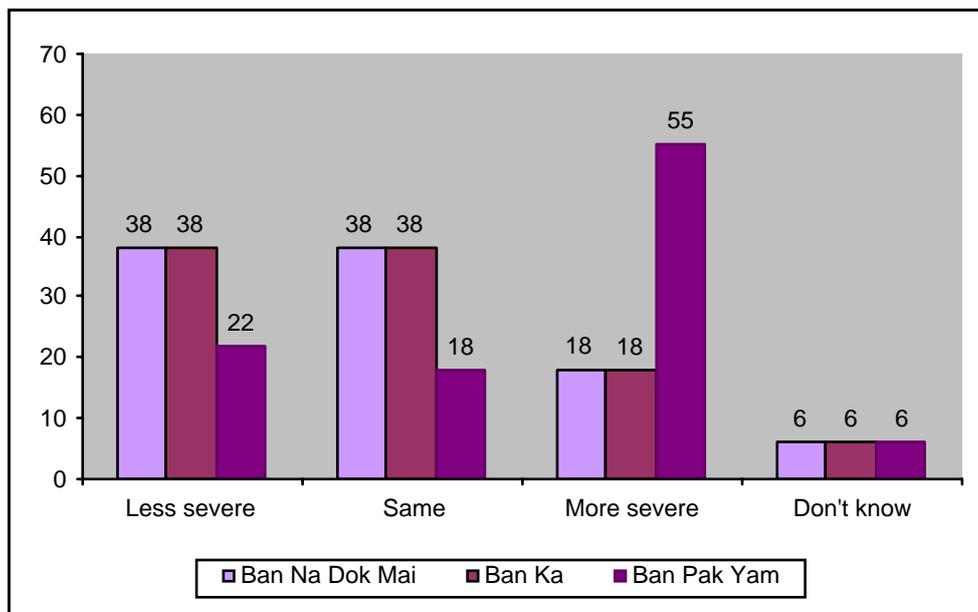


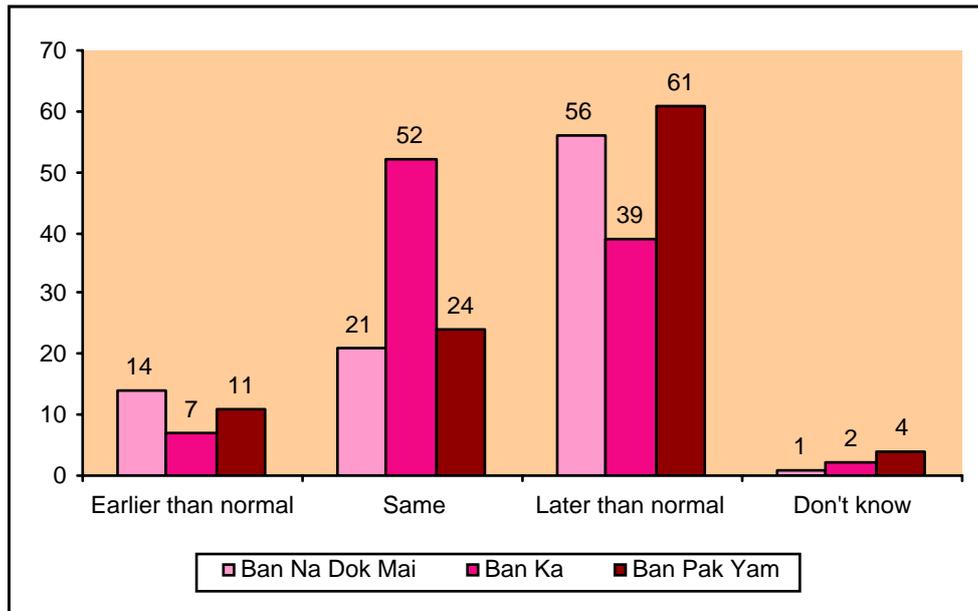
Figure 6: Community Views on Drought Severity in the Past 10 Years (%)



6.4.3 Seasonal Shifts

The assessment also touched upon the timing and duration of seasons, and whether villagers perceived any shifts during the past ten years. Figure 7 below shows that the majority of people in Na Dok Mai and Pak Yam feel that the rainy season begins later than normal. This decreases the amount of fish they are able to catch due to falling water levels. In Ka village, people feel that it begins at approximately the same time each year. If rains are delayed it does not affect their livelihood greatly, since the village has water pumps to continue with their rice farming.

Figure 7: Community Views on Rainy Season Shifts in the Past 10 Years (%)



In addition to the onset of the rainy season, the assessment also found that people in all three villages feel that the length of the season is shorter than normal. This was especially true of Pak Yam villagers, where it was noted that the Songkram River receives less inflow from its branches during dry years.

Villagers said that there have been significant changes regarding all of the seasons. In Na Dok Mai, 85% said the cool season has become shorter, while 79% in Pak Yam and 73% in Ka agree. One person said, “The cold season seems to last only one or two days, and then it gets hot again!” Another elderly man said that 20-30 years ago, he could see his breath in the winter season, but now the temperature never goes so low that this is possible.

6.5 Other Elements of Climate Vulnerability

6.5.1 Factors Enhancing Vulnerability

Many of the villagers felt that floods occur naturally every year and are therefore a part of the natural cycle. Villagers said that their parents, grandparents, and countless generations of ancestors have lived with the same conditions. People feel they can accept the level of damage that occurs from normal floods, and even that of severe floods, such as 1995-6. Generally, the three villages may experience some housing damage in limited areas, but people mostly feel that floods do not affect them much. Even if the family home is damaged, they are accustomed to it.

This attitude has led to the communities' acceptance of flood impacts, with little motivation to prepare or take steps to mitigate damage. Some of the villagers surveyed believed that it is best to “let nature take its course”. This was particularly common in Pak Yam, which is also due to the fact that they perceive floods as largely beneficial for their livelihoods. During those times they are able to catch more fish. Another reason is that villagers believe that their preparedness efforts are not likely to be effective. In the past, they had tried to build a levee to hold back the floodwaters. However, the village ended up being flooded anyway, so they do not feel that it is worth the effort.

6.5.2 *Factors Reducing Vulnerability*

The key elements that reduce vulnerability for families in the Lower Songkram Basin are their physical assets. The three villages are relatively developed compared to other sites that have been assessed in Lao PDR and Cambodia. WFP (2001) uses proximity to a road as an indicator of vulnerability, and all three of the villages can easily access the road network. They can quickly bring goods to the market for sale and buy necessary items at fair prices. The transportation costs are not prohibitive in the area.

Unlike the study villages in Lao PDR or Cambodia, the villagers in Thailand also have access to formal savings mechanisms. Several people said they use banks to keep some savings, in addition to the traditional mechanisms of livestock and making equipment. This increased reliance on formal savings accounts helps to reduce vulnerability in times of extreme climate events when cows and buffalo are likely to contract diseases or die.

Finally, the villages in Thailand also have more regular communication with the government, NGOs, and international organizations than study villages in the other two countries. This interaction helps to enhance resilience during climate-related disasters and to speed the process of recovery.

7 COPING STRATEGIES FOR CLIMATE HAZARDS

As described above, the floods were not negative events in general. In all three villages, the majority of people felt that floods are good. People can catch more fish, and therefore they have more income and more food to eat. It is also better for select households who depend on rice farming for their livelihoods. 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. Droughts may present greater impacts on household well being since it is more difficult to find alternative food sources than in floods. Also, external assistance is more readily available in times of flood, as will be discussed in more detail below.

Communities in the Lower Songkram River Basin have developed a number of ways to deal with floods and droughts, most significantly by diversifying or altering their livelihood activities. A range of coping mechanisms employed by households affected by climate risks is described below. Households generally use a combination of these strategies at once to maintain the family's basic needs. This section also includes information on external assistance from the government and international organizations.

7.1 *Early Warning and Preparedness*

The vast majority of the villagers answered that they do not prepare for floods or droughts, or they prefer to let nature run its course, as shown in Table 3 below. As mentioned earlier, they felt that the level of damage incurred during flooding was tolerable. Also, 2003 was the only incident of drought in the past 10 years, and families had not been affected too much. Therefore, families did not feel the need to take special precautions.

Table 3: Preparedness Measures for Flood and Drought in Study Villages

Preparedness Measures	Na Dok Mai	Ka	Pak Yam
Store water	6	2	-
Harvest crops, adapt agriculture methods/varieties	2	9	2
Secure livestock	3	-	-
Adapt fishing equipment and grounds	1	3	9
Secure house and goods	-	2	-
Notify officials	9	7	-
Monitor information	-	1	-
Do nothing/don't know	86	69	89

However, upon further discussion with team members and during focus groups, many people mentioned several actions they took to minimize impacts of climate risks. This includes stocking rice for the household and placing the storage containers in a high place in case of a flood. In Na Dok Mai, many of the families own livestock. When there is a threat of flooding, three of the survey participants noted that they prepare grass and straw for the cattle. They also move them to higher ground and take measures to prevent epidemics during floods. To prepare for a drought, people in Na Dok Mai and Ka said they would store drinking water.

Only one person mentioned monitoring TV and radio broadcasts for climate information, although this also came up during discussions on preparedness in focus groups. Interestingly, many people felt the Thai Meteorological Department is very accurate with its weather reports. Discussions also revealed a wealth of information regarding indigenous forecasting methods. Some examples of these methods include the following:

- 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-colored 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.

In general, people said watching out for abnormal behavior among particular species of insects and birds is useful for forecasting extreme climate events. Many community members felt that this indigenous knowledge of linkages between the climate and ecosystems is gradually being lost. They urge education for younger people in the community since a better understanding of these issues will help households to better prepare for climate risks.

7.2 Appropriate Fishing Equipment

People in Pak Yam, the majority of whom earn their 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 to catch more fish. It greatly supports the villagers' flexibility and resilience in response to climate variability.

7.3 Appropriate Farming Practices

In the Lower Songkram River Basin, people have adapted rice farming for different seasons. In years past, Ka villagers practiced *na pree*, which is planting during the wet season. After repeated floods, they changed to practice *na prang*. *Na prang* is planting during the dry season, also practiced in Pak Yam. One of the drawbacks of *na prang* planting, however, is that it requires irrigation during very dry years. The villagers must then use pumps to get water. They have also dug ponds to harvest and store water throughout the year. Approximately 30% of the village has multiple use ponds for irrigation, breeding fish, and to provide water for livestock.

In addition to varying the crop calendar, villagers also cope with climate variability by planting suitable rice varieties. For example, one variety called *khao daw* can be harvested sooner than other varieties. Some of the villagers surveyed said it has been successful in flood-prone areas.

7.4 Alternative Livelihood Activities

Another way of coping with climate risks is to increase certain existing activities. People in Pak Yam said that when there is a flood, they catch fish and can then sell it to buy rice. During informal discussions with women around the village, they also said that one of the most lucrative activities is to make rice liquor for sale. They often fall back on this when agriculture and fishing slows down, which was the case during the hot season of 2003 when the rains were delayed. At that time, many farmers were idle while waiting to plant the next crop.

A very common coping mechanism to maintain household income during unfavorable climate conditions is to find alternative livelihoods. Villagers in Ban Ka said many people in Isaan migrate to Bangkok, or abroad, to find employment. These are often positions in domestic service, construction, driving taxis, and other low-skill jobs. The money earned can support their living costs in the city, with enough to send back to their families in the villages. Some people are able to return home to help with the farming activities during planting and harvesting, but many said that the income in the city enables a higher quality of life and greater security.

7.5 External Assistance

Many affected households receive external assistance from family, neighbors, and the government or other organizations. Through individual interviews, the assessment found that people in Na Dok Mai and Ban Ka feel that extended family is the most reliable source of assistance. There is a reciprocal system within the community for helping each other through difficult times. Aside from extended family, villagers said that neighbors are also helpful. However, households within the same area are normally struck by climate disasters at the same time, so this type of assistance is limited. Third, villagers will turn to the government. This was not the case in Pak Yam, where people felt that the government is the second-most important source of assistance after extended family.

When they have floods or drought, the leader of the village reports the event to the government for further assistance. For example, the village head prepares the names

of households facing severe impacts from disasters. They also tell them what kind of assistance is needed usually consisting of food, farming or fishing equipment, fertilizer, rice seed, cooking utensils, and recovery funds. The Department of Labor and Welfare has provided rice and dry goods when floods have occurred. Villagers said that government assistance is much greater during floods than drought. However, the Royal Irrigation Department has lent pumps to the village during past droughts.

Aside from immediate relief to individual households, people also recommend that the government help by establishing or supporting village funds and repairing roads and other infrastructure. Several people also expressed interest in training on disaster preparedness and how to improve their livelihood practices, such as livestock management, agriculture, and wetlands management. Regarding NGOs, villagers felt that these organizations have several opportunities for becoming more active in the area.

8 NATIONAL DEVELOPMENT STRATEGIES

8.1 Thailand's Development Strategies

Aside from physical elements of climate, economic and social changes in the next decades will also have an impact on communities' vulnerability to floods. The development strategies implemented by the government and other organizations have the potential to enhance livelihood opportunities, which in turn reduce vulnerability. This section reviews major development plans and trends that will affect communities in the Lower Songkram River Basin.

The Ninth Plan (NESDB, 2002) for Thailand's social and economic development places a major emphasis on the balanced development of human, social, economic, and environmental resources to alleviate poverty and elevate well being. One of the priority goals is to achieve good governance at all levels of Thai society to support sustainable development focused on people and communities. Planners have also recognized the disparity in urban and rural development levels. Thailand's development strategy for the next 20 years includes programs to diversify and further strengthen the agriculture sector, with a strong focus on human resources and management. This should encourage responsive systems that are able to effectively adapt to changes, whether those are economic or climate-related. The Ninth Plan outlines targets for human and social development, some of which will directly support the resilience of communities in the Lower Songkram River Basin to climate risks. The Plan emphasizes the need to embrace the "sufficiency economy", which is

"A philosophy that stresses the middle path as the overriding principle for appropriate conduct and way of life by the populace at all levels. "Sufficiency" means moderation and due consideration in all modes of conduct and incorporates the need for sufficient protection from internal and external shocks. To achieve this, the prudent application of knowledge is essential. At the same time, it is essential to strengthen the moral fiber for the nation so that everyone, particularly public officials, academics, business people and financiers adhere first and foremost to the principles of honesty and integrity. A balanced approach combining patience, perseverance, diligence, wisdom, and prudence is indispensable to cope appropriately with critical challenges arising from extensive and rapid socio-economic, environmental, and cultural change occurring as a result of globalization." (NESDB, 2002)

The three overarching objectives are as follows:

- To **rehabilitate the national economy** in order to bring about quality economic growth, a strong grassroots economy based on self-reliance, and international competitiveness
- To **establish a strong foundation** for national development through strengthened human resources and learning processes, education and health reform, a social protection system, and the empowerment of local communities
- To **promote good governance** at all levels

The main development targets outlined in the Ninth Plan that will help reduce vulnerability in the Lower Songkram region are:

- To accelerate economic stabilization and recovery, through promote small and medium enterprises
- To strengthen grassroots economies, with participation by the poor
- To alleviate social problems, such as drug addiction and corruption, and provide an efficient health insurance system
- To create opportunities for the poor to receive government services, to access natural resources, and to participate in natural resource management
- To develop social safety nets to enhance the security of the poor, through mechanisms such as revolving funds and savings mechanisms
- To restructure development across Thailand's regions and promote rural development
- To promote good governance through a lean, efficient, and decentralized government sector
- To develop human resources and social protection
- To strengthen science and technology knowledge and application

8.2 Effectiveness of Coping Mechanisms Under Climate Change

The successful implementation of these policies would help to enhance resilience and the effectiveness of coping mechanisms within the Lower Songkram region. Currently, villagers participating in the dialogue expressed the opinion that climate risks are a concern for them, but they are not devastated when they occur. One of the main goals of the Ninth Plan is to involve the communities in decision-making, and to create an enabling environment for sustainable development. A large concern now is good governance, which is exacerbated by Thailand's traditional system of highly centralized management. Empowering communities in the management of their natural resources and social services will greatly improve the effectiveness of programs by addressing local needs.

The emphasis on strengthening education, training, and research applications will also benefit the Lower Songkram villages. All villages have access to local markets and basic needs are satisfied (running water, electricity, etc.). They have good communication with external organizations in case of disasters. Therefore, efforts to build on local knowledge, expand agriculture extension services, and disseminate new understanding in agriculture, livestock, and wetlands management will help enhance resilience in the face of climate risks.

Some of the villagers expressed the opinion that drought is a bigger problem than flooding. This is not due to greater impacts from droughts, but rather because the external assistance from the government and organizations following a flood helps them to deal with those impacts more easily. One woman mentioned that the government will provide assistance during and after a flood, but not during a drought because, “There are many villages and houses, so [the government] cannot send pumps to everyone.” The government’s plans to improve climate information and water management will help the villages to cope more effectively to droughts. This is urgently needed since climate projections show that droughts are likely to increase in the future.

9 CONCLUSION

The dialogue on climate risks found that the three villages in the Lower Songkram River Basin are vulnerable to both floods and droughts. The main impacts of floods are loss of paddy fields, reduced rice yields, lack of drinking water and food. There can also be some damage to houses and livestock shelters, so that the family’s important assets are affected. Other problems are difficulties in transportation and illnesses. The main impacts of drought are decreased rice yields, and insufficient food and drinking water. For flood, drought, and seasonal shifts, families experience increased expenses to deal with the impacts. For example, many families must buy food and water, and replace equipment for farming and fishing. Seasonal shifts also affect the family’s livelihood, such as when to plant and harvest rice. The changes in wetland resources have a strong impact on coping mechanisms in the village. For example, coping with flood may be easier for families because of the abundance of aquatic plants and animals as alternative food sources.

The coping mechanisms used by families to deal with climate risks range from preparedness to adapting fishing equipment and farming practices to migration. Floods in the Lower Songkram region are slow-rising, so families generally have time to prepare by securing their household goods and taking livestock to safe areas. Farmers have adapted their rice farming practices to suit the Isaan climate over the years. Fishermen also use equipment tailored to the water levels and other conditions in the wetlands. Villagers said they rely on external assistance from family, neighbors, and the government. One of the most common coping mechanisms is to migrate to Bangkok, other provinces, or abroad. This supports the individual’s livelihood, as well as the family back in Lower Songkram. Many of the people who migrate are unlikely to find attractive employment in the village again.

Floods and droughts are likely to become both more frequent and more severe with future climate change. A shorter, more intense rainy season will increase floods during the wet season and drought during the dry season. Continuing development efforts, however, could go a long way towards enhancing the resilience of villagers by promoting expanded livelihood options, better preparedness, and adaptation to climate risks.

10 RECOMMENDATIONS

Expand employment opportunities—Employment opportunities in the local labor market will be supported through funding for farm and non-farm jobs, and by encouraging communities to establish revolving funds or cooperatives. The Ninth Plan

encourages support for non-farm work in non-irrigated areas through training for the underemployed. Training will also be developed for people who may work overseas in the service industries, such as childcare, cooking, etc. This will provide a broader range of livelihood options for villagers in the region, reducing their climate vulnerability.

Promote climate information applications—Improving climate information applications through work with the meteorological office, agricultural extension, water resource managers, and other users would be valuable for enhancing flood and drought preparedness. This would require improved forecasting ability at the provincial level, which is currently quite low in Thailand. The Thai Meteorological Department is developing a forecasting system to facilitate water resource management. It is also developing a drought risk map for the Isaan region and setting up drought information centers to provide timely information to relevant organizations. Another program that supports this is the Mekong River Commission's (MRC) Flood Forecasting System, which now provides 3-5 day forecasts on a daily basis (MRC, 2002). They also publish flood data, flood hazard maps, and other information. The MRC also plans to develop standard training programs covering land-use planning, structural measures, flood preparedness, and emergency response.

Improve access to social welfare—Increasing access to, and the quality of, health care and other social services will also reduce villagers' vulnerability to climate risks. This includes supporting local organizations to deliver social welfare services that are responsive to the local community's needs. People in the three villages currently felt that NGOs could be more active by helping to coordinate development programs jointly between government agencies, NGOs, and the private sector. Revolving funds at the village or district level should assist local disadvantaged groups, or provide a type of insurance for households affected by climate hazards.

Promote local participation in environmental management—Promoting community empowerment in local administration and planning for development will better ensure village livelihoods. Development planners may also draw on local knowledge when managing natural resources such as wetlands, water, and soil. IUCN is currently implementing a valuable community fish monitoring program that works with locals to identify the species in the Lower Songkram wetlands. Thailand aims to preserve and rehabilitate natural resources. For example, forest reserves should cover an area at least 25% of the country. By 2006, soil erosion reduction measures will be undertaken to address soil quality problems, such as acidity and salinity.

Improve agricultural productivity and training—Several villagers would welcome the opportunity to receive training in agriculture and livestock management. Research that increases productivity in the agricultural sector, for example on resilient crop varieties and other adaptive farming practices, should be shared through local institutes and agriculture extension services to enhance self-reliance and incomes of farmers. Support should also be given to developing technologies that improve water management in the dry Isaan region. The government is now aiming to expand irrigated areas with a four billion baht program involving 600 pumps. This is a joint program between the Agriculture and Cooperatives Ministry and the Energy Ministry. The government estimates that there are 60 million *rai* of irrigable land in Thailand, of which only 20 million is currently irrigated (Thongrungrung, 2003).

Enhance capacity for climate risk and vulnerability assessment—This local dialogue illustrated the enthusiasm among local organizations to build understanding of climate issues. An extensive planning stage strengthened linkages between partners and was very useful for defining the objectives of the study. In addition, pilot

tests on the methodology helped clarify questions and exercises. Currently, there is a great deal of information yet to discover on the Isaan region. While this study addressed a wide range of climate hazards, future assessments would benefit from by focusing on one or two types of hazards. This will promote a deeper understanding of vulnerability and coping mechanisms regarding those climate risks.

Thailand has devised promising policies to improve education and employment for people in the region. The successful implementation of these policies will greatly enhance the communities' resilience. The recommendations above target the factors that currently limit villagers' abilities to better prepare for and cope with floods and droughts. In the coming decades, the effective management of climate risks will support sustainable development and livelihoods in the Lower Songkram River Basin.

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ANNEX A: VULNERABILITY ASSESSMENT TEAM MEMBERS

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Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme

The Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBP) is a joint programme of the four riparian governments of the Lower Mekong Basin – Cambodia, Lao PDR, Thailand and Viet Nam – managed by the United Nations Development Programme (UNDP), the World Conservation Union (IUCN) and the Mekong River Commission (MRC), in collaboration with other key stakeholders. With funding from the Global Environment Facility (GEF), UNDP, the Royal Netherlands Government, MRCS, the Water and Nature Initiative (WANI) and other donors, the programme addresses the most critical issues for the conservation and sustainable use of natural resources in the Mekong wetlands. MWBP aims to strengthen the capacity of organisations and people to develop sustainable livelihoods and manage wetland biodiversity resources wisely. It is a five-year (2004-2009) intervention at three levels – regional, national and local – with demonstration wetland areas in each of the four countries: in the Songkhram river basin, Thailand; in Attapeu province in southern Lao PDR; in Stung Treng, Cambodia; and in the Plain of Reeds in the Mekong Delta, Viet Nam. The programme aims to:

- Improve coordination for wetland planning from regional to local levels
- Strengthen policy and economic environments for wetland conservation
- Generate and share information
- Train and build capacity for the wise use of wetlands
- Create alternative options for sustainable natural resource use and improve livelihoods

MWBP is a partnership between governments, aid agencies and NGOs, and provides a framework for complementary work for wetland conservation and sustainable livelihoods in the Lower Mekong Basin.

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VIET NAM



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