

# Assessment of Coping Strategies in the Coastal Zone of Cambodia



## Cambodia Climate Change Alliance (CCCA)

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## Acknowledgement

This report is part of the Coastal Adaptation and Resilience Planning Component (CARP) as initiated by the Cambodia Climate Change Alliance (CCCA). The objective of the CARP is to increase resilience of coastal communities and ecosystems to climate change through adaptation planning, demonstrated targeted local interventions and provision of practical learning experience in adaptation planning.

The report has been prepared by Mr. Torben Krab in cooperation with national consultants and project staff. The national team consisted of Ms. Sorn Somoline, Mr. Chea Leng and Mr. Meas Rithy.

The team would like to express their appreciation to the Ministry of Environment and the Department of Environment, Community and Commune Councils in Prey Nup and Peam Krasaop in Koh Kong and Sihanouk Provinces for a constructive dialog and support throughout the preparation of this report.

## Abbreviations and Acronymes

ADB	Asian Development Bank
AFD	Agence Française de Développement
CARP	Coastal Adaptation and Resilience Planning Component
CCCA	Cambodian Climate Change Alliance
CCD	Climate Change Department
CDP	Commune Development Plan
IUCN	International Union of Conservation of Nature
KAP-study	Understanding Public Perception of Climate Change in Cambodia study
MFI	Microfinance
MoE	Ministry of Environment
MoWRAM	Ministry of Water Resources and Meteorology
NAPA	National Adaptation Program of Actions to Climate Change
NCCC	National Climate Change Committee
RGC	Royal Government of Cambodia
SLR	Sea Level Rise

## Executive Summary

This report is an assessment of current coping strategies in the Coastal Adaptation and Resilience Planning Component's (CARP) target communities in relation to flooding, drought and other extreme events. The study has been carried out in the two target communities Prey Nup District in Sihanouk Province and Koh Kong District (Peam Krasaop) in Koh Kong Province. The report is based on existing literature and a comprehensive data collection in the two target communities conducted by this study.

There is a general consensus in existing literature that the coastal zone in Cambodia will be subjected to further impacts of climate change than it is today. The weather hazards such as drought, floods, seawater intrusion, pest on crops and others will stay the same, however the frequencies and intensity of these are predicted to increase in the future.

Both target communities in Koh Kong and Sihanouk Province experience these impacts of climate change as described in existing literature. These impacts influence villagers in the target communities in negative way in relation to economy, occupation and health.

Both target communities does have coping strategies in place, which supports them in overcoming the consequences of the impacts of climate change. These coping strategies are, however, based on a low technical capacity and limited institutional support, with the result that none of the coping strategies seems to be fully working in relation to their potential.

This report's data are in line with other existing literature in identifying a gap between villagers' perception and the technical definitions of climate change.

The assessment in this report identifies the lack of an organized system of information, providing information about weather hazards to and from the villagers in the target communities, as a key problem in ensuring the effectiveness of existing coping strategies. As part of the assessment in this report, recommendations are provided regarding how such a system of information should be developed, and what type of information it should be based upon.



## Introduction

The Royal Government of Cambodia has identified the coastal zone as a focal point in Cambodia's work to adapt to existing and coming impacts of climate change. Cambodia's coastal zone is threatened by impacts of climate change such as storms, surge, rise in sea levels and seawater intrusion.

This report provides an assessment of current coping strategies in the Coastal Adaptation and Resilience Planning Component's (CARP) target communities in relation to flooding, drought and extreme events. The objectives of the assessment have been formulated as objective 2.2 in the CARP. Furthermore, a brief assessment of the institutional capacity within the framework of the CARP has been conducted.

The objectives of the CARP are to build coastal zone adaptation capacity at national and provincial level and develop coastal adaptation plans through a practical learning-by-doing capacity building exercise involving all relevant stakeholders. The adaptation plans will then be translated into practical demonstration adaptation measures to be implemented in vulnerable communities in selected agricultural and mangrove areas.<sup>1</sup> In order to accomplish this, one of the first steps was to initiate the present assessment. The report will provide input to the CARP baseline on the three following themes:

- Present perception of the population living in the coastal zone on climate change
- Information being provided to the population in the coastal zone on climate change and weather hazards.
- Existing coping strategies implemented by the population in the coastal zone, and their effects in the coastal zone

In the next section it will be elaborated on each of these three themes.

Building an increased resilience to climate change through adaptation planning is dependent on integrating knowledge, information and tools into the existing livelihoods of the people residing in the coastal zone.

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<sup>1</sup> Cambodia Climate Change Alliance, "Coastal Adaptation and Resilience Planning Component", 2010, p. 34

## Methodology

The assessment has to a large extent been based on existing literature. However field research has also been conducted in order to present site-specific data on selected variables.

Since 2009, there have been a number of climate change studies carried out in Cambodia. This research has been used extensively in combination with the collected site-specific data.

## Target communities

The study has been carried out in two pre-selected target communities. The two locations are:

- **Prey Nup District, Sihanouk Province**
- **Koh Kong District (Peam Krasaop), Koh Kong Province**

As stated in the CARP, “Prey Nup and Koh Kong/Peam Krasaop districts were selected as pilot districts during consultations between the MoE, provincial and district authorities from the coast, the CCD and the national and international consultants. Their selection was based on the fact that both areas border the shoreline and largely consist of low-lying land, and consequently are highly vulnerable to SLR, storm surges, saltwater intrusion and tropical storms.”

Below is a brief presentation of the target communities.

### Prey Nup District, Sihanouk Province

Prey Nup district consists of 18,444 households with 93,141 people. This district is located in a particularly low-lying area with a total of 10,000 ha used for rice production, and protected by a dyke system. This dyke system was rehabilitated over a four-year period through funds from the French Development Agency, Agence Française de Développement (AFD).

Two examples of livelihood seasonal calendars for two villages in Prey Nup<sup>2</sup> are presented below. From the calendars it is possible to see how the livelihoods in the two villagers base their income during the different months of a year.

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<sup>2</sup> Adaptation Knowledge Platform, “Climate Change Adaptation: Finding the appropriate responses, Annex 1, Cambodia, 2011

Livelihood seasonal calendar for Ou Ta Sek village, Ou Okmha Heng,, Prey Nup District, Sihanouk Province

Livelihood	Monthly Calendar											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Agriculture based</b> - early & late rice - long bean - water melon - cucumber - gourd - cassava					←	→	←	→	←	→		
<b>Fisheries</b> - Freshwater - Marine	←	→	←	→	←	→	←	→	←	→	←	→
<b>Forestry</b> - Year round collection of what every they can – not for livelihood purposes												
<b>Animal husbandry</b> - Chicken - Duck - Pig, cow & buffalo	←	→	←	→	←	→	←	→	←	→	←	→
<b>Labor</b> - In community - garment worker, security guard	←	→	←	→	←	→	←	→	←	→	←	→
*Climate Pattern	Dry Season				Wet Season				Dry Season			

Livelihood seasonal calendar for Boek Krang Village, Prey Nup Commune, Prey Nup District, Sihanouk Province

Livelihood	Monthly Calendar											
	1	2	3	4	5	6	7	8	9	10	11	12
<b>Agriculture based</b> - Rice production					←	→	←	→	←	→		
<b>Fisheries</b> - Production/ harvesting					←	→	←	→	←	→	←	→
<b>Animal husbandry</b>	←	→	←	→	←	→	←	→	←	→	←	→
<b>Labor</b> - Construction and fisheries employee in dry the season - Garment worker	←	→	←	→	←	→	←	→	←	→	←	→
*Climate Pattern	Dry Season				Wet Season				Dry Season			

### Koh Kong District (Peam Krasaop), Koh Kong Province

According to the most recent information regarding communities in Peam Krasaop the number of families is 1,883, with a total population of 9,152 residents. Almost 95% of all villagers living in Peam Krasaop rely on fishing as their main source of livelihood. Following the efforts by the government to stop mangrove destruction in the sanctuary, many of the local people changed occupations to chicken and duck raising, harvesting crabs and snails, fishing, small-scale business, hunting, small speed boat operation, repairing boat and fishing gear, thatch weaving, fish processing, and repairing houses.<sup>3</sup>

Below is an example of a livelihood seasonal calendar of livelihoods in Peam Krasaop.<sup>4</sup> Compared to the seasonal calendars of the two villages in Prey Nup,

3 Cambodia Climate Change Alliance, "Coastal Adaptation and Resilience Planning Component", 2010, p. 23 - 24

4 Adaptation Knowledge Platform, "Climate Change Adaptation: Finding the appropriate responses, Annex 2, Cambodia, 2011



the village in Peam Krasaop to a larger extend base its income on fishery, as in line with the profile of the two target communities.

Livelihood seasonal calendar for Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province

Livelihood	Monthly Calendar											
	1	2	3	4	5	6	7	8	9	10	11	12
RICE CROP												
CROP (CHAMKAO) - Jackfruit, durian, water melon, cucumber, corn, pineapple, banana, cassava January to April – grow out for fruits, late August to December - harvest time												
SMALL SCALE HAND FISHING ALONG THE CANAL AND MANGROVE - Crab, shrimp, fish with small boat (Village does not have the capacity and ability to fish in the sea) - Use small amounts of nets and traps – better catch from January to March - Note that the more salt water in the canal the better the fishing												
ANIMAL HUSBANDRY - Chicken, pig, duck, cow January to March the streams and canals are dry, hence there is a high rate of animal death at this time, i.e. the dry season												
*Climate Pattern	Dry Season					Wet Season					Dry Season	
----- dotted line equals less activity												

## Clarification of terms

A brief clarification of two terms is necessary. These two terms are:

- Adaptation strategy
- Coping strategy

The reason for this clarification is that “adaptation” is a common term used in the climate change debate. However, it is often mistakenly used to describe individuals and households ability to cope with climate change, which can more correctly be defined as coping strategies.

In order to avoid any confusion, this section will discuss the two terms and how they are defined within climate change research.

## Adaptation strategies

Adaptation is being used to define a system’s ability to adjust to climate change – including climate variability and extremes. By *adjustment* is meant a system’s ability not only to moderate potential damages and consequences, but also to work with potential opportunities that may arise from climate change. Primarily a system’s means of adjustment are linked to adjusting national behaviour, use of resources and technologies.<sup>5</sup>

## Definition of a coping strategy

*Coping strategies* focuses on the micro level or more specifically the means by which people and organizations use available resources, and strengthen their capacity, in coping with the consequences of climate change.

<sup>5</sup> Intergovernmental Panel on Climate Change, “The Fourth Assessment Report of the Intergovernmental Panel on Climate Change”, 2007.

The important notion of the definition of a coping strategy is that the strategy should not only function during extreme or adverse conditions, it should also function during normal times. Consequently a coping strategy should be in place and function also prior to the occurrence of any weather hazards.<sup>6</sup>

Moreover, a sustainable coping strategy needs to be based on an informed basis of relevant data such as weather forecasts.

### Data collection

As mentioned previously, a significant body of research on climate change in Cambodia exists, and this data is essential to this report. However in selected target areas additional primary research was carried out in order to obtain data on selected indicators – indicators that will be elaborated on later. The data collection consists of quantitative and qualitative data. The data collection consisted of four elements:

- Questionnaire at village level
- Group Discussion at Commune Committee level
- Group Discussion at Commune Council level
- Questionnaire at Commune Council level

### Questionnaire

First part of the data collection was based on a 5 page questionnaire (see annex 1). The questionnaire was completed through a face-to-face interview.

The questionnaire used was based on the following three themes.

#### *Perception:*

Research has shown that people's perception on climate change is directly linked to their ability to distinguish between effective and ineffective climate change responses.<sup>7</sup> Thus as stated in the section "Clarification of terms" a sustainable coping strategy must be developed and conducted on an informed background. In order to have such an informed background it is important to ensure that peoples' perception of climate change is in accordance with the technical definition of climate change. Otherwise there is a risk of a miscommunication between the technical elements of the CARP and the target communities. Such a miscommunication will in the long-term lead to mal-adaptation.

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<sup>6</sup> UNISDR, "UNISDR Terminology on Disaster Risk Reduction", p 8, 2009

<sup>7</sup> Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p 1, 2011

*Information:*

A coping strategy must be based on an informed background. However, studies have shown that Cambodians often lack information when weather hazards occur, and consequently having limited possibilities to develop effective coping strategies.

Secondly if information is intended to create knowledge, then this information has to be based on the existing perception on climate change. Thus it is important to understand the link between the perception of the target communities and the manner in which the target communities are informed about climate change.

*Coping strategies*

This theme is to understand if target communities have developed any coping strategies regardless of whether they are effective or not.

Considering this third theme is crucial, as this report aims to elaborate on coping strategies. Secondly, this theme will support the analysis of the concordance between villagers' perception on climate change and the technical definition, by providing data on the villagers' perception of what constitute a coping strategy.

The term "coping strategies" has been extended in its definition compared to the more theoretical definition as presented in the section "Clarification of terms". In the data collection it is the respondents perception of what constitutes a coping strategy. The respondent's perception may not be in concordance with the theoretical definition of the term. This will be analysed on later in the report.

**Group discussions and questionnaire**

The second part of the data collection consisted of two types of group discussions. The purpose of this part was to enter into a more reflected discussion on the specific weather hazards that have occurred in the target communities.

Both group discussions were done through a facilitated process; one consisting of community committee members and the other for the commune councils in the target communities.

For the community committee group discussion a matrix has been developed. This matrix summarizes the outcomes of the group discussion. All the matrices conducted can be found in Annex 2.

For the commune council a group discussion based on a questionnaire was conducted. Furthermore, each member of the commune council answered a questionnaire giving a score to the asked questions. Both of these documents can be found in Annex 1.

## Limitation

There are a number of limitations to this report mainly in relation to the data collection.

Climate change is a concept based on very technical definitions, and due to this technical terminology there can be an issue of understanding when going into remote areas and collect data. Thus a simplification of terminology was necessary in order to carry out the research in the field. However, this creates a validity issue in analysing the data in relation to the more technical climate change data.

“Perception on climate change” is an important concept in this report. It is a concept used and analysed in other literature as well. However, there is no definition of what constitutes a well-founded perception on climate change and what technically is just an awareness of weather patterns. Or to put it in another way, how much awareness of weather patterns constitutes a well-founded perception on climate change? This question is not something that the existing literature gives a well-defined answer to. Because of this lack of a well-defined answer it has an impact on the validity of conducting a comparative study on public perception on climate change.

In conducting field research during daytime in the coastal zone, the research has a natural bias based on gender. Men are often at sea or in the field working during daytime and thus not available for interviews and so on. This means that there is not an equal gender split in the respondents used in the data collection. . There are methods to overcome this bias, but it is not within this report’s scope to apply such methods. A general method for overcoming this bias is to compensate chosen respondents ensuring they will stay in their households, while the data is collected, instead of going to sea or in the fields. Furthermore it requires a certain time frame to organize. As a short-term consultancy it was not within the budget or time frame to apply this method. This bias does have certain impacts on the data collected. As the respondents of the questionnaire are villagers who stays and works around the households, this is also the perspective that in general is being represented in the data collected. This however is to some extent made up by the group discussion of the community committee. The members of the community committees are mostly men working outside the households. However for this report it was organized so the members of the community committees was attending the before mentioned group discussion.

The data collected for this report is quite extensive and has been used to create a fairly extensive database. It has not been within the scope of this study to analyse every detail of the data. Rather the focus has been on carrying out the detailed assessment using data retrieved from the database.

## The coastal zone

Cambodia's coastal zone consists of four provinces: Kampot, Koh Kong, Sihanouk and Kep. The total area covered by these provinces is an estimated 17,237 km<sup>2</sup>. The coastal shoreline is 435 km and runs along the Gulf of Thailand. Along the coastline there is one deep seaport located in Sihanoukville, which is considered to be one of the economic centres in Cambodia.<sup>8</sup>

The coastal zone's climate is defined as tropic monsoon with an annual rainfall between 2000 and 4000 mm. This amount of rainfall is higher than other areas of Cambodia.<sup>9</sup>

The coastal zone has access to substantial sources of fresh water from river streams, rivers and lakes that run in the area. Despite these sources of fresh water, the lack of freshwater is a problem in the area.

During rainy season the rivers, streams and lake flood due to the amount of rain, and in the process destroying crops in low lying areas. In the dry season, the downstream river water is getting mixed with salty seawater, making the water unsuitable for irrigation purpose.<sup>10</sup>

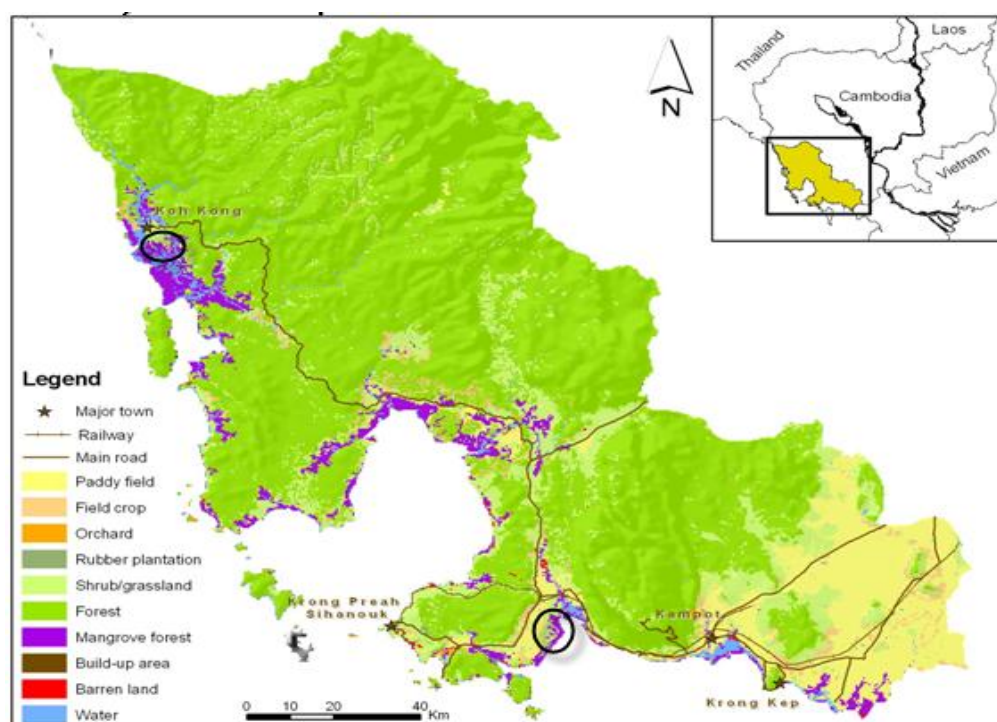


Figure 1: Land Uses in the Coastal Zone.

<sup>8</sup> 3/2-2012, <http://www.wepa-db.net/policies/state/cambodia/seaarea.htm>

<sup>9</sup> IBID

<sup>10</sup> Cambodia Climate Change Alliance, "Coastal Adaptation and Resilience Planning Component", 2010, p. 16

The coastal zone has two major types of natural resources: forest and sea grass beds.

### *Forests*

The vast majority of the area in the coastal zone is covered by forest. The highest forest cover occurs in the Koh Kong province (83% or 1,002,721 ha), followed by the Sihanouk Province (54% or 81,539 ha) and then Kampot province (48% or 224,730 ha). The lowest forest cover is found in the Kep province (21% or 3,733 ha). From 1993 to 2005 the area in the coastal zone covered by forests has declined from 84% to 71% - mainly due to agricultural production.<sup>11</sup>

In 2005, 55,419 ha along the coastline were covered with mangrove forests. The mangrove forests with their ecosystems are essential for the coastal zone for two reasons. Firstly, the mangrove forests have a vital role in the survival of a numerous fish species and other marine organisms. Secondly, the mangrove forests act as the frontline against tropical storms, storm surges and rises in the sea level, thereby reducing coastal erosion and inundation by creating a buffer zone in protecting the coastal zone. Despite its above-mentioned vital role for the coastal zone, some studies estimate that between 1993 and 2005 a decline of 25 % of the mangrove forests has taken place. This decline is mainly due to the illegal use of mangroves for firewood and for charcoal production. Other causes include clearing of forests in for land reclamation, the establishment of salt pans and intensive shrimp aquaculture are also playing a critical role in the decline of mangrove forests.<sup>12</sup>

### *Sea grass*

Cambodia's coastal zone has large areas of sea grass. At the coastline 8 different species of sea grass can be found. The sea grass function as habitat for juvenile fish, hereby serving as the nursing ground for many different species of fish including crustaceans and invertebrates.

The sea grass is under pressure from degradation of water quality due to logging, sand mining and costal reclamation activities. Furthermore destructive fishing practices also have a negative impact on the extent of sea grass along the coastline.<sup>13</sup>

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11 Cambodia Climate Change Alliance, "Coastal Adaptation and Resilience Planning Component", 2010, p. 14

12 IBID, 2010, p. 15

13 IBID, 2010, p. 15 - 16



## Climate Change in Cambodia

In order to assess coping strategies to climate change in the coastal communities, it is essential first to understand what these communities have to cope with.

Cambodia is not a country that is highly exposed when it comes to climate change compared to other countries in the region such as Vietnam and the Philippines. However, Cambodia is ranked as one of the most vulnerable countries to climate change in the world (9th rank World Risk Index 2011 Vulnerability ranking catastrophes and natural disasters, 6th rank Maplecroft Climate Change Vulnerability Index 2012).<sup>14</sup> Cambodia's vulnerability is based on a low level of infrastructure, a very low level of capacity in adapting to climate change effects, and that a large part of the population work as farmers in remote areas.

Cambodia with its monsoon climate is heavily dependent on the rainy season from May to November and the seasonal flooding of the Mekong River and Tonle Sap Lake. Both these factors have become increasingly unreliable in its coming and in its intensity.<sup>15</sup>

The mean annual temperatures in Cambodia are projected to increase by 0.7-2.7<sup>0</sup> by the 2060s.<sup>16</sup>

### The Coastal zone

One of the most vulnerable areas in Cambodia in terms of climate change is the coastal zone. Among other things the coastal zone is subject to a rise in sea levels. Studies indicate that if the coastal zone experience a rise in sea level by 1 m, 0,4% of the total area of the Koh Kong Province will be permanently under water,<sup>17</sup> with climate projections stating that Cambodia can experience a sea level rise of 0.18 to 0.56 m by the 2090s.<sup>18</sup> This threat should be understood in relation to another key environmental problem in the coastal zone. The coastal zone has experienced a decline in the area covered with mangrove forests due to deforestation and a more general decline in its biodiversity on the coastal zone – a decline in biodiversity that can lead to natural decline in the mangrove forest. All this combined with an increase in the frequency and intensity of storms and storm surges has led to more coastal inundation.<sup>19</sup> This coastal inundation has dramatic effects for the communities along the coastal line. One consequence is

14 2/2-2012, <http://www.businessinsider.com/climate-change-vulnerability-2011-10>

15 25/2-2012, [http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country\\_profile](http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile)

16 25/2-2012, [http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country\\_profile](http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile)

17 Cambodia National Mekong Committee, "The state of climate change management in Cambodia", 2010, p. 7

18 17/2-2012, <http://www.thegef.org/gef/sites/thegef.org/files/documents/document/2-7-11%20-%20Webposting.pdf>

19 2/2012, <http://www.sida.se/Global/Countries%20and%20regions/Asia%20incl.%20Middle%20East/Cambodia/Environmental%20Policy%20Brief%20Cambodia.pdf>

the salinization of the surface and the groundwater, which has a severe impact on the fertility of the areas used for farming, and on ecosystems based on fresh water.

Furthermore, most agriculture in the coastal zone is concentrated in low-lying coastal areas; hence the food security in the region could be threatened. Furthermore, the infrastructure in the coastal zone is under pressure from impacts of climate change, which can lead to an increased vulnerability over time and loss in income from tourism.<sup>20</sup>

Other threats from climate change in the coastal zone are:<sup>21</sup>

- An increase in rainfall of 2 to 6 % by 2050, which will lead to more flooding.
- More heavy rainfall during a short period of time.
- An increase in mean annual temperatures of 0.7 to 2.7 degrees by 2060 and 1.4 to 4.3 degrees by the 2090s, which will lead to more droughts.

### Institutional framework

In order to be able to adapt to the impacts of climate change, a certain institutional capacity is required. This capacity includes not only coping strategies enacted by villagers in the target areas, but also adaptation strategies that are integrated at all levels in the Cambodian society.

*The National Climate Change Committee (NCCC)*, which was established in April 2006 as an inter-ministerial mechanism, has as mandate to prepare, coordinate and monitor the implementation of policies, strategies, legal instruments, plans and program of Cambodia in relation to climate change. The Cambodian Prime Minister H.E. Hun Sen acts as the honorary chairman of NCCC; a fact that testifies to the political leverage that the NCCC has. The NCCC is composed of Secretaries from 19 Ministries, and Under-Secretaries from State and government agencies.<sup>22</sup>

Beside the NCCC, the following 3 ministries have the main responsibilities related to climate change, natural resources and coastal ecosystem management and development:

- **Ministry of Environment (MoE)** was established in 1993 and is responsible for environmental protection and natural resources management in the country. MoE is also responsible for Climate Change and the Climate Change Department in MoE functions as the secretariat for the NCCC. In relation to the coastal zone the MoE has a mandate to

<sup>20</sup> 17/2-2012, <http://weadapt.org/knowledge-base/vulnerability/Cambodia>

<sup>21</sup> 17/2-2012, IBID

<sup>22</sup> Royal Cambodian Government, "Sub-decree on The Establishment of The National Climate Change Committee", 2006

coordinate coastal environmental management and development activities in the coastal zone according to a decision letter signed by the Prime Minister.

- **Ministry of Agriculture, Forestry and Fisheries (MAFF)** has the mandate for the management of all activities related to fisheries, including artisanal fisheries, mangroves, sea grass and industrial fisheries. In practice, the ministry has the responsibility for day-to-day management of most of the coastal resources, without the general coordinating mandate for overall environmental management.
- **Ministry of Water Resources and Meteorology (MoWRAM)** has the responsibility for managing all activities related to water and meteorology development and natural disasters. MoWRAM has signed a Memorandum of Understanding (MoU) regarding the sharing of responsibility for the Prey Nup polder management with Sihanouk provincial authority and the farmer water user's community of Prey Nup polders.

Other government agencies involved with climate change are:

- **Ministry of Land Management, Urban Planning and Construction (MLMUPC)** has responsibility for formulation of development plans and land use plans on the national and local levels.
- **The National Committee for Disaster Management (NCDM)** was established in 1995 and is an inter-ministerial body chaired by the Prime Minister. NCDM plays a key role in disaster management, working both on disaster risk reduction/prevention and response preparedness.
- **Ministry of Industry, Mines and Energy (MIME)** is responsible for planning industrial water uses and hydropower, water supply provision to provincial towns and administration of single-purpose schemes involving hydro-power.
- **Ministry of Public Works and Transportation (MPWT)** is responsible for construction of roads, infrastructure e.g. bridges and ports.
- **Ministry of Rural Development (MRD)** is responsible for small-scale water supply to households (drilling well, digging well, and pond), primary health care, small-scale infrastructure (road, bridge, culvert, etc.)

## Policy framework

The National Adaptation Program for Action to Climate Change (NAPA) acts as the political framework for NCCC. The NAPA was developed following a process of gathering information about climate change impacts in Cambodia in order to prioritize adaptation needs in the country, and to create synergies to other environmental and development programs.<sup>23</sup>

The Cambodia NAPA identified the following objectives:<sup>24</sup>

- To understand the characteristics of climate hazards in Cambodia
- To understand coping mechanisms to climate hazards and climate change at the grassroots level

<sup>23</sup> Royal Cambodian Government, "National Adaptation Programme of Actions taken to Climate Change", 2006, p. i

<sup>24</sup> IBID, 2006, p. 1-2

- To understand existing programs and institutional arrangements for addressing climate hazards and climate change.
- To identify and prioritize adaptation activities to climate hazards and climate change

Beside the NAPA a national strategic action plan for climate change is under preparation by the MoE.<sup>25</sup>

Furthermore the Provincial Environmental Management Plan covering 2011-2015 is being finalized, but has not yet been approved. However, it is expected that this plan will have climate change as an integrated theme, and serving as an important policy framework for climate change adaptation strategies.

### **Cambodia's Perception on Climate Change**

A number of studies regarding the topic of "perception of climate change" have already been carried out in Cambodia. The most comprehensive of these is the study *Understanding Public Perception of Climate Change in Cambodia* (KAP-study) by Oxfam America. The data from this study and others are also used in the present report.

From one of the first perception studies on climate change in Cambodia the Danish NGO DanChurchAid found that in order to study this topic, a change in terminology had to be introduced. Instead of the technical term "climate change" the term "a change in weather patterns" was applied when gathering data on this topic.

As mentioned in the Methodology section, it is essential when implementing climate change projects to understand people's perception of climate change. However, this perception should not only include that of climate change events, but also in relation to the terminology used when discussing climate change.

Based on the aforementioned studies, there is a consensus on the topic of public perception of climate change in Cambodia. In general, Cambodians have a poor understanding of the scientific basis for climate change; however, studies have also shown that the vast majority of Cambodians recognizes the term "climate change".<sup>26</sup>

Due to this poor understanding of the scientific basis for climate change, studies instead used the term "changes in weather patterns", when studying public perception on climate change in Cambodia. This however raises an issue of what is meant by the term "changes in weather patterns"? Instead of a clear defined theoretical term it is more a term based on the individual perception of the term

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<sup>25</sup> UN-HABITAT, "Vulnerability Assessment", 2011, p 2

<sup>26</sup> Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p 19, 2011

by the respondents and the researcher, which creates the same validity issue of analyzing perception as discussed in the section "Limitation".

The vast majority of Cambodians have an understanding that a change in the weather patterns have occurred in Cambodia. As consequences of these changes Cambodians experience an increase in extreme weather events, with droughts, high temperatures and very heavy rains as the three main weather hazards.<sup>27</sup>

A substantial proportion of the respondents living in coastal fishing communities have experienced coastal erosion and higher tides and waves in recent years. Cambodians feels these changes in weather patterns have had a negative impact in their ability to improve their daily living.<sup>28</sup>

Furthermore, it is in relation to these local impacts of climate change they perceive the term, rather than in relation to the global causes.<sup>29</sup> When asked in the KAP study about the causes of climate change, of those who answered that they were familiar with the term, only around 15% mentioned industrialization as a cause, in contrast to deforestation, where 57% saw this as a cause.<sup>30</sup> Based on this and other answers in the KAP-study, the study concluded that the respondents tend to define the term in relation to localized weather events and local changes in natural resources rather than national and international impacts and causes.

### **Information on climate change.**

As defined previously, an adequate and sustainable coping strategy regarding climate change needs to be based on sound information. However, the information on climate change reaching the public is generally limited. Furthermore, in the information provided to the public there tends to be a gap between the public's perception on climate change terminology and the more technical defined terminology used by climate change experts and government officials.<sup>31</sup>

For the same reason a substantial amount of literature on climate change in Cambodia also focus on this issue. Again a broad consensus exists in the literature as in the KAP<sup>32</sup>. There is serious lack of formal information from Cambodian authorities regarding weather hazards and also in a broader sense on climate change. Existing research has shown that, of those respondents who experienced extreme weather, 36% did not receive any information about the

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27 Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p. 12, 2011

28 IBID, p. 29, 2011

29 IBID p 20, 2011

30 IBID, p. 20, 2011

31 IBID, p. 2, 2011

32 IBID, p. 15, 2011

weather event, and only 25% of those who did, received the information prior to the event occurring.<sup>33</sup>

Most information given to affected areas is being provided through informal channels (mouth-to-mouth) and radio and television. The national KAP-study showed that only 3% of the respondents indicated that they got information on climate change from the authorities (including commune council and village chief). On the other hand 50% indicated that they have received information on climate change from neighbours, 58% from radio and 62% from television<sup>34</sup>.

### **Coping strategies in Koh Kong and Sihanoukville**

The Adaptation Knowledge Platform has conducted a study similar to the present in 2010 in the two target communities (Prey Nup and Peam Krasaop). Due to the similarities in the scope of research, a summary of the research from The Adaptation Knowledge Platform has been given below. The village of Stung Veng is not a target community of the CARP, however, the data is still interesting for understanding the situation in the area.

The report *Climate Change Adaptation: Finding the appropriate responses* from the Adaptation Knowledge Platform is based on 6 participatory tools of research, all of which have been applied in each of the two communities.

It is recommended to review the report from the Adaptation Knowledge Platform. The report can be downloaded at the following link:  
<http://www.climateadapt.asia/resources/publication/view/60>

Special emphasis should be given to Annex 1 & 2.

#### **Koh Kong - Peam Krasaop & Toul Koki Commune**

The communities in Peam Krasaop and Toul Koki have experienced environmental changes over time that is in accordance with the literature: some of these changes are:

- Increase in coastal storms
- Drought due to less rain in the rainy season
- Seawater intrusion
- Decrease in marine life
- Well water/ground water no longer drinkable

Among other things, these changes have resulted in larger expenditures for drinking water for the villagers and consequently less money available for expanding livelihoods.

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<sup>33</sup> Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p 13, 2011

<sup>34</sup> IBID p 21, 2011



Livelihoods have moved to marine collection from farming, increasing the pressure on the natural resources. The pressure on marine life has also resulted in increased expenses for fishing gear, e.g. in Stung Veng village where they have increased their fishing nets by a factor of two, and their traps for crabs by a factor of 5.

Besides discussing the environmental changes over time, the report also looks into the communities' perception on changes in the ecosystem, what the causes are and what coping strategies are in place. This perception of changes is discussed below.

### ***Peam Krasaop Commune***

For Peam Krasaop the villagers' perception of the changes to the eco-systems is that they have experienced a decline in marine life. The villagers mention as a cause that the law prohibiting fishing from "outsiders" is not being enforced, causing an unsustainable pressure on the marine life. Furthermore, sand dredging is also mentioned as a cause of changes to the eco-systems.

The villagers feel an improvement has occurred in the enforcement of protecting the mangrove forests. However, the negative effect of this enforcement is that they cannot hunt monkeys, thus losing one possible food source.

Because the village of Stung Veng was relocated from an island to the main land, the villagers now have the possibility of backyard farming, hereby enabling them to grow fruits and vegetables. However, the absence of fresh water limits the productivity of this backyard farming.

A very positive change for the villagers is the expansion of eco-tourism. Due to an increased awareness of the possibilities in tourism, the villagers have organized themselves in a way so that tourism now is an alternative source of income for the villagers, whereas before the villagers had to migrate in order to find alternative sources of income.

In Peam Krasoap the villagers have a number of coping strategies in case of different weather hazards. In Stung Veng village they have started to build lower houses, so there is less damage when storms occur. For the same reason trees have been planted to protect the houses, and to have a cooling effect during the increasing numbers of very warm days. Furthermore, dikes have been built to protect the village against floods; however, the dikes are not high enough to protect against the more severe floods

### ***Toul Koki Commune***

The Toul Koki commune is located further inland than Peam Krasaop, and the villagers in Tachat Village experiences a severe decline in their access to fresh water, due to the drying out of fresh water sources on a yearly basis.

This decline has a number of consequences. According to the villagers, the marine life in the fresh water sources has dramatically decreased, due to the fact that fresh water-marine water cycles are no longer regular. The water cycle now has shortened the fresh water period as a result of more frequent droughts. The villagers perceive the decrease in fresh water as a consequence of deforestation in the area near the lake and fresh water streams.

For Tachat Village the mangrove forest has been subjected to mass deforestation due to forest concessions being provided to companies. The villagers have, however, themselves also taken part in deforestation of the mangrove forests, as part of their production of charcoal. Furthermore, the villagers use the slash and burn technique in order to create land for agriculture.

In order to cope with more frequent weather hazards Tachat Village has with financial support through microfinance loans built artificial ponds in order to secure water for crops and animals during droughts. In the case of soil erosion during the wet season the villagers, due to training in agriculture technology, have started to use chemical fertilizers and pesticides in order to boost crop production. Furthermore, the villagers have also started to fish in order to make up for shortfall in food.

#### **Sihanoukville – Prey Nup & Ou Oknha Heng Commune**

The communes of Prey Nup and Ou Oknha Heng have as in Koh Kong experienced a number of environmental changes over time, some of these are:

- Extended wet season
- Intensified storms during the wet season
- Livestock health problems due to intensified heat
- Ecosystem contribute less to food security
- Decrease in soil fertility

As a consequence of these impacts, farmers have been forced to increase the use of pesticides, herbicides and chemical fertilizers. Another change is that farmers have been forced to change to other natural resources for extraction.

The pressure on marine fish continues at an unsustainable rate.

The lake has also come under increased pressure from a growing number of households trying to substitute their losses by fishing in the lake. Villagers also indicate that an added consequence is that there is now less solidarity in the commune due to increased competition for resources.

None of the villagers have participated in any development activities in the area.

***Prey Nup Commune***

The village Boek Krang in Prey Nup Commune have a number of different coping strategies in place. In the case of flooding, which happens 2 to 3 times per year, the villagers open gates in the dikes in order to lower the level of the flooding. This, however, has a negative impact on the water volume for agriculture.

The villagers are aware of the health risks involved with a flooding. Thus after a flooding has occurred the villager make sure of cleaning the surroundings immediately after the flooding.

None of the above-mentioned strategies are by the villagers seen as sustainable coping strategies, and they still encounter a loss when flooding occurs.

## Data collection

As mentioned earlier beside the literature review this report is also based on a data collection in Koh Kong and Sihanouk Provinces. This section will present the data collected.

### Koh Kong

In Koh Kong data was collected in the districts of Peam Krasaop, Mondul Seyma and Toul Koki. A total of 114 questionnaires were collected by interviewing respondents and then entered into a spread sheet. Four group discussions with commune committees and equally four group discussions with commune councils were conducted. The data was collected in the 6 villages of Bong Krayak, Konh Kang, Peam Krasaop (village 1 and village 2), Toul Koki and Ta Chart.

### Questionnaire

Of the 114 respondents, 66 were women and 48 men.

The reason for the majority of women was respondents is because that many of the men were busy in the rice fields or at sea, while the data were collected during daytime, as elaborated on the section "Limitation".

67 % of the respondents had their livelihoods' based on fishing and with only 18% based on farming. The rest was occupied in different areas such as shop owners, tailors and other. These numbers of occupation was to be expected based on the profile of the target community, which as elaborated on earlier describe the community as mainly based on fishermen.

It should be noted that the categories "Farmer" and "Fishermen" both included small-scale backyard farming and small-scale fishing. Thus some of the respondents perceive themselves as being occupied in both categories.

7% of the respondents were women-lead households

In the questionnaire the respondents were also asked to list their daily income during wet and dry season. This was asked in order to analyze on whether income can be seen as a factor in the respondent's ability to cope to the impacts of climate change. The respondents income was categorized as follows.

**Daily income during wet season:**

12 respondents = 1000 – 5000 Riel

38 respondents = 5000 – 10.000 Riel

29 respondents = 10.000 - \_\_\_\_\_ Riel

16 respondents = No answer

Base: all respondents

**Daily income during dry season:**

4 respondents = 1000 – 5000 Riel

22 respondents = 5000 – 10.000 Riel

49 respondents = 10.000 - \_\_\_\_\_ Riel

4 respondents = No answer

Base: all respondents

Overall these numbers indicate that the respondents have a higher income during the dry season. Based on the data it is not valid to go into a further analysis why this seems to be the case. However one valid notion can be made, that the dry season is also the high season for tourism in Peam Krasaop, thus generating an income opportunity for the community.

***Perception***

In general, the data collected as part of the theme “Perception” is in accordance with other observations on the subject. However, it needs to be taken into account that there exist a natural difference in answers from a coastal community and an inland community, due to the differences in the eco-system that surrounds them.

97% of the respondents answered to question 1 that they have noticed a change in the weather patterns over the last 5 years.

Of the perceived consequences of these weather changes, the answers of the respondents were divided into the following categories:

### Question 2 in "Perception on Climate Change"

"If yes (question 1), what consequences has the change had?"

• Change in rainfall	84%
• Changes in temperatures	54%
• More drought	16%
• More flooding	27%
• More storms	74%
• More seawater intrusion	86%
• Pest on agriculture	24%
Base = All respondents	Multiple answers possible

The answers testify to what can be expected of a coastal community in Cambodia. Comparing this data to that of the nationwide KAP-study "Understanding Public Perception of Climate Change in Cambodia", it is clear that a coastal community perceive consequences of the weather changes somewhat different from the public nationwide. An example is the category "More drought" where only 16 % perceived that to be a consequence in Koh Kong, with 36% answering "More drought" in the KAP-study.<sup>35</sup> Again this could be expected as natural difference between an inland and coastal community

The respondents were also asked if the changes in weather patterns have had any negative impact on their livelihoods. A consensus existed in the answers given.

### Question 3 "Perception on Climate Change"

"Has these consequences had an impact on your livelihood?"

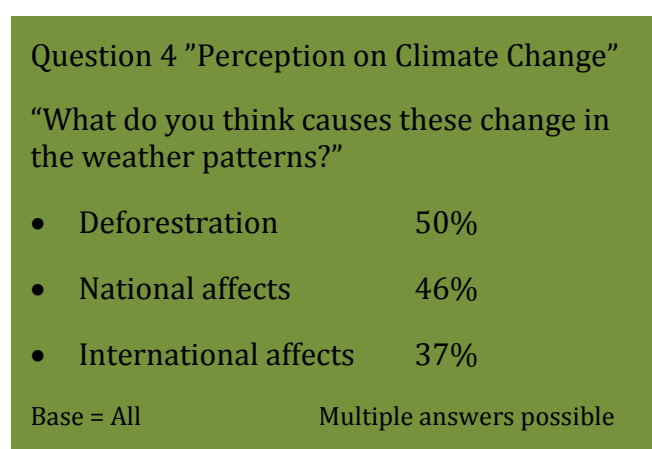
• Occupation	76%
• Income	88 %
• Health	61%
Base = All respondents	multiple answers possible

<sup>35</sup> Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p 26, 2011

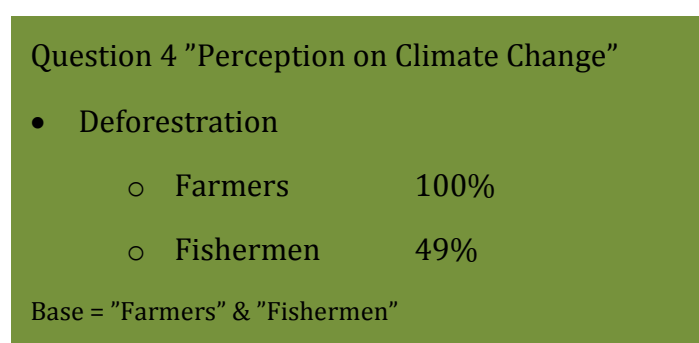


These responses leave no doubt that the respondents perceive the changes in weather patterns as a negative influence on their life.

In understanding public perception to climate change in Cambodia, a conclusion has been that people perceive climate change in relation to local changes or impacts. The public does not have an understanding of climate change as a global phenomenon when it comes to causes and effects. This is also supported by the data collection in Koh Kong. In response to the question of what the respondents perceived as the main causes for the changes in the weather patterns, the answers were given as follows:



Interestingly if the base of data of those who answered "Deforestation" is being sub-divided into categories of occupation, the trend is further emphasised.



This could be explained that farmers relate to the changes in their local working environment – the rice fields and their surroundings.

Additionally many of the fishermen respondents mentioned sand extraction as a cause of change. Again this could be explained that the fishermen are witnessing the sand extraction along the coastline.

In general sand extraction is a concern by many of the respondents in Koh Kong, also to an extent that the data from the questionnaire does not fully reflect; due to the way the questionnaire was organized. When the questionnaire was developed it did not specifically integrate the topic of sand extraction, because this is not perceived to be a cause to climate change. Thus the topic had to be raised on the initiative of the respondents themselves, which could be argued of creating a bias for the issues included in the questionnaire.

### **Information**

When it comes to the term “climate change”, 71% of the respondents indicated that they have heard the term before. This figure is a bit lower compared to the figure in the KAP study where it was 84%.<sup>36</sup>

This figure is relatively high, since only 25% of the respondents have participated in an awareness-raising event in the communities.

The data indicates that climate change is a topic that in general is a part of the awareness of villagers in Koh Kong.

When dividing the data into “male” and “female” the following numbers are obtained:

Question 2A "Information"	
Have you participated in awareness-raising activities?	
Female (yes)	Men (yes)
21	8
32%	17%
Base: All respondents	

With only 17% of the male respondents having participated in an awareness-raising event compared to 32 % of the women. The data indicates that any awareness-raising event has to give emphasis in getting men to participate. This of course is difficult due to the fact many of the men in the communities are either at sea or in the rice-fields. However, there are ways to overcome this issue as previous discussed.

Furthermore, these two numbers for men and female should be seen as fairly low, when it is taken into account that these target communities have been subject to previous climate change activities.

<sup>36</sup> Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p 19, 2011



That a gap exists in information-sharing in relation to climate change going from the Cambodian authorities to the communities in the coastal zone is further supported by the data from question 6.

#### Question 6 "Information"

"Do you know about the work of the government on climate change adaptation?"

Yes	No
22%	76%

Base: All respondents

### *Coping strategies*

The final theme of the questionnaire is *Coping strategies*, as mentioned in the section "Methodology", it is the respondent's perception on what constitute a coping strategy. This perception is not necessarily in accordance with the technical definition of a coping strategy.

When asked what kind of weather hazards the respondents are able to cope to, the answers were given as a response to the ability to cope:

#### Question 1 "Coping strategies"

"In the case of the following weather hazards, do you have the ability to cope when they occur?"

• Droughts	6%
• Flooding	15%
• Storms	31%
• Seawater intrusion	25%
• Pest on agriculture production	8%
• None	4%

Base: All respondents

Multiple answers possible

This data of course needs to be understood in relation to question 2 in "Perception on climate change", of which weather hazards are more frequent than others.

One also needs to take into account the complexity of the weather hazard the respondents needs to cope with. For a fisherman it is not too complex to cope with a storm. As long as you are informed about a storm is going to occur, you can stay on land. On the other hand a farmer, who experiences a seawater intrusion in his rice field, has a more complex situation to cope with.

The figures are slightly more positive compared to data collected in the KAP study.<sup>37</sup>

As presented earlier the respondents were asked to list their daily income during wet and dry season. This was asked in order to analyze on whether income can be seen as a factor in the respondent's ability to cope with the impacts of climate change.

In dividing the respondents into these income categories, the following data can be generated. The data has been extracted from the category "wet season".

Question 1 "Coping strategies"			
Income category, wet season			
"In the case of the following weather hazards, do you have the ability to cope when they occur?"			
	1000-5000 Riel	5000 - 10.000 Riel	10.000 - _____ Riel
Droughts	8 %	11 %	5 %
Floods	33 %	29 %	40 %
Storms	48 %	55 %	67 %
Seawater intusion	58 %	45 %	67 %
Pest on agriculture production	0 %	34 %	16 %
Base: Respondents	12	38	37
Multiple answers possible			

37 Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p 36, 2011

The data does not provide a clear indication of the relation between the level of household income and the ability to cope with the listed weather hazards. If one was to make a conclusion, it was that the higher income the respondents have the more they perceive themselves as having the ability to cope. This conclusion is based on the sum of the figures in each income category, which gives the following score.

Income category	1000-5000 Riel	5000-10.000 Riel	10.000 - ____ Riel
Sum	147	174	195

However since the base of respondents is not large, e.g. the income category is based on 12 respondents it is difficult to make valid conclusions.

In elaborating on these coping strategies the respondents mention some of the following as coping strategies:

#### Question1 "Elaboration", "Coping Strategies"

In the case of the following weather hazards, do you have the ability to cope when they occur (if yes please elaborate)?

- Build small dikes around the household.
- Buy fresh water.
- Go to the mountain behind the village as a safe place.
- Digging a pond
- Prepare boat for evacuation
- Use chemical fertilizer to prevent pest from attacking the crops

Base: All respondents

The coping strategies are all despite the use of chemicals, strategies that does not require a high level of technical capacities, but instead the result of what means that are available to the villagers. These coping strategies will be discussed in more detail in the presentation of the group discussion with the community committees.

However these coping strategies cannot mitigate households from experiencing an economic loss. This is indicated in the responses to question 3:

### Question 3 "Coping strategies"

"In the case of the last weather hazard, did it give your household a loss?"

Yes	No
54%	23%

Base: All respondents

### Group Discussions – Community Committees - Peam Krasaop

The above presentation of data from the questionnaire gives an overall understanding of trends in the target communities within the three themes of the questionnaire. However, the questionnaire does not offer a more detailed reflection on existing coping strategies in the communities. In order to get such reflections, a group discussion with a focus on coping strategies was conducted with the Community Committees in the two communes Peam Krasaop and Toul Koki. The group discussions as mentioned in the section Methodology were based on a matrix, which was discussed and elaborated on.

The group discussion was structured based on types of weather hazards. This section presents the main results from the matrices of the group discussions.

However, it is recommended that the reader go through the matrices in the appendix, since some of the matrices hold additional data.

### *Peam Krasaop Community Committee*

As can be seen in the annex the matrix was organized based of different types of weather hazards, which was discussed in relation to a number of topics. The following is a summary of the main and most important findings from the group discussion of Peam Krasoap Community Committee.

#### *Drought:*

In relation to advance actions prior to droughts the community committee focus on the following areas: (1) To ensure water sources for the community by building basins to store drinking water for the community. (2) Prepare medicine for the community both in relations to humans and animals, (3) to ensure preparedness in the case of forest fire.

The community committee is fully aware of the risk of sickness among animals during a drought, and have methods for ensuring that if an animal gets sick, then it is burned immediately in order to prevent the sickness to spread.



The community committee has a budget, which they seek funding for from district authorities to be used in the case of a drought. The budget includes buying medicine and trees for planting.

According to the community committee these actions, have resulted in the planting of 160 Ha of trees, less than 50 % of animals dies during a drought and one community well has been constructed

#### *Seawater intrusion/flooding*

The community committee has had a 5 km saltwater protection dike built, based on community funding and contribution in kind from villagers. Furthermore the community committee is informing households to construct small hills for the animals to use in case of flooding. Boats are also being prepared for storing of the villagers' belongings.

The community committee are informing villagers about the importance of cleaning their houses during and after seawater flooding has occurred.

The community committee support financially villagers in repairing houses, which have been damaged.

#### *Storms and lightning*

The community committee has limited coping strategies for storms and lightning. In 2011 38 houses were destroyed, 14000 m<sup>2</sup> of mangrove forests were destroyed, 2 fishing boats sank and forest fire occurred at about 30 places.

The community committee advise villagers to listen to radio and TV, in order to keep updated. When a storm hits the community, villagers are informed to move to a safe place, which has been established.

According to the community committee as a result of this information-sharing none of the fishermen goes out fishing at the sea. It is estimated that 90 % of households are listening to radio or TV to keep updated.

10 % of the households have bought lightning protection devices.

#### ***Toul Koki Community Committee***

The same exercise as with Peam Krasoap community committee was conducted with the community committee in Toul Koki

Drought:

In the case of drought the community committee rehabilitate the channel system, to protect the drinking water sources. Furthermore the committee makes sure that fences are being constructed around the ponds.

*Seawater intrusion/floods:*

In severe cases villagers are being evacuated to a safe place, which has been established. The committee ensures both prior, during and after that the seawater dike protection system is repaired, if any damages have been done.

The seawater dike that the community has constructed is 600 meters long and 1 meter high.

*Storms and lightning:*

A priority for the community committee is to get the villagers to stay updated on storm events by using TV and radio, and to have them ready to evacuate to the safe places.

Furthermore, the committee has conducted awareness-raising on the importance not to cut down trees around the villages, as it protects the households against the storm.

In the case of lightning some of the villagers have bought lightning protection gear.

*Severe rainfall*

The community committee define severe rainfall as a period of 2 months continuous rain. For the villagers it impacts the agricultural production by developing pest attacks on the crops.

The agriculture officer of the district is an important resource person for the community. The community committee contacts the officer as soon as they identify a pest problem. The agriculture officer then provides advice to the community how to reduce the pest problem.

According to the community committee, the focus on pest reduction and mechanisms in place to combat pests has ensured that 70% of the expected crop production was prevented from being destroyed by pest.

**Group Discussion – Commune Councils – Peam Krasaop**

Beside the group discussion at the level of community committees, another group discussion was made with the commune councils. This group discussion was based on 10 questions, which were discussed while notes being taken. The following is a summary of the main topics of the discussions conducted with the commune councils of Peam Krasaop and Toul Koki communes.

Both commune councils have an understanding of Climate Change, which seem to be more detailed, than the one indicated from the questionnaire. However both councils have participated in a climate change workshop in Koh Kong

province. Additionally the councils' understanding of climate change is developed by information from the monthly newsletter about development issues that RGC distribute to the commune councils.

Both commune councils have participated in adaptation activities being done by IUCN and ADB. For Peam Krasaop the activities have been the construction of dikes, water gates and reservoirs. In Toul Koki the activities included the construction of dikes to protect against seawater, construction of reservoirs and canals to maintain the fresh water supply, enabling irrigation in the dry season for domestic uses. Furthermore the commune council in Toul Koki is actively participating in protecting the forests.

The commune councils do not have a coordinated information-sharing system with the national or provincial authorities regarding updated information prior to weather hazards. The information they receive is from TV and radio channels. If the commune councils receive information regarding weather hazards they try to inform the villagers, however, no established information system is in place.

None of the commune councils regarded climate change as being integrated into the present Commune Development Plans (CDP). However both councils requested for this to happen, in order for the CDPs to include specified climate change adaptation measures.

#### Questionnaire:

Additionally a questionnaire was handed out for each member of the commune councils to plot in a score on 5 questions. The questionnaire resulted in the following scores.

Commune Council: Toul Koki										
(1=nothing and 10= very much), ■ = number of answers										
1. How much do you know about the term climate change?										
1	2	3	4	5	6	7	8	9	10	
■			■		■	■				
2. How well is your commune ready to deal with weather hazards?										
1	2	3	4	5	6	7	8	9	10	
		■		■		■				
3. How satisfied are you with the information that the commune council receives on weather hazards from other national authorities?										
1	2	3	4	5	6	7	8	9	10	
		■		■	■	■	■			
4. How well do you think the commune council supports the villages in the case of a weather hazard?										
1	2	3	4	5	6	7	8	9	10	
	■		■	■	■	■				
5. How well is the coordination with other sectors (e.g. NGO and private sector) in relation to weather hazards?										
1	2	3	4	5	6	7	8	9	10	
	■		■	■		■				
Base = 7 members from the commune council										

**Commune Council: Peam Krasaop**

(1=nothing and 10= very much), **[red box]** = number of answers

1. How much do you know about the term climate change?									
1	2	3	4	5	6	7	8	9	10
			<b>4</b>		<b>2</b>				
2. How well is your commune ready to deal with weather hazards?									
1	2	3	4	5	6	7	8	9	10
		<b>5</b>		<b>1</b>					
3. How satisfied are you with the information that the commune council receives on weather hazards from other national authorities?									
1	2	3	4	5	6	7	8	9	10
	<b>1</b>	<b>3</b>		<b>1</b>	<b>1</b>				
4. How well do you think the commune council supports the villages in the case of a weather hazard?									
1	2	3	4	5	6	7	8	9	10
	<b>2</b>		<b>2</b>	<b>2</b>					
5. How well is the coordination with other sectors (e.g. NGO and private sector) in relation to weather hazards?									
1	2	3	4	5	6	7	8	9	10
				<b>5</b>		<b>1</b>			

Base = 6 members from the commune council

It seems from the above data and the group discussion in the communes that there is a base for developing a more technical capacity on climate change within the commune councils. Furthermore, even though the information-sharing about weather hazards is not very well structured the commune councils should be the link of information-sharing on weather hazards from national and district authorities to the villagers in the affected areas.

### Conclusion on data from Koh Kong

In the target communities in Koh Kong the villagers experience a clear tendency of a change in the weather patterns, which have the consequence of more frequent weather hazards.

Both in Peam Krasaop and Toul Koki commune coping strategies are in place that supports villagers against impacts of climate change. However none of these coping strategies protects the villagers against experiencing negative consequences in relation to their economy, occupation and health.

The community committee in Peam Krasaob seems to have a more detailed perception of climate change compared to the other data. This more detailed perception results in a more reflected awareness of how the community committee can support the villagers in implementing the existing coping strategies.

The community committee in Toul Koki has actively engaged with the authorities, in using the institutional capacity that is available. The community did this in their use of the provincial agriculture officer, who provided advise in the community's fight against the outbreak of pests on crops, with a positive result.

In general from the commune councils and down there is an awareness of the importance of information sharing in order to ensure successful coping strategies. However none of the target communities have a system that supports the needed information sharing both in relation to internally in the communities but also in relation to provincial and national authorities.

### Sihanouk Province

In Sihanouk Province the data collection took place in Prey Nup district in the three communes of Tek Thla, Tek Lork and Samaki. In all 128 questionnaires were collected in the villages of Boeng Reang, Chho Loung, Kampong Smarch Touch and Ta Orn Thom. Three group discussions with community committees were conducted and another three discussion sessions with commune councils.

#### Questionnaire

Of the total 128 respondents 73 were women and 55 were men. So the split between men and women is roughly the same as in Koh Kong.

In contrast to Koh Kong most of the respondents are occupied with farming. Of the 128 respondents 38 % based their livelihoods only on farming, while 66% based their livelihoods on farming and other income sources including fishing. Only 11 % of the respondents based their livelihoods on fishing.

13% of the respondents were women-lead households.

As in Koh Kong the respondents were asked to provide information regarding their daily income during the wet season and the dry season. Unfortunately a substantial amount of the respondents in Prey Nup did not give an answer to this. Only 55% of the respondents have their income listed in the questionnaire in the category “wet season”. The respondents was divided as follows:

Daily income during wet season:	Daily income during dry season:
45 respondents = 1000 – 5000 Riel	51 respondents = 1000 – 5000 Riel
15 respondents = 5000 – 10.000 Riel	21 respondents = 5000 – 10.000 Riel
11 respondents = 10.000 - _____ Riel	34 respondents = 10.000 - _____ Riel
57 respondents = No answer	22 respondents = No answer
Base: all respondents	Base: all respondents

Because of the few respondents to the question regarding income in Prey Nup, the data was not be subjected to the same analysis as in Peam Krasaop.

### **Perception**

As also concluded in the data from Koh Kong, the data collected on the theme “Perception” in Sihanoukville is in accordance with other literature.

Of the respondents, 100% answered that they have noticed a change in the weather patterns over the last 5 years compared to 97% in Koh Kong.

Of the perceived consequences of these weather changes, the answers of the respondents were divided into the following categories:

#### Question 2 in “Perception on Climate Change”

“If yes (question 1), what consequences has the change had?”

- Change in rainfall 92%
- Changes in temperatures 39%
- More drought 26%
- More flooding 18%
- More storms 98%
- More seawater intrusion 75%
- Pest on agriculture 59%

Base = All respondents

Multiple answers possible

The answers are a bit closer to the data from the KAP-study compared to Koh Kong. This could be explained by that the respondent’s occupation in general was more in line with national level.

The data from Sihanoukville is quite convincing, and does not leave much doubt that the villagers in Prey Nup district do perceive that a weather change has occurred, and has resulted in the above categorized weather hazards.

As in Koh Kong the respondents perceived the categorized weather hazards to have a negative impact on their livelihood.

### Question 3 "Perception on Climate Change"

Has these consequences had an impact on your livelihood?

- Occupation            63%
- Income                75%
- Health                 58%

Base = All respondents    multiple answers possible

As mentioned previously, public perception of the causes to climate change is perceived in relation to local changes and less to global changes. This is again supported by the data from Sihanoukville, as can be seen from the answers to the question of what the respondents thought was the main causes for the changes in the weather patterns.

### Question 4 "Perception on Climate Change"

"What do you think causes these change in the weather patterns?"

- Deforestation            50%
- National affects        46%
- International affects    37%

Base = All                      Multiple answers possible

### **Information**

When asked if the respondents have heard about the term "climate change", the result is surprisingly low compared to the KAP-study and the data from Koh Kong. Only 51% answers "yes" with 48% answering "no". In the KAP-study 84% answered "yes" and 71% answered "yes" in Koh Kong.<sup>38</sup>

The relative low figure should be understood in relation to question 2A, where the respondents are being asked if they have participated in any awareness-raising activities regarding climate change. The data from Prey Nup is low, as can be seen from the data below.

<sup>38</sup> Oxfam America, "Understanding Public Perception of Climate Change in Cambodia", p 19, 2011



## Question 2A "Information"

Have you participated in awareness-raising activities?

Female	Men
2	4
3%	7%

Base: All respondents

Of the 16 respondents that were categorized as women-led households, 2 of them answered, "yes" to have participated in an awareness-raising event.

To the question of what source, if any, the respondents get their information about weather hazards from the data is much in line with the data from Koh Kong. However again the data from Sihanoukville shows a surprisingly low figure. Only 2% of the respondents answer they have received information regarding weather hazards from government officials. As in Koh Kong this number indicates that there are no information-sharing tools available at an institutional level. Many of the respondents in answering question 4 requests to get such information from the commune authorities.

## Question 3 "Information"

How are you informed about weather hazards in your district?

- Radio 65%
  - Cambodian radio 54%
  - Thai radio 2%
  - Vietnamese radio 4%
- TV 13%
  - Cambodian TV 13%
  - Thai TV 0%
  - Vietnamese TV 0%
- Neighbours 19%
- Government officials 2%

Base: All respondents

Multiple answers possible

Considering the few of the respondents having been informed by government officials regarding weather hazard, or have participated in awareness-raising activities it is not surprising that only 2% of the respondents, have knowledge about the RGC work on climate change adaptation.

### ***Coping Strategies***

Despite that the respondents from Prey Nup district scores low on knowledge on climate change as a concept the respondents still have an understanding of being able to cope with some weather hazards, as shown by the data below.

#### Question 1 "Coping strategies"

"In the case of the following weather hazards, do you have the ability to cope when they occur?"

• Droughts	7%
• Flooding	4%
• Storms	45%
• Seawater intrusion	42%
• Pest on agriculture production	30%
• None	0%

Base: All respondents

Multiple answers possible

Most respondents consider that they are able to cope with storms. As described in the data from Koh Kong, storms are less complicated to adapt to than other weather hazards. However, 42% of the respondents answer that they are able to cope with seawater intrusion and this is a high percentage. This should however be understood in relation to the extensive rehabilitation of the dyke systems carried out over a four-year period by AFD in Prey Nup.

Below are some of the coping strategies that the respondents mention.

### Question 1 "Elaboration", "Coping strategies"

In the case of the following weather hazards, do you have the ability to cope when they occur (if yes please elaborate)?

- Build dikes around rice fields
- Build dikes around households
- Get the rice to lie down
- Do not go out fishing
- Suggest to open the water gate
- Use chemical fertilizer to prevent pest from attacking the crops.

Base: All respondents

These examples of coping strategies are similar to those used in Peam Krasaop. The coping strategies are all despite the use of chemicals, strategies that do not require a high level of technical capacities, but instead the result of what means that are available to the villagers. These coping strategies will be discussed in more detail in the presentation of the group discussion with the community committees.

### Question 3 "Coping strategies"

"In the case of the last weather hazard, did it give your household a loss?"

Yes	No
54%	23%

Base: All respondents

As in Koh Kong despite having some coping mechanisms in place the majority of the respondents have experienced a loss in relation to the latest weather hazard.

### Group Discussion, Community Committees – Prey Nup

Three group discussions were conducted in the villages of Boeung Rang, Teuk Lork and Teuk Thla in Prey Nup. The three matrices can be found in the appendix. The reader is again recommended to go through these matrices. This section will summarise the main findings.

In general, it was found that none of the three commune committees has the same level of awareness as the community committees in Peam Krasaop. This

was also indicated by the fact that the community committees were unable to provide reflections to a number of the columns in the matrix. Thus also fewer findings can be extracted from the group discussions.

### *Storms*

As in Peam Krasaop information was given to villagers to stay updated by radio and TV, and not to go out fishing on the sea. If informed prior to a storm some of the villagers had developed a coping strategy of using wood sticks to support the rice crops from breaking during a storm, by bending down the rice.

In Teuk Thla the community committee provides help to villagers whose houses had been damaged by storms. Furthermore in Teuk Thla the community committee inform district authorities about the impacts of a storm.

### *Seawater intrusion*

In the case of seawater intrusion the coping strategies are similar to those of Peam Krasaop. Building dikes to protect against the seawater is a main strategy in the communities, but also to prepare boats for evacuation of villagers and their belongings.

## **Group Discussion, Commune Councils**

Group discussions with commune councils were conducted as in Koh Kong and using the same 10 questions. In Sihanoukville the three commune councils of Teuk Thla, Teuk Lork and Samaki took part in this exercise.

The three commune councils understanding were more in line with the results from the questionnaire than in Koh Kong. The members of the councils perceived climate change in relation to local impacts, as in contrast to the councils in Peam Krasaop, which also had an understanding of climate change in a global context.

Samaki commune, as the only one of the three communes, has integrated climate change in the CDP, and has established a committee for disaster preparedness and rescue. This committee has identified a safe place for villagers to escape to during weather hazards like e.g. storms.

All three communes have been involved in climate change activities organized by MoE and the provincial authorities. The activities relates to awareness-raising guidance of crop selection and planting of mangrove trees.

The two communes of Teuk Thla and Teuk Lork have received information from MoWRAM and provincial authorities prior to a weather hazard. Samaki commune has not received such information from the authorities prior to a weather hazard.

As in Koh Kong besides the 10 questions, each member of the commune councils was asked to fill out a questionnaire. The scoring results of these questionnaires are as follows:

**Commune: Teuk Thla**  
(1=nothing and 10= very much), ■ = number of answers

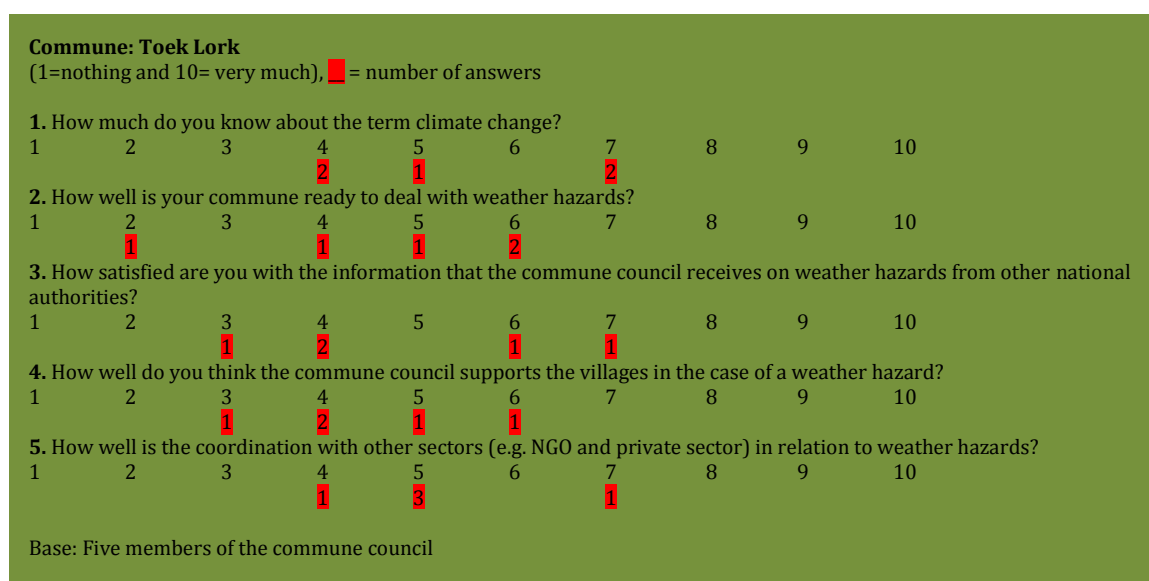
1. How much do you know about the term climate change?										
1	2	3	4	5	6	7	8	9	10	
					3	1				
2. How well is your commune ready to deal with weather hazards?										
1	2	3	4	5	6	7	8	9	10	
			3	1						
3. How satisfied are you with the information that the commune council receives on weather hazards from other national authorities?										
1	2	3	4	5	6	7	8	9	10	
				3	1					
4. How well do you think the commune council supports the villages in the case of a weather hazard?										
1	2	3	4	5	6	7	8	9	10	
		1	3							
5. How well is the coordination with other sectors (e.g. NGO and private sector) in relation to weather hazards?										
1	2	3	4	5	6	7	8	9	10	
							3	1		

Base: Four members of the commune council

**Commune: Samaki**  
(1=nothing and 10= very much), ■ = number of answers

1. How much do you know about the term climate change?										
1	2	3	4	5	6	7	8	9	10	
			3	5						
2. How well is your commune ready to deal with weather hazards?										
1	2	3	4	5	6	7	8	9	10	
				1		1	1			
3. How satisfied are you with the information that the commune council receives on weather hazards from other national authorities?										
1	2	3	4	5	6	7	8	9	10	
	1	1	1							
4. How well do you think the commune council supports the villages in the case of a weather hazard?										
1	2	3	4	5	6	7	8	9	10	
				1	2					
5. How well is the coordination with other sectors (e.g. NGO and private sector) in relation to weather hazards?										
1	2	3	4	5	6	7	8	9	10	
	2		1							

Base: Three members of the commune council



The scoring provided by the members of the commune councils to the answer seems a bit high compared to the data from the questionnaires. This can be explained by the scoring is based on the members of the commune councils own perception, without the need for any further reflection of the questions, compared to the group discussion, which was a facilitated discussion, where the members needed to go into a more reflected discussion. Thus the scoring needs to be analysed in relation to the findings of the above presented group discussions by the commune councils. As analyzed the level of reflection in the commune councils in Sihanoukville is more in line with the data from the questionnaires, which is a fairly limited level. Hence the level of the scoring based on the perception of the members in the commune councils in Sihanoukville is perceived by the report to be a bit to high.

### Conclusion on data in Sihanouk Province

As in Koh Kong the target communities in Sihanouk experience a change in the weather patterns. This change has a negative impact in relation to the respondents' economy, health and occupation. Despite these negative impacts of the weather changes, the villagers in Prey Nup do have coping strategies in place similar to those in Peam Krasaop and Toul Koki commune.

Compared to Koh Kong the target communities in Sihanouk are supported by a stronger adaptation mechanism with the extensive water gate system built by ADF. However this water gate system needs to be further developed, in order for it to serve as a well functioning adaptation mechanism.

In Sihanouk the data reflected a lower awareness of the term climate change, both compared to the data from Koh Kong, but also in relation to the nation-wide KAP-study. This lower awareness is also supported by the group discussion with the commune councils, from which this report concludes that there exist a lower awareness in the councils compared to the ones in Peam Krasaop.

As in Peam Krasaop the level of information sharing is low, and based on the group discussion with the commune councils, it seems that the level is also lower than in Peam Krasaop. This lower level of information sharing is in relation to the internal communication in the commune during a weather hazard. In Prey Nup there does not exist a system of information with the authorities related to weather hazards. However in Prey Nup the commune councils have received ad hoc information from the authorities regarding weather hazards, without this being part of a system.

## Assesment

The final section of this report is the assessment of the level of coping strategies in the target communities. The assessment follows the same three themes as the data collection:

- Coping strategies
- Perception
- Information

As part of the assessment recommendations is also being presented.

The reader of this report is recommended also to read, the two reports below on coping strategies in the coastal zone. These two reports provide relevant analysis and recommendations based on similar research questions as this report. Furthermore the two reports are conducted in the same areas as this report.

The two reports are:

- The policy note by Regional Climate Change Adaptation Platform <http://www.climateadapt.asia/resources/publication/view/62>
- The “Interim Report on Vulnerability to Climate Change in Sihanoukville Municipality”, 2012 by UN-HABITAT.

This reports assessment is based on the data presented throughout this report, however a special emphasis will be given to the site-specific data collected by this report.

The assessment is conducted on an overall perspective of the level of coping strategies in the two target communities. It discusses the general level of coping strategies in the two target communities in Sihanoukville and Koh Kong with examples of coping strategies being provided.

## Coping strategies

In general there exist no coping strategies in the target communities, which provide full protection against the negative impacts of weather hazards occurring in the coastal zone.

With the predictions of an increased intensity of the weather hazards occurring in the future, these negative impacts can likewise also be predicted to further worsen. Therefore the level of coping strategies has to be raised to meet future challenges.



To achieve this it is important for the target communities to not only develop coping strategies based on a short-term perspective but also to develop strategies based on a long-term perspective.

Another issue in relation to not have a long-term perspective on coping strategies, is that some of the coping strategies due to their short-term perspective put further pressure on the ecosystem, thus worsening the situation in the long-term. An example is when villagers change their occupation from farmers to fishermen as a result of change in weather patterns, hence putting further pressure on this resource, as has been experienced in Prey Nup. Thus an emphasis should be given in any awareness-raising activities to stress the interconnection between coping strategies to climate change and other development issues.

Despite not having coping strategies, which fully protects against weather hazards, both target communities do have coping strategies in place, which might reduce the negative impacts of climate change. Below are the main strategies assessed.

The identification of a safety place seems to be an effective strategy against storms and other severe weather hazards. This strategy ensures the immediate safety of the villagers. Naturally the optimal strategy would be for villagers to be able to secure their houses in a way, so they can stay in them during storms and other weather hazards. The safety place coping strategy should be developed both in relation to the physical surrounding of the safety place, the coordination of transporting villagers to the safety place and also the information system in place for informing villagers to prepare to evacuate to the safety place.

Building and maintaining dike systems are another important coping strategy for the target communities. Despite these dike systems are not able to fully prevent flooding and seawater intrusion, they are still regarded as an important coping strategy by the villagers in the target communities. Again this coping strategy has room for improvement on multiple levels. The technical level of these dike systems seems to be primitive. There seems to be no development by the communities of the quality of the dikes, instead the communities try to repair them to the same technical level as prior to their damage, when they are on a continuously basis being destroyed by weather hazards. Thus this coping strategy should be improved on a technical level. Such an improvement is closely linked to the financial resources available, hence funds need to be established for this improvement to happen. Furthermore the technical capacity of developing these dike systems needs to be established at an institutional level, in order to ensure that the systems are developed based on the right expertise.

A problem for farmers is that their rice crops break during storms. Some farmers have developed the fairly primitive coping strategy of using wooden sticks to support the rice from breaking, by using the sticks to bend down the rice during a storm. This coping strategy despite its primitive nature seems to be an effective one, and used generally by the farmers in the target communities.

If this coping strategy is further technically developed and implemented in more structured way, this strategy could serve as an effective coping strategy for farmers.

The use of chemicals as a coping strategy to pest on crops due to much rain seems to be quite effective, e.g. in Toul Koki where the commune committee perceived the use of chemicals to save 70 % of the rice crops attacked by pest from being destroyed. The effectiveness of the coping strategy is based on two factors, 1) knowledge on how to use the chemicals in the most effective way, 2) the availability of the chemicals to the farmers. Both these two factors are specific in ensuring that they are accomplished. Thus this coping strategy could and should be supported by an institutional capacity, which to some extent is already being done as the data from Peam Krasaop has presented.

These coping strategies can be found in both target communities. However there is a difference on how these strategies are integrated, and to which extent they are based on joint efforts in the communities. It seems that the community in Peam Krasaop is better organized than the others.

The matrix from the group discussion with community committees in Peam Krasaop provides an understanding of a community, which work together in strengthening the general level of coping strategies for the community. Furthermore it has been analysed that the knowledge of climate change seems to be at a higher level in Peam Krasaop compared to the other target communities.

This level of knowledge is seen as an essential factor in raising the communities' level of coping strategies.

Samaki commune is the only commune, who has integrated climate change in the CDP, and has established a committee for disaster preparedness and rescue. This step by Samaki is positive in relation to be better organized as a commune in relation to coping strategies. However besides locating a safety place, which has also been done in the other communes, this committee seems to be limited in its output. However such an organizational step and how it could become more effective should be further analysed on, as going to be discussed beneath.

Prey Nup, based on the water gate system that has been rehabilitated, is supported by stronger adaptation capacities compared to Peam Krasaop. Of course it should be taken into an account that the water gate system does not fully prevent water flowing over the dikes. However it is still an adaptation capacity that supports the villagers in Prey Nup, even though the water gate system needs to be further developed in order to be able to serve as an adaptation capacity in relation to future impacts of climate change. Interestingly many of the respondents in Prey Nup referred to the water gate system as a coping strategy, when instead it should be regarded as an adaptation mechanism. Whether to define the water gate system as a coping strategy or an adaptation mechanism is in itself not very interesting. However it raises an important notion. In developing adaptation mechanisms it is essential to ensure

that this is done as a support mechanism to existing coping strategies, or as a catalyst of developing new coping strategies. The risk is to develop an adaptation mechanism, which gives the target communities a sense of that it will solve all the problems related to weather hazards. This can lead to target communities becoming passive in relation to further developing their own coping strategies. It is not the case in Prey Nup, such a conclusion would not be valid to make based on this report's data collection, but however it is a notion to be made. Another notion that needs to be made in relation to develop adaptation mechanisms is that it is important in developing adaptation mechanism to ensure that these are not putting a pressure on the villagers resources, which is used for their own coping strategies, due to requirements of maintenance of the adaptation mechanism by the villagers.

Another issue is that an institutional capacity to support the communities in integrating and developing their coping strategies is not in place. Most of the capacities that are in place are mostly based on the development of the infrastructure like the water gate system in Prey Nup. However more capacity on technical knowledge needs to be established. Such as provincial resource persons, who are available to support the communities in case of more complex impacts of weather hazards like pest on crops, change of crops, sickness among villagers and sickness among animals. As for instance in Toul Koki commune, where the communes use of a provincial agriculture officer has had a positive effect in the communes struggle against pest on crops.

The earlier mentioned level of organization at the commune councils and community committee level is by the author seen as an essential factor in raising the level of existing coping strategies in the coastal zone. One example is the development and maintenance of the dike systems in the target communities. It is important that it is well defined whose responsibility is to develop and to maintain the different dike systems and water gate systems. When this has been done, the next step is to ensure that the knowledge and resources are available to the stakeholders. At the moment the responsibility of maintaining the dike system is placed in the community committees, however this reports data shows that the community committees does not have the capacity to repair the system in a way that ensures them of not being flooded on a continuously basis. Thus raising the question if the community committees based on their current level of capacity is at the right organizational level to have the responsibility of maintaining the dike systems.

Thus it is recommended that the CARP gives an emphasis to raise the organizational level of these two stakeholders. The following three steps are recommended for the CARP to take as method for raising the organizational level at the commune and community level.

1. First step would be to define what role these two stakeholders should have in securing the coastal zone against climate change.
2. Second step should look into how the two stakeholders should be organized internally and in relation to other stakeholders, e.g. should a

- climate change resource person be appointed within the two stakeholders?
3. Third and finally how, based on step 1 and 2, should a capacity building process be organized and implemented?

## Information

The key problem in both target communities is there is no system in place for sharing relevant information between relevant stakeholders. As defined in this report a coping strategy needs to be based on an informed background both prior, during and after a weather hazard occurs.

The data from the questionnaire provides a clear understanding from which sources the respondents receive their information regarding weather hazards. By far the two main sources are radio and television. Thirdly the respondents receive information from the neighbours and local authorities, however this is limited. Only very few of the respondents have experienced to receive information about weather hazards from the national authorities.

Furthermore the respondents commented that they in the future would like to receive more information from the local authorities.

For the commune councils the sources of information are much the same as for the villagers. None of the commune councils have a coordinated system of information with the national or provincial authorities. However the two commune councils of Teuk Thla and Teuk Lork have previously received information from MoWRAM and provincial authorities prior to a weather hazard. Furthermore in Teuk Thla the community committee has informed district authorities about the impacts of a storm, however it is unclear from the data of this report how the authorities used this information, beside that no coordinated system of information is in place. If the commune councils receive information regarding weather hazards they try to inform the villagers, however again, no established system of information is in place.

This leads to another discussion of what type of information and how much is needed to constitute an “informed background” in relation to the three time categories (prior, during and after)? The data collection of this report does not give a full answer to this question. However some notions can be made.

In general a system of information should ensure that relevant information is not only going to the villagers but also from the villagers. Beneath is an assessment on what type of information in relation to the three time categories a system should facilitate.

*Prior* to a weather hazard a system of information should ensure that whatever information/predictions that are available about the weather hazard are shared with the communities that is going to be affected. As part of the ongoing work progress with developing more qualified weather forecasts and weather hazard

prediction, the two media radio and TV should be given a key role in informing the target communities prior to a weather hazard is occurring. In case of extreme weather hazards this information is recommended to come directly from the relevant authorities. This could be done in a number of ways. One way would be for the authorities to have a contact person within the commune councils, which they could contact by phone, and inform on a predicted weather hazard. It should then be this contact person's responsibility to share this information to the community committees, which then could initiate relevant actions.

*During* a weather hazard it is important within a community that a system is in place, which ensures that relevant villagers are informed e.g. in case of the need for an evacuation to a shelter area

*After* a weather hazard has occurred it is important that relevant information is going from the villagers to the authorities. Such information would most likely be related to the impacts of a weather hazard. This information can be used by the authorities in making assessment of damage and economic loss due to the weather hazard. Furthermore this data could support the development of a database on the issue. Such a database could serve as baseline for a number of indicators in relation to weather hazards e.g. frequency, impact, and level of success by adaptation capacity and certain coping strategies. These data could serve as essential inputs for future research.

To create an information system is by the author regarded as essential in ensuring improvement of existing and the development of new coping strategies. Thus it is recommended that an analysis based on a participatory process of relevant stakeholders is conducted, in order to analyse, how a information system is best developed and integrated.

It is further recommended that such a system of information would be formulated and included into the CDP.

## **Perception**

As stated in the methodology the respondent's perception may not be in concordance with the theoretical definitions of climate change. This seems to be the case in the data collected. There is a clear tendency in the data collected that respondents perceive climate change and its impacts in relation to local environment, and does not have the understanding of climate change in a global context. In relation to assessing the existing coping strategies in the target community, this perception of climate change as local phenomena is not assessed to have an influence to the existing coping strategies, which it could have had due to that some coping strategies in its implementation should be perceived in a cross-border perspective e.g. water resource management. However there are some risks related to a community to base its perception of climate change on local events. One of these risks is that climate change becomes the problem to everything in the local environment. If a tendency based on such an

understanding were established, which is not seen as unrealistic, it would create a difficulty not only for climate change projects but also for other development projects implemented in the target communities. This difficulty would to a large extent base itself on ensuring that beneficiaries does have clear focus on the objectives of a development project to be implemented, and not perceive the development project in a context it is not meant to. An example is the issue of sand extraction, which by many of the respondents in Koh Kong were mentioned as a cause to climate change impacts. Sand extraction should not be perceived as a cause to climate change impacts. However since in Koh Kong it is perceived as a cause to climate change, it creates an issue for the CARP in its implementation, because the respondents have different perception on the causes of climate change than the one CARP is based upon, thus a miscommunication based on this different understanding can happen – the CARP and the target community in Koh Kong are so to speak not on the same page of understanding.

Thus it is important for the CARP to ensure a good communication and awareness raising to the target communities about the objectives of the CARP. This would be to avoiding miscommunication between the stakeholders based on the above mentioned issue of perception. Such a miscommunication can have an impact of the outputs of the CARP. This awareness raising needs to have the right level of complexity. It would be a further miscommunication if the objectives of the CARP were communicated in all its detail and complexity to the target communities. Thus it is important that the technical stakeholders of the CARP analyses on this issue, and comes up with a communication plan that overcomes this issue.

It is recommended for the CARP to have an objective of raising the general level of awareness regarding the existing coping strategies in the target communities. To do this it is recommended that awareness materials be developed based on two formats, (1) a coping strategy catalogue listing developed coping strategies in the target communities, (2) developing posters illustrating coping strategies. This material should be divided into the time categories of prior, during and after.

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<http://www.sida.se/Global/Countries%20and%20regions/Asia%20incl.%20Middle%20East/Cambodia/Environmental%20Policy%20Brief%20Cambodia.pdf>, 2/2-2012

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## **Annex 1: Questionnaire**

## Questionnaire

Name:

Age:

Sex: male

female

Civil status: Single

Married

Widower

Occupation:

Village:

District:

Daily income in average:

Wet season

Dry Season

Date of interview:



### **Perception on Climate Change**

1. Have you noticed a change in the weather patterns over the last 5 years?

Yes

No

2. If yes, what consequences has the change had?

Change in rainfall

Change in temperatures

More droughts

More flooding

More storms, cyclones

More seawater intrusion

Pest on agriculture production

3. Has these consequences had an impact on your livelihood?

None

Occupation

Income

Health

Elaboration.....  
.....  
.....  
.....  
.....  
.....  
.....

4. What do you think causes these change in the weather patterns?

Deforestation

National affects (e.g. increased pollution)

International affects (e.g. increased pollution)

Yourself

Don't know

Other affects (please elaborate).....  
.....  
.....  
.....  
.....

5. What kind of risks do you think these changes in weather patterns poses for the future?

Elaboration.....  
.....  
.....  
.....  
.....  
.....  
.....



**Information**

1. Have you heard about the term "climate change"

Yes                      No

If yes, please elaborate.....

.....  
.....  
.....  
.....  
.....  
.....

2. Has awareness-raising on climate change been done in your community ?

Yes

No

Have you participated in the awareness-raising?

Yes

No

3. How are you informed about the weather hazards in your district?

Radio broadcast

If yes, which Cambodian, Thai or Vietnamese radio

TV

If yes, which Cambodian, Thai or Vietnamese radio

Neighbours

Government officials

4. From where would you like to receive information about any weather hazards that would occur in the future?

.....  
.....  
.....  
.....

5. Are you informed about any weather addaptation projects in your district?

Yes

No

If yes, do you know who is the provider of these projects?

.....  
.....  
.....  
.....

If yes, have you been contacted by the providers?

Yes

No

6. Do you know about the work that the government's official have been doing on a climate change coping strategy?

Yes

No

If yes, please elaborate?.....

.....

.....

.....

.....

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.....

### Coping strategies

1. In the case of the following weather hazards, do you have the ability to cope when they occur (if yes please elaborate) ?

Droughts

Flooding

Storms

Seawater intrusion

Pest on agriculture production

None

Elaboration.....

.....

.....

.....

.....

.....

2. Are there any capacities that supports your means of coping?

.....  
.....  
.....  
.....

3. In the case of the last weather hazard, did it give your household a loss?

Yes

No

If yes, what kind of loss (e.g. agriculture, income, animals)?

.....  
.....  
.....  
.....

4. What kind of capacities could be established that would support your means of coping (please elaborate)

.....  
.....  
.....  
.....

5. Considering a change in weather patterns, has this led to alternatives in the way you conduct your livelihood?

Yes

No

If yes, please  
elaborate.....

.....

.....

.....

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.....

.....



## Questionnaire for Commune Council

Please put a circle to your answer

**1.**

How much do you know about the term climate change?

(1 = nothing and 10 = very much)

1    2    3    4    5    6    7    8    9    10

**2.**

How well is your commune ready to deal with weather hazards?

(1 = not at all and 10 = very much)

1    2    3    4    5    6    7    8    9    10

**3.**

How satisfied are you with the information that the commune council receives on weather hazards from other national authorities?

(1 = not satisfied and 10 = very satisfied)

1    2    3    4    5    6    7    8    9    10

**4.**

How well do you think the commune council supports the villages in the case of a weather hazard?

(1 = not well and 10 = very well)

1    2    3    4    5    6    7    8    9    10

**5.**

How well is the coordination with other sectors (e.g. NGO and private sector) in relation to weather hazards?

(1 = not well and 10 = very well)

1      2      3      4      5      6      7      8      9      10

## **Annex 2: Matrix for Group Discussion**

## Matrix for Group Discussion

Community: Peam Krasaop

District: Peam Krasaop

Date of interview: 26 January 2012

Weather Hazards (events)	Frequencies of the event	Vulnerabilities (impacts)	Action taken to reduce the impact			Capacities that supported the action			Result of the action
			Before	During	After	Before	During	After	
Drought	<ul style="list-style-type: none"> <li>- Rain falls between April and May</li> <li>- No rainfall for half a month to a month (3-4 times per rainy season) (between July and September)</li> </ul>	<ul style="list-style-type: none"> <li>- Animal Sickness</li> <li>- People Sickness</li> <li>- Damage to households plants</li> </ul>	<ul style="list-style-type: none"> <li>- Consultation with agriculture officers for the method to protect animals from being sick</li> <li>- Find water sources</li> <li>- Built a basin to store drinking water for community</li> <li>- Prepare medicine</li> <li>- Preparedness on the prevention of forest fire</li> <li>- Plants more trees to reduce the heat</li> </ul>	<ul style="list-style-type: none"> <li>- Discuss with veterinary officers to find a solution on preventing animal from getting sick</li> <li>- Find other water sources</li> <li>- Keep children indoors</li> </ul>	<ul style="list-style-type: none"> <li>- Buried or burnt animals that died by diseases, in order to prevent the contagious diseases from spreading</li> <li>- Rehabilitated water sources</li> <li>- Planted trees</li> </ul>	<ul style="list-style-type: none"> <li>- Informed people to be prepared</li> <li>- Prepare budget (Community fund and district fund)</li> <li>- Find other sources of fund, and apply for funding for planting trees</li> </ul>	<ul style="list-style-type: none"> <li>- Means for transporting of drinking water from the town (buckets, carriage, water pumping machine...)</li> <li>- Village veterinary spraying medicine to prevent animals from being infected</li> </ul>	<ul style="list-style-type: none"> <li>- Promote methods of coping (by educational methods)</li> <li>- Use commune and community funds</li> </ul>	<ul style="list-style-type: none"> <li>- Prevent 50% of animals from death by diseases</li> <li>- Planted 160 Ha of trees</li> <li>- Rehabilitated one community well</li> </ul>

Seawater intrusion	- 4 to 5 times in a 3 months period (from November to January)	- Damage to roads - Damage to vegetables, plants and animals - Flooded houses (flooded for half a day)	- Prepare budget to build a salt water protection dike - Consult with community members to contribute in kind (labour support for building the dike) - Inform household to prepare high hill or shelves for animal or poultry - Informed household to prepare boats to keep belongings - Prepare the houses.	- Open water gate - Informed people to be careful - Informed people to evacuate to the safety place - Prepare valuable things on boat	- Repaired the salt water protection dike if destroyed by seawater intrusion - Informed people to clean the house to keep sanitation and hygiene at acceptable level.	- Prepared budget to build salt water protection dike (raised the budget in commune development plan) - Promote people to participated in kind to build the new seawater protection dike (discussion, meeting, education..) - Prepared fund to build (other NGOs...)	- Control the condition of seawater protection dike - Release saving funds for victim - Use the community contribution fund	- Support fund for repairing houses - Awareness raising on preparedness for the next events	- 100% doesn't go out fishing - Built a salt water protection dike about 4-5km long and 0.5m high - 100% of community member contribute in kind in building the salt water protection dike (support in labour) - 70% have boat and make shelves to keep animal or poultry from the flood)
Storm and Lightning	- 3 times a year	- Destroyed 38 houses (2011) - Destroyed mangroves forests (20m x 700m) - Forest fire (20m x 20m) about 30 places - Sank 2 fishing boats	- Informed the people to be careful (warn from house to house ) - Informed people to listen to the weather forecast on radio and TV - Informed people to protect from lightning by not turning on the TV, do not go under the tree when raining) - Planted tree (mangrove forests) for storm protection	- Informed people not to go out fishing - Informed people not to go under trees	- Inform people to prepare for the next events - Repaired houses - Replanted trees	- Prepare budget for planting trees - Reforestation Project budget (Commune budget and IUCN) - Prepares safety area for evacuation (humans and animals)	- Evacuated people to the save area	- Support funds to repair houses (provincial red cross and commune fund) - Support fund to plant trees	- 90% of total household participated in preparedness (listen to radio on weather forecast, prepared boat to evacuate) - 10% of total household bought lightning protecting device - Participated in planting trees (160 Ha) - 100% of household stopped fishing during the storm

## Matrix for Group Discussion

Community: Boeng Reang

District: Prey Nup

Weather Hazards (events)	Frequencies of the event	Vulnerabilities (impacts)	Action taken to reduce the impact			Capacities that supported the action			Result of the action
			Before	During	After	Before	During	After	
Storm	- 5 times in 2011	- Damaged households - Fruitless rice - Damaged 1 boat - Affected fishing	- Informed fishermen to listen to the weather forecast - Informed people to use wood stick to bend the rice, down in order to prevent from the wind destroyed - promote seed choosing by forestry officers - Informed people to maintain natural forest to prevent storms - Prepared budget for growing 10000 trees in 2012	- No fishing activity - Used wood stick to bend the rice, down in order to prevent the rice from being destroyed by the wind.	- Informed people to build stronger new houses - Informed people to use wood sticks to protect rice crops before the storm occur next time - Choose rice species that can stand against the storms - Trained people to maintain natural forests	- Support the rice seeds that can withstand wind (the Provincial Department of forestry fisheries and agriculture) - Protected mangrove forests - FIX organisation support funds to grow mangrove forest	- Prepare boats for individual evacuation - Listen to radio forecast	- Provide rice seeds - Informed the people to be prepared for the next events	- Received 1000kg of rice seeds - Plant tree at community forest (4125Ha) - Protected mangrove forest (321Ha) - Plant 1000 of mangrove tree
Dry wind	- Occur during the whole month of October								
Seawater Intrusion	- 10 times a year from October to February	- Damaged rice fields - Damaged the road - Flooded the village - Damaged crops - Affected domestic animals, poultries	- Prepare 6000\$ to build a salt water protection dike (20km) - Prepared budget to repair, build salt water protection dike to protect rice fields - Prepared boats to store materials when	N/A	N/A	N/A	N/A	N/A	-Saved 500Ha, 70% rice

Date of Interview : 03 February 2012

			the sea water rises						
Flood and rainfall	- 5-6 times a year from July to August	- Damaged small roads - Damaged rice seedlings - Flooded houses - Affected fishing	- Prepared budget for repairing roads (commune development plan)	- Observe the roads during the flood	- Repaired the road (funds from people in the province) - Reported the damages to the district Level district.level	N/A	N/A	N/A	
Pests on agriculture product	- From August to November	- Damaged rice product	- Informed the district agriculture officer to support	- Used pesticides as informed by agriculture officer	- Training about the methods of pests prevention	N/A	N/A	N/A	

## Matrix for Group Discussion

Community: Tek Thla

District: Prey Nup

Date of discussion: 2<sup>nd</sup> February 2012

Weather Hazards (events)	Frequencies of the event	Vulnerabilities (impacts)	Action taken to reduce the impact			Capacities that supported the action			Result of the action
			Before	During	After	Before	During	After	
Storm and Dry wind	- Twice a year - Dry wind 2 months in a year	- Affect fishing - Fishing boats sink - Damaged houses - People died - Destroyed rice and other plants - Damaged mangrove forests	- Replant mangrove forests - Conducted meeting with community on preparedness - Informed people not to go out fishing if the big winds occur - Listen to weather forecast - Use wood stick to bend the rice, down in other to prevent from the wind destroyed	- Observe the conditions - Informed people to evacuate to the safety area - Informed people to take attention of the event	- Compensate the families that lost their relatives - Contribute in kind to repair houses that were damaged - Reported the damages to district officer - Inform people to be careful and listen to weather forecast - Go fishing in groups so it's easier to save each other (Group fishing)	- Prepare funds for plating mangrove tree - Fund supported by Japanese organisation (CIVADECRE) - Prepare budget to purchase guarding boats to help the fisherman while the big wind occur - Raise the budget (Commune budget)	- Observed the conditions - Evacuate people to the safety area	- Provided community fund to those who lost relatives - Community contributed (in kind) to repair the damages - Reported about the damages and sent to District Level - Planting trees	- Planted 3000-5000 trees - Supported in repairing 8 houses - Provide fund to help casualty family (80,000 riels/ each family) - Provided 2000 riels for every family in the community.
Seawater Intrusion	- Three times a year	- Damaged rice and other plants - Damaged animals - Damaged rice field - Damage household equipments (motos, bicycles)	- Prepare salt water protection dike for individual paddy fields - Prepared boat for evacuation human, animals, poultry, equipments	- Make salt water protection dike to protect the rice fields - Evacuate people, animals, poultry, equipment to the high place	N/A	N/A	N/A	N/A	N/A
Land level rise	- The water is going shallower every year, the deepest sea level is 1m (land rises 50m from the beach)	- Affected fishing territory and fishing activities - Less fish and crabs	N/A	N/A	N/A	N/A	N/A	N/A	N/A



More rainfall	- 10 times per dry season	- Damaged rice making it fruitless - Affected the timing of planting and cultivating rice	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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## Matrix for Group Discussion

Community: Tek Lork

District: Prey Nup

Date of interview: 02 February 2012

Weather Hazards (events)	Frequencies of the event	Vulnerabilities (impacts)	Action taken to reduce the impact			Capacities that supported the action			Result of the action
			Before	During	After	Before	During	After	
Seawater Intrusion	-Big difference in the last 5-6 years -Sea intrudes in September, October, November, and December (4 months per year)	- Affect drinking water and animals' food -Affected rice fields and plants	- Inform people not to cut down trees - Grow mangrove forests -Conduct consultation meeting at district level to find solutions	- Reported to the commune about the disasters - Informed people to be careful with their domestic animals, poultry	- Build a higher salt water protection dike around the rice fields (individual) - Reported to commune authority about the impacts	- Inform people about the change in weather (storm, floods etc) - Hold a community meeting to find a way to prepare for less impacts - Hold a meeting with local authorities about the change in weather	- Find a safety area for people and animals, poultry	- Provided information for people to be able to find good seeds - Cooperate well with authorities and organizations	- Have informed 80% of people about storms - Moved 200 cows and buffaloes to a safe place - Contact with the Ministry of Forestry, Fisheries and Agriculture and received 20 tons of rice seed.
Storm	- 3 to 4 times a year	- Fruitless rice and rice production drops by storm							
Change in weather pattern (dry and wet)	- In the last 5-6 years had a big change in the amount of rainfall and droughts	- Damaged rice production and pest on agriculture product							
Lack of drinking water	- Lack of drinking water from November to June every year	- Affect people's health							

## Matrix for Group Discussion

Date of interview: 27 January 2012

Community: Toul Koki

District: Peam Krasob

Weather Hazards (events)	Frequencies of the event	Vulnerabilities (impacts)	Action taken to reduce the impact			Capacities that supported the action			Result of the action
			Before	During	After	Before	During	After	
Seawater Intrusion	Once in a season (2 days in December)	- Damage 2 Ha of rice in Ta Jark and 5 Ha in Toul Koki - Damage plants in the village	-Prepare safety area -Built salt water protection dike (Ta Jark) - Repair salt water protection dike (Toul Koki)	- Evacuate to the safety area. - Check the condition of the saltwater protection dike.	- Repair the salt water protection dike and water gate	- Prepare budget for construction and repairing salt water protection dike (Commune development plan)	- Budget support - The salt water dike - Fund support for evacuation activities (human, animal, things)	- Repairing salt water protection dike that damaged by sea water intrusion - Fund support for the victim (repairing houses)	- Built a 700m salt water dike (repair + newly built) in Toul Koki (connecting from upper Toul Koki to lower Toul Koki) - Repaired 600m with 1m high salt water protection dike (connecting lower Toul Koki to upper Toul Koki)
Storm + Lightning	Twice a year	- Damaged soil - Damaged houses - Damaged some houses' roof	- Stop cutting tree (stop deforestation) - Promote planting trees (reforestation)	- Advice people to be careful of the storm and lightning (listening weather forecast through radio) - Advice people on how evacuate to safety area.	- Repair the houses - Plant more trees to protect the storm - Awareness-raising on preparedness when the next event comes, such as listen to weather forecast, install lightning protection	N/A	N/A	N/A	- Protect the forest surrounding the community
Drought	Twice in 5 years (2-3 months each time)	- Lack of drinking water - Damage fruit trees -Damage rice and animals	- Protect drinking water sources - Build fences around ponds -Rehabilitate canals, keep water in household	N/A	N/A	N/A	N/A	N/A	N/A
Too much rainfall	2 months continuously	- Damage rice - Increase pest on crops	- Prepare pesticide -Contacted agriculture officers to consult on solutions to protect the crops - Build new canals, repair old canal and water gate	- Use pesticide - Contact agriculture officer as soon as possible to get help on time - Open water gate to save the rice from flood	- Inform people about the change in weather so they can understand and find solutions for the next weather hazards - Repair canals and water gate	- Consult with agriculture officer to find the solution to save the agriculture product from pest - Prepare budget for repairing canals and water gate	- Provide pesticide - Open water gate to save the rice from flood	- Prepare budget for the next weather hazard (commune development plan)	- Saved 70% of rice product from pest destroyed - Repaired some rice seedlings after the rainfall finished - Built 1660m canal - Repaired old canal