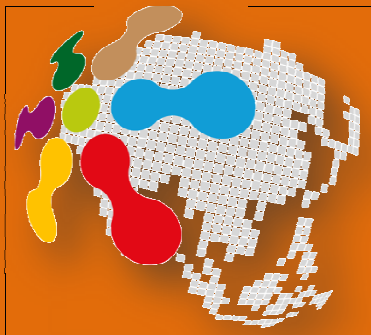


**CLIMATE CHANGE ADAPTATION:
FINDING THE APPROPRIATE RESPONSE
FEBRUARY 2011**



**ADAPTATION
KNOWLEDGE
PLATFORM**



**CLIMATE CHANGE ADAPTATION: FACTORS OF CHOICE, EFFECTIVENESS,
AND SUPPORTING SYSTEMS**



**REGIONAL CLIMATE CHANGE
ADAPTATION KNOWLEDGE PLATFORM** for Asia

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CONTENT

ABBREVIATIONS & ACRONYMS	4
EXECUTIVE SUMMARY	5
CLIMATE CHANGE ADAPTATION - FACTORS OF CHOICE, EFFECTIVENESS, AND SUPPORTING SYSTEMS	
BACKGROUND AND INTRODUCTION	8
BUILDING A CONCEPTUAL FRAMEWORK AS A BASIS FOR THE RESEARCH AND ANALYSIS	9
PROCESS METHODOLOGY AND SCOPE OF INQUIREY	11
STATE OF AUTONOMOUS AND PLANNED ADAPTATION – KNOWLEDGE, ASSETS, STRATEGIES, AND OUTCOMES	13
- Climate Change Vulnerability: Exposure, sensitivity, and adaptive capacity in context	13
- Climate hazards, onward impacts, losses, and local responses	14
- Responding to losses and adaptation needs through development services	18
- Reflecting on losses and climate change adaptation	21
DRIVERS OF ADAPTATION: FACTORS AND INFLUENCES DETERMINING OUTCOMES AND BENEFITS	22
REFLECTING ON ADAPTATION EXPERIENCES: CHOICES MADE, RISKS, AND FORWARD STEPS	25
FILE ANNEX	
ANNEX 1 SIHANOUKVILLE PROVINCE FIELD RESEARCH DATA – AIT-UNEP RRCAP 2011 PDF	30
ANNEX 2 KOH KONG PROVINCE FIELD RESEARCH DATA – AIT-UNEP RRCAP 2011 PDF	57
ANNEX 3 WORKING DAY – LIST OF PARTICIPANTS – AIT-UNEP RRCAP 2011 PDF	82

ABBREVIATIONS & ACRONYMS

<i>AIT-UNEP</i>	Asian Institute of Technology – United Nations Environment Programme
<i>CBNRM</i>	Community based Natural Resource Management
<i>DSP</i>	Development Service Profiles
<i>FGD</i>	Focus Group Discussion
<i>IPPC</i>	Inter-governmental Panel on Climate Change
<i>JCCI</i>	Joint Climate Change Initiative
<i>MA</i>	Millennium Ecosystem Assessment
<i>MAP</i>	Mind, Attitudes and Processes
<i>NGO</i>	Non Government Organization
<i>NRM</i>	Natural Resource Management
<i>PIP</i>	Policy and Institutional Processes
<i>PNKS</i>	Ponleu Ney Kdey Sangkhum
<i>Sida</i>	Swedish International Development Agency

EXECUTIVE SUMMARY

In cooperation with the Asian Institute of Technology and the United Nations Environment Programme (AIT-UNEP), and the Learning Institute, the Climate Change Adaptation Knowledge Platform for Asia has seen great value in learning more about climate change adaptation in Cambodia. Asking questions around what best supports positive adaptation, questions of capacity gaps and of those related to barriers that impede 'good' adaptation outcomes, but to answer these, first we must understand how local assets are mobilized in times of climate stress, what constitutes good adaptation and mal-adaptation, and how support for adaptation is being carried out.

To build 'understanding', a multi-stakeholder participatory learning initiative was conducted, included villages, communes, and districts representatives within the coastal provinces of Koh Kong and Sihanoukville; later joined by a key set of national and international entities. Explored in the context of rural livelihoods based on natural resource and the management of these resources were:

- Driving forces behind adaptation responses, and the level of climate change resilience obtained from these;
- If natural asset based livelihood adaptation responses posed risks to the sustainability of the natural resource base; and
- If adaptation responses have inherent family and societal risks that decrease a 'community's' resilience to climate change?

For the individual, and or household, adapting to climate change means adapting to losses; losses in areas of livelihood production, food security, human safety and general health, and ecosystem services. Driving forces behind adaption constitute a spectrum of climate related cause and effect stimuli on ecosystems, combined to a spectrum of socio-economic and political influences that are shaping adaptation strategies, the outcomes of these, and for whom. Stimuli in the form of a natural hazard (not disaster) sets of a cyclic pattern of influence starting with the level of stability and natural wealth within the surrounding ecosystems, and elements of sensitivity related to people's general resilience to adversity, e.g. the nature of their livelihoods and the productive natural resources they use, and the level of infrastructure supporting and protecting these livelihoods. On one level, the form and degree of impact is found to be a function of sustainability as it would relate to the use and management of ecosystems. Also important to note is that climate change impact and adaptation is shaped by policy and institutional processes e.g. land use and management patterns, development patterns, and economic factors influencing the behaviors of stakeholders. Thus, current and future climate change impact cannot be determined without considering the given constituents together.

Climate change adaptation at the local level often begins with the mobilization of assets; how this is done, supported, and or influenced determines the result. Conceptually, adaptation strategies and their outcomes operate in a cyclic process of influences; those operating at the level of the individual and or household, and those at the community level. Internally, each has a set of component factors that influence one another, e.g. state of poverty, social status, knowledge, and participation constituting opportunity at the individual or household level; and community social infrastructure, land tenure security, assets and the ability to access assets and knowledge constituting options at the level of community.

The ultimate question asked most often is... are communities gaining resilience to climate change? This question cannot be answered definitively, however, noted is the ability for a rural community to cope with climate change largely depends on the condition and diversity of the natural resource base they live within. If living in a degraded area, needed is sustained access to relief services just to survive. If living within a diversified ecosystem, provisional ecosystem services can provide communities with adequate resources to cope; even build small levels of resilience if they have appropriate access to development services. Ultimately, villagers participating well in their development and natural resource management efforts, they are adapting to climatic change. Unfortunately, few within the research area are building resilience; widespread is a downward trend of resident resilience to a multitude of natural and socio-economic hazards over the last five years. Additionally, no specific adaptive

responses are taken to lower related risks towards women, e.g. safety, health, and nutrition. Hence, social and cultural risks are not recognized as a priority to invest resources in to lower vulnerability. Priority hazards identified by local stakeholders are:

- Lack of capacity to secure fisheries and agriculture activities in villages to bring continuity to food security;
- Lack of capacity to meet water resource needs economically during flood and drought cycles outside of rice production needs;
- Lack of capacity to lower the impact of drought on home based food production systems to ensure food security throughout the year;
- Lack of capacity to access development services appropriately, e.g. micro-finance institutions, livelihood technologies, and natural resource management; and
- Lack of capacity to engage in local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs.

FORWARD STEPS

Development services are constrained by their own capacity to deliver adaptation support, be it financially, the lack of appropriate technology, even the lack of human resources to reach so many in need. Needed are costly efforts to boost infrastructure around water management, storage, and water delivery. However, there are some small adjustments to the delivery of development support that could help avoid mal-adaptation responses, and build resilience to climate change:

- **RECOMMENDATION 1** - Fostering two-way communication and collaborative relationships between service providers and recipients. This small step could improve the connectivity of knowledge, e.g. around ecosystem services and natural resource management. Two-way communication can also improve people's participation in their development; highlighted as a major factor to successful adaptation.
- **RECOMMENDATION 2** - Harnessing local committees and associations to improve the movement of knowledge in and out of vulnerable areas. Actions should create a form of collaboration between the actors involved, i.e. ensuring knowledge needs are met in content and form, and collaboration on how such can be disseminated and updated systematically;
- **RECOMMENDATION 3** - Increasing participation in, and or initiating community forms of natural resource management beyond law enforcement, e.g. the rehabilitation of ecosystems. Actions should also extend to the formal recognition of community based groups; their rights, roles and responsibilities, and returns;
- **RECOMMENDATION 4** - Ensuring that micro-finance, said to be used for livelihood purposes, is tied to oversight and appropriate capacity development activities by relevant development service providers; and
- **RECOMMENDATION 5** - Ensure capacity development consistently targets the most vulnerable, e.g. poorest of the poor and women headed households, to avoid crisis situations that often lead to mal-adaptation responses.

Important to this study was bringing together a diverse set of stakeholders to think through barriers and challenges to climate change adaptation, and to produce a set of recommendations based on the situational context of the coastal areas where the study was conducted.

Action Point 1 - OUR NEEDS to build resilience

- Fisheries and agriculture training courses, information dissemination, and multiple model site establishment;
- Supporting infrastructure – dikes, reservoirs, and water delivery systems;
- Functional and managed ecosystems – streams, rivers, natural canals, watersheds, and PEOPLE; and
- Land use planning and management done in a way that brings fairness, diversity, and stability to rural natural resource based livelihoods.

Action Point 2 - OUR KNOWLEDGE NEEDS to build resilience

- Understanding better the seasonality of water usage in order to enhance and streamline management and infrastructure needs;
- Learning better ways to transfer skills and technology to local stakeholders; and
- Learning how to build positive value towards multi-stakeholder interactions – changing of Minds, Attitudes, and Processes (MAP).

Action Point 3 - OUR NEEDS to build resilience

- Development service profiles that highlight processes of empowerment and knowledge building, e.g. knowledge of legal protection and advocacy, to knowledge of useful networks and how to link effectively to these, to understanding better how to turn knowledge and skills into active capacities;
- Development service profiles that create an enabling environment for participation, e.g. participatory planning facilitation, alternative livelihood options and opportunities, to partnership building that brings about Authority Partnerships.

Barriers dealing with knowledge gaps and how to move knowledge towards active capacities are persistent amongst communities and development service providers. The challenge to overcoming these is further compounded by existing mindsets, attitudes and process underlined to facilitate stakeholder cooperation. Today, development service profiles in the research area include a comprehensive set of capacity support initiatives geared towards livelihoods, but these remain less effective than thought by their providers.

Outlined are recommendations to support climate change adaptation, from probable small steps forward, to an outline of climate change resilience building needs. A look through the pages of this 'study', one can note a need to bring inclusiveness to climate change adaptation decision-making, and a need to share the responsibility of building climate change resilience by all stakeholders. This will require development service providers to move away from passive participation wherein decisions are made by powerful 'external' stakeholders, and local communities participate by being told what is going to happen or has already happened; towards a state of interactive participation wherein stakeholders groups and individuals (men, women, youth, and the elderly) participate equitably in joint analysis, leading to joint action, and the formation of new cooperative groups or the strengthening of existing ones.



Photo by Minette Arzadon, 2010

Cambodia does have valuable knowledge to deal with its development and climate change adaptation needs, from basic technologies to strong foundational capacities to turn knowledge into actions – it's now a matter of bringing connectivity amongst knowledge banks, and connectivity amongst people.

CLIMATE CHANGE ADAPTATION - FACTORS OF CHOICE, EFFECTIVENESS, AND SUPPORTING SYSTEMS



BACKGROUND AND INTRODUCTION

Discourse amongst the climate change arena has begun to highlight ‘adaptation’ as a means to provide more tangible responses to foreseen climate related impacts because they are seemingly driven by local capacities and meet immediate needs. However, in Cambodia, climate change autonomous adaptation has proceeded unchecked for effectiveness, and planned adaptation responses struggle to meet local expectations. Understanding this, in cooperation with the Asian Institute of Technology, and the United Nations Environment Programme (AIT-UNEP), and the Learning Institute, the Climate Change Adaptation Knowledge Platform for Asia is now asking questions of what best supports positive and forward movement in adaptation strategies, questions around capacity gaps, and questions related to barriers that impede ‘good’ adaptation outcomes. And questions of ‘HOW’ need to be answered:

- How are local assets mobilized in times of climate stress, and mobilized in a way that constitutes ‘good’ adaptation;
- How can mal-adaptation be identified and mitigate;
- How can inclusive decision-making and informed support improve local level resilience to climate change impacts through adaptation?

To bring light to the aforementioned, AIT-UNEP and the Learning Institute facilitated a joint learning process amongst stakeholders that identify climate change adaptation responses and the drivers of those responses at the village, commune, district and provincial level. This learning process focused on climate change impacts in the context of rural livelihoods based on natural resources and the management of these resources to secure ecosystem services in the coastal provinces of Koh Kong and Sihanoukville, Cambodia – the primary research target area. Insights and experiences from related work conducted through the Joint Climate Change Initiative¹ (JCCI) in the province of Kompong Speu, Cambodia has also been of great value to the research team as they explored:

- What drives and shapes adaptation responses, and the level of climate change resilience obtained from these;
- If natural asset based livelihood adaptation responses posed risks to the sustainability of the natural resource base; and
- If adaptation responses have inherent family and societal risks that decrease a ‘community’s’ resilience to climate change?

¹ The Joint Climate Change Initiative is funded by the Swedish International Development Agency (Sida), and aims to build the capacity of Cambodian partner NGOs to address issues of climate change in a way that benefits local people, particularly women, children and indigenous communities. The initiative has nine (9) field based projects that support climate change adaptation through multi-stakeholder involvements. Experiences from Ponleu Ney Kdey Sangkhum (PNKS), a JCCI supported partner operating in the province of Kompong Speu, have been used to add context and insight to this body of research.

By integrating and answering the aforementioned questions, the Climate Change Adaptation Knowledge Platform for Asia is responding to the demand for knowledge on climate change adaptation aimed to further adaptive capacities in Asian countries. The Platform supports research and capacity building, policy making and information assimilation, generation, management and sharing. Focusing on strengthening the foundation of climate change adaptation knowledge and adaptive capacities in Cambodia, seen is that climate change vulnerability is more than just dealing with drought and flood.

'Finding the Appropriate Response' is a new and dynamic contribution from the Platform that breaks down 'climate change vulnerability' into its constituents. Beginning with setting the conceptual framework for the research and the scope of inquire, the paper goes on to briefly describe the context of adaptation vis-à-vis climate change vulnerability from the perspective of local respondents participating in the research. Following is a review of how local people are responding to climate change impacts in relation to a spectrum of losses, e.g. from livelihood productivity, to food security, health and safety, to losses in ecosystem services. The next component of this paper presents a conceptual framework as to what drives and shapes climate change adaptation responses and their outcomes. The last section reflects on the 'adaptation experiences and insights' put forth in previous sections to answer questions around that of onward 'risks' associated with adaptation responses, how mal-adaptation can be identified and prevented, and what is needed to support better support good adaptation responses at the local level. Additionally, provided by research participants is a set of short to medium term actions that could help in overcoming identified barriers to climate change adaptation in the coastal areas covered by the research.



BUILDING A CONCEPTUAL FRAMEWORK AS A BASIS FOR THE RESEARCH AND ANALYSIS

To understand climate change resilience in the rural development context, it is important to reflect on the constituents of climate change vulnerability (Figure 1) and why ecosystems are necessary for sustainable living and resilience to climate change impacts. Facilitating this need, researchers used a second conceptual framework (Figure 2) describing the interconnections between the services derived from ecosystems that are important to sustain the rural poor, and how these services relate to elements of rural resilience under any conditions.

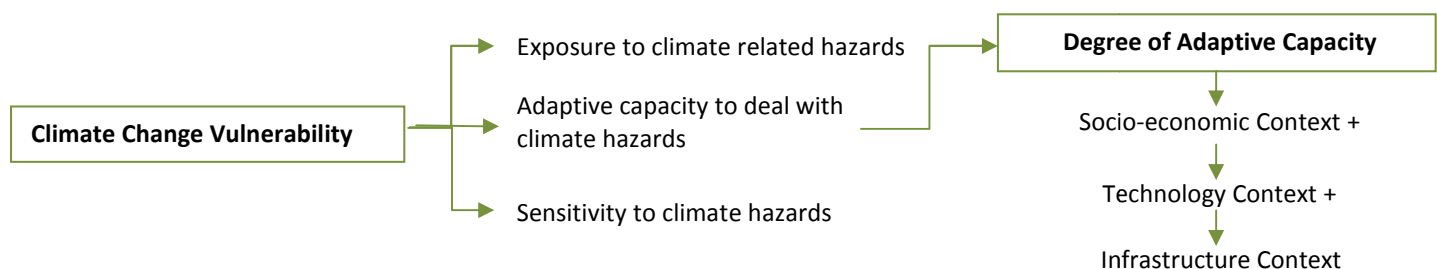


Figure 1 Constituents of climate change vulnerability (Anshory, A., and Francisco, H., 2009).

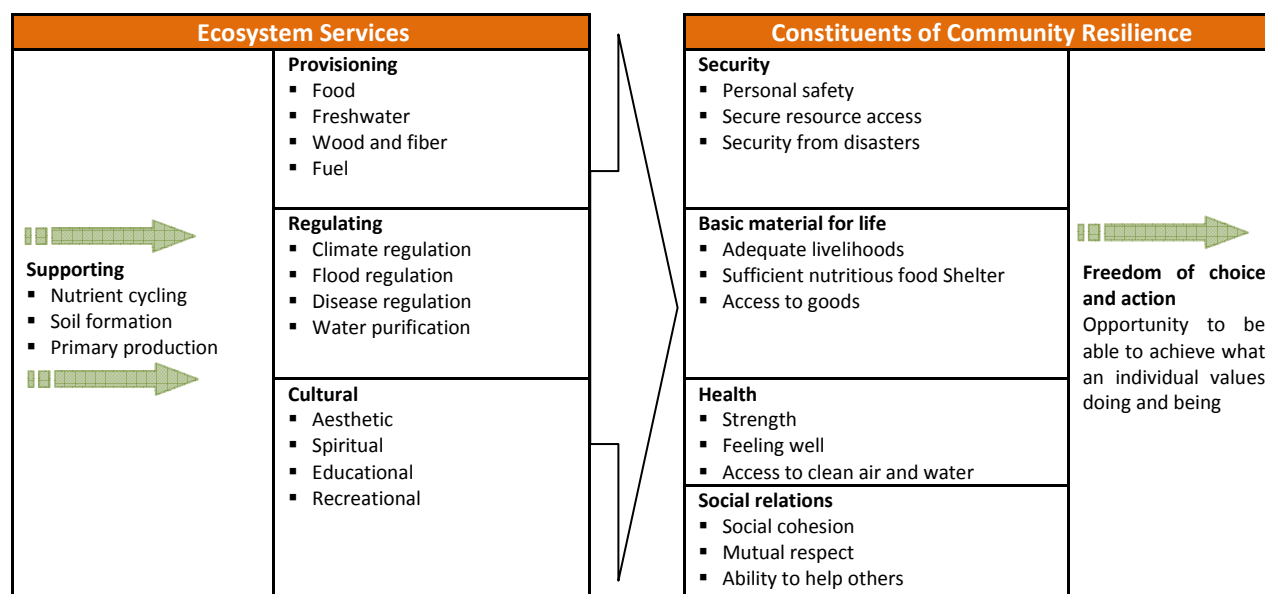


Figure 2 Conceptually, examples of the constituents of ecosystem services and their dependent relationships on constituents of community resilience (The Millennium Ecosystem Assessment (MA) framework: MA, 2005).

Figure 2 notes that ecosystem and their functional components are essential to the realization of human resilience because they contribute to human security; providing basic materials for a good life, good health and good social relations – often through economic value. Thus, when considering climate change adaptation strategies respective of rural livelihoods, researchers had to also consider the fundamentals of how rural livelihoods based on natural resources (assets) develop - their drivers and influences (Table 1).

Table 1 Constituents of rural livelihoods, and influences that shape strategies and outcomes.

Livelihood platform	Access to assets modified by...	Taken in the context of...	The results in...	Composed of...	Resulting effects on...
Assets:	Social Relations:	Trends:		Natural Resource/ Asset Based Activities:	Livelihood Security:
Natural Capital	Gender, Class, Age, Ethnicity	Population, Migration, Ecological			Income level, Income Stability, Seasonality, Level of Risk, Access
Physical Capital		Changes, Technical		Extraction - Fishing, Cultivation, Forestry, and Livestock	
Human Capital	Institutions:	Change, Macro-Policy and Market Demands			Environmental Sustainability:
Financial Capital	Regulations, Policy, Customs, Tenure, Traditional Use	Shocks:	... in a Given Set of Livelihood Strategies	Non Natural Resource Based Activities:	Water and Soil Quality and Quantity, Fish Stocks, Land Quality, Forest, Biodiversity
Social capital	Organizations:	Natural Disasters, Recruitment Failures, Disease		Trade, Services, Manufacturing	
	Associations, NGOs, national Agencies, Local Government				

Taken into consideration the dynamics put forward in Table 1; for an accurate analysis of 'influences' effecting climate change adaptation, researchers must also consider imbedded hazards associated with society that may relate to climate change vulnerability. Reflected in Figure 3 is a reworking of the livelihood framework presented in Table 1 to include elements of natural hazards and those of society that may have an equal or emphasized influence on climate change adaptation strategies - as factors of choice, effectiveness, and supporting systems that may or may not determine adaptation outcomes.

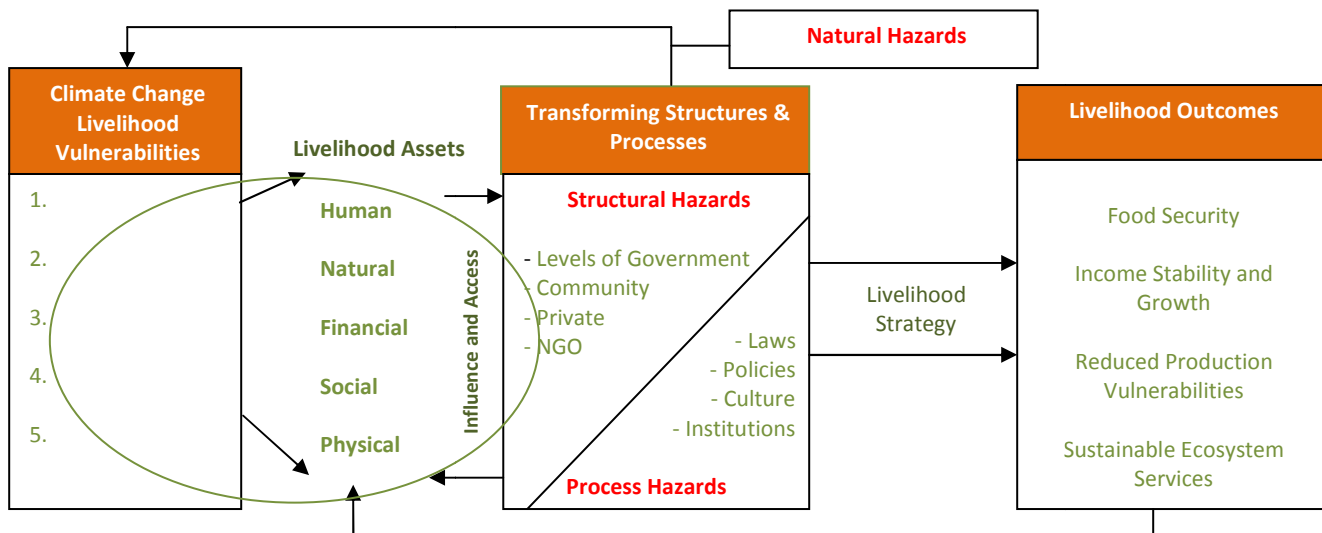


Figure 3 Expanded conceptual framework outlining origins of possible hazards that could influence rural livelihood strategies in the context of climate change vulnerability.



PROCESS METHODOLOGY AND SCOPE OF INQUIREY

The methodology has been explicitly detailed in an accompanying document to this paper². Following, is an overview of the process:

TOOL #1

Focus Group Discussions (FGDs) used as a 'warm-up' activity to introduce the topic of climate change, the scope of the research, and to allow participants space to share and discuss their 'climate change' experiences openly;

TOOL #2

Natural resource flow and hazard spot maps used to provide reference points to ecosystem composition, natural assets, natural resource use and management patterns, to hazardous locations. The map was used to further reference physical information gathered from other investigative tools, to help facilitate and contextualize discussions, and to help formulate relevant questions to deepen the research;

² AIT-UNEP RRCAP 2011. An approach to climate change adaptation Research: Events, Strategies, and Drivers. Bangkok, Thailand

- TOOL #3** Ecosystem services change matrices, used to facilitate participating stakeholders in the identification of 'changes' noted in their surrounding ecosystems, and in the services these systems provide, e.g. supporting, providing, and regulating services over a period of time. The purpose of the exercise is to help stakeholders focus on 'change' in multiple dimensions, and to provide researchers with an idea of context and where climate change impact and adaptation may be happening;
- TOOL #4** Extended livelihood profiles to define changes resulting from climatic changes and impacts. This profile also documented the range of adaptive responses to losses and assets used, or lack thereof, to sustain or improve livelihoods;
- TOOL #5** Hazard, vulnerability, and action profiles to define climate hazards and vulnerabilities to these hazards in the context of the physical environment, and that of society as a whole. Hazards were divided into three (3) categories: 1) those associated with natural events and the environment (flood, drought, fire, weather related storms, pests, to environmental degradation); 2) those associated with culture and societal norms that prevent gender equity and local participation; and 3) that associated with access to natural resources, development services, and participation in decision-making processes. The action profile underscored drivers of climate change adaptation; identifying climate related hazards, the impact of this, how villages react to the impact, and what capacities were used to support the reaction. Together the aforementioned outlined the complete range of elements that intuitively drive climate change adaptation; and
- TOOL #6** Risk reduction Development Service Profiles (DSPs) built from key climate change impact issues identified with Tool 5, i.e. dealing with hazards. This was done to provide researchers with a view towards development services villagers (and upward) could access, and other can provide in support of climate change adaptation strategies; as well as identify gaps in development services to support climate change adaptation.
- Note that the full complements of tools were used during village level investigations; with participating stakeholders coming from the commune, district and provincial level, focus was placed on TOOL #6 – DSPs using the hazard statements formulated at the village level.

SCOPE OF INQUIRY

- **Temporal changes:** This forms the root of a situational analysis, noting changes in natural asset based livelihoods, from form and level of productivity, understanding what ecosystems services support livelihood strategies, to the performance of the services, i.e. are they meeting the demand over a given period of time – Tools #1 – 4;
- **Elements of adaptation:** Understanding an identified 'hazard', its location of impact (Tool #2), and the form of response to mitigate the impact of the hazard. Linked to mitigation, assets are used and they come in the form of inputs. Through Tool #5, these elements are defined, however, it is also important to note where assets are being derived from – this links in part to Tool #4 and to Tool #6;
- **Driving forces of adaptation:** This can begin from several points of origin, climate hazards, form of chosen livelihoods and the capacities that support or not needed improvements, to a decline in ecosystem services; hence the importance placed on understanding context and how assets are used and managed. Tool #5, through facilitation, focuses the research on the impetuses to climate change adaptation - climate related hazards and impacts, and details the mode of an adaptation strategy

taken – influenced by assets and opportunities available to make adjustments to hazards, new conditions, and or stresses;

- **Linkages to adaptation:** Understanding if the adaptation strategy is a result of new conditions and or stressors. This requires the use of temporal knowledge, and an understanding of development priorities and initiatives in the given target area. Focus Group Discussions outlined in the tools would provide this insight, as well as strategic information from comparing the different DSPs developed at differing levels of investigation; and
- **Form of resilience obtained:** Many of the tools strategically chart what is doing better and what is not, the reason for this, and outcomes of the actions taken to improve a given situation. However, for a complete analysis of resilience obtained, the researchers had to link impacts to actions taken in terms of society, from the point of family and upwards – including levels of governance. This information was derived from a ‘complete’ understanding of all information derived. Importantly, this composite of information also help researchers identify the root causes of climate change vulnerability. It is important to note that by defining functional relationships, and the form of development services provided in support of a prioritized need, researchers were able to identify existing capacity gaps – from knowledge needs, to the delivery of technology, to multi-stakeholder cooperation in terms of collaboration and decision-making processes.



STATE OF AUTONOMOUS AND PLANNED ADAPTATION – KNOWLEDGE, ASSETS, STRATEGIES, AND OUTCOMES

CLIMATE CHANGE VULNERABILITY: EXPOSURE, SENSITIVITY, AND ADAPTIVE CAPACITY IN CONTEXT

To understand the current state of autonomous and planned adaptation knowledge and strategies in use, first, we must understand what coastal communities are experiencing and trying to adapt to in the context of climate change vulnerability, i.e. exposure, sensitivity and adaptive capacity. In an Inter-governmental Panel on Climate Change (IPCC) report, EXPOSURE is defined as “the nature and degree to which a system is exposed to significant climatic variations”; SENSITIVITY is defined as “the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli”; and ADAPTIVE CAPACITY is defined as “the ability of a system to adjust to climate change (including climate variability and extremes), to moderate the potential damage from it, to take advantage of its opportunities, or to cope” with combined capacity gaps respective of the constituents of adaptive capacity (Anshory, A., and Francisco, H., 2009). The following is a general perspective of climate change vulnerability in the context of the research area:

EXPOSURE

In terms of climate-related hazards, impact beyond past and current conditions of cyclic wet and dry season variations is limited. However, in recent years, storms during the wet season are said to have intensified; during the dry season, intensified temperatures are experienced in conjunction with increases in pest infestations affecting agricultural production. Amongst coastal and inland communities there is a heightened sense of concern respective of prolong dry seasons; that leading to conditions communities consider as drought conditions. This is describe as an absence of available water sources for domestic and agricultural use extending beyond three (3) weeks.

SENSITIVITY

Conditions of drought dominate both the minds of rural communities and the landscape of the coastal and inland communities. This is a combination of two factors, 1) the physical scarcity of useable water (quantity and quality) and 2) economic scarcity of water. Physical scarcity is attributed to environmental impacts, e.g. degrade watersheds and land use changes disrupting natural flows, and a lack of capacity to ensure and manage water storage and distribution multiple uses. The aforementioned and the lack of economic capacity to purchase available water lead to the 3rd factor contributing to climate change vulnerability – adaptive capacity.

ADAPTIVE
CAPACITY

Generally, coastal communities have far more adaptive capacities in place to deal with flood and storm conditions than drought, and that adaptive strategies in times of drought are more apt to lead to mal-adaptation than the building of resilience to drought conditions. For the inland District of Boseth, Kompong Speu Province, adaptive capacities respective to drought and flood are similar, however adaptation strategies lead to less mal-adaptation – a factor of increase options and opportunities available to villagers to deal with given drought conditions.

CLIMATE HAZARDS, ONWARD IMPACTS, LOSSES, AND LOCAL RESPONSES

The previous subsection is a highly simplified analysis of climate change vulnerability amongst the research sites; a deeper analysis of local adaptive capacities across a spectrum of stakeholders within the coastal provinces revealed the true nature of what the rural poor in the villages are trying to adapt to and how. This constitutes a spectrum of climate related cause and effect stimuli on ecosystems, combined to a spectrum of socio-economic and political influences that are shaping adaptation strategies, the outcomes of these, and for whom.

Data and the analysis of the following draws on information gained through the use of participatory tools that allowed villagers to self analyze their ‘climate change’ and ‘development’ situations. An overview of their ‘climate change’ impact situation and responses to this are given in Table 2. It is important to note that the concept of ‘climate change impact’ is a very abstract concept for most stakeholders involved with this research, thus ‘hazards’ only invoked generic responses from participants as indicated in Table 2. However, integrating data from the Extended Livelihood Profiles and Hazard, Vulnerability, and Action Profiles; clearly communities related to climate change impacts in terms of losses, and adaptation responses in terms of the assets they mobilize or access to deal with given losses.

Table 2 Perceived climate change impacts by villagers in the research area, including general responses to the impact and resilience achieved from the response.

Hazard	Impact	Response	Resilience	Perceptions
Flood	Agriculture, aquaculture and animal husbandry production loss equating to income losses.	- Move productive assets such as livestock to safe locations; and - Mobilize and or tap monetary and institutional assets to cover losses in income and to regain productivity.	Able to maintain food security and human safety.	Water management efforts are on-going, but ‘dikes’ are only to retain water for dry periods. Water management systems and infrastructure cannot manage well excess water during the wet season
Storms during wet season	Property loss but more frequently, damage to rice farm production and associated income losses.	- Some farmers are experimenting with short stalk rice varieties; and - Mobilize human resources to compensate for farm income losses – temporary outsource of human labor.	Able to maintain food security and human safety.	More frequent and increasing in intensity over the last five (5) years.

Prolonged dry season	Erodes ecosystem services impacting multitudes of natural resource based livelihoods, e.g. aquaculture, agriculture, and fishing.	☒ Mobilizing monetary assets for onward sale; ☒ Borrowing money to maintain basic health and food security needs; ☒ Increase in inputs to maintain livelihood productivity; and ☒ Exploitation of adjacent natural environments.	Seldom are immediate needs met; and Strategies can be considered as mal-adaptation practices with negative medium to long term effects.	Often coupled to increased heat and pests infestations... effects are lasting and recovery rates slower than other natural hazards – streams, dikes and reservoirs are able to retain water, but only provide for a 2-3 week buffer.
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Following is a deeper review of how the rural poor are adapting to climate change as they see it - in terms of losses related to a spectrum of experiences, e.g. from livelihood productivity to food security, to human safety and health, to losses in ecosystem services that support the aforementioned. Data has been summarized and given in the form of a strategy as follows:

LIVELIHOOD PRODUCTIVITY AND INCOME LOSSES – NATURAL ASSET BASED

KNOWLEDGE INPUTS	Making up for losses, local people make use of technical knowledge to reduce climate change impact stresses by trying to further boost agricultural and animal husbandry production – knowledge associated with the application of material inputs, e.g. fertilizers, pesticides, commercial feeds, and how to minimize water purchases. To a far lesser extent they use their knowledge basis to diversify their livelihoods.
ASSETS USED	Assets mobilized to make up for livelihood productivity losses include direct inputs from develop service providers such as government agencies and or NGOs, e.g. seeds to replant lost crops and fish fry to restart aquaculture initiatives. The use of savings and micro-finance institutions are further assets tap in times of increased climate stress outlined in Table 2. Other institutional assets tapped are local water management associations, and to a far lesser extent farmer field schools or farmer extension services.
ADAPTATIONS	☒ Increase of material inputs, e.g. fertilizers, pesticides, commercial feeds, and the purchasing of water; ☒ Use of micro-finance for material inputs and to composite for other losses; ☒ Shifts in feed supply for livestock to those of lesser value, e.g. use of spoiled rice and vegetables to replace a lack of natural fodder or loss of commercial feeds; ☒ Shifts in domestic food consumption – lesser quality and quantity; and ☒ Use of Thailand based radio for storm monitoring and early warnings for marine fishermen – SECURING FISHING ASSETS.
EFFECTIVENESS OF THE STRATEGY	Limited resilience to climate change impacts gained. Increase inputs into livelihoods only slow/ reduce the rate of production decline year on year. However, fishers have been able to secure their fishing assets – a stark change from previous years.

Note that when dealing with livelihood productivity and income losses, focus is on replacement of lost assets – not on building climate change resilience within natural asset based livelihoods. Additionally, most locals tap institutional assets only in times of stress or when approached by development service providers. Again this indicates more-so reactive and short term responses to adverse climate stimuli, i.e. autonomous adaptation strategies, rather than strategically thought out/ planned adaptation strategies.

When considering income losses in general, many locals will seek temporary labor activities – for young women and men, they seek off farm opportunities in construction and manufacturing; for adolescent men and women, they seek other agricultural related activities for cash, or in kind payments, e.g. food. Note that for some this has resulted in improvements to family health and nutrition, but social and safety risks associated with those that have migrated are considered significant. Hence, for the targeted areas, off-farm labor has been noted as a reactive response to extreme stresses like a prolonged dry season; the response ending most often shortly after the stimuli ends.

The mobilization of savings or the taking of loans is a common reactive strategy to compensate for livelihoods productivity losses. Noted is that most often for the poorest and or women headed households, informal and costly loans are accessed, for all, few use financing to enhance their livelihoods, even fewer to build climate change resilience within their livelihood profiles. Overall, increased inputs, increased cost, and the increased use of micro-finance as a strategy to compensate for livelihood productivity losses has created a cycle of debt, and very limited maintenance of livelihood productivity – not increases.

FOOD SECURITY LOSSES

KNOWLEDGE INPUTS	The scope of knowledge inputs can be describe as ‘local knowledge’ learned and past through generations respective of ecosystem productivity; what and when ‘food’ would be available amongst a range of ecosystems. In recent years, as competition for limited food resources increases in times of stress, villagers combine ‘production’ based knowledge to that which tracts community movements – getting to available natural resources at the right time and ahead of others.
ASSETS USED	It is common place to access food banks/ hand outs via religious, government, and aid institutions to compensate for losses in food security. The aforementioned listing is relative to the degree of stress experienced, e.g. low stress, religious institutions are the primary provider. Focus is on the replacement of lost ‘food’ assets as a reaction to heightened adverse stresses; however, religious institutions also provide a continuous safety net to food insecurity.
ADAPTATIONS	✦ Exploitation of one natural asset after the next depending on availability of food resources, e.g. movement to usable alternative agriculture locations, heightening extractive pressure on lakes, rivers, and then mangroves to meet daily food requirements, then to forests based food resources; ✦ Reduction in food consumption for women and children; and ✦ Trading labor for cash or food supplements, small informal money borrowing for food/ and of food if needed.
EFFECTIVENESS OF THE STRATEGY	In most cases villagers are able to maintain ‘limited food security’ but at the detriment to women and children; noting that mothers indicate growing problems of malnutrition and under nutrition is recent years (approximately a 5-year period). Heightened competition for limited food resources from providing ecosystems has disrupted community unity, and degraded the ecosystems’ ability to recover and or function normally.

Of interest and of heightened concern is the level and rate that ‘community unity’ is degrading as villagers compete for a limited resource base. With some villages, relationships have deteriorated respective of government stakeholders mandated to

regulate the use of the natural resource base; in others, it is within the community itself where relationships have degraded. Looking outward, forestry resources have been listed last in a series of choices/ movements. This is attributed to the state of the resource base - degraded and offers little in terms of an immediate 'food' resource for relief. Mangrove forests for some communities are a very important source of direct food, for others, the mangrove forest is out of physical reach, or access may come with some degree of 'social-safety' risk, i.e. would be seen as intruders if from another village or commune not involved in the management of the resource base. Overall, expressions of 'disunity' and 'exclusion' are working against natural resource management and climate change resilience objectives in the areas.

HUMAN SAFETY AND GENERAL HEALTH LOSSES

KNOWLEDGE INPUTS	For those that fish in the open marine system, knowledge inputs come from formal channels of communication related to broader weather conditions and a resident understanding of Thai; those fishing inshore, informal channels of communication are used respective of knowing about more localized weather conditions. The use of these knowledge bases is to secure human safety at sea. Other knowledge bases focus on the use of local medicines (from the natural resource base) and other remedies to address health matters related to increase and prolonged hot periods (primarily heat stroke and fever). In some case, villagers have had exposure to awareness building activities on how to protect their general safety and health during hazardous conditions, e.g. flood and drought conditions.
ASSETS USED	For safety when working in the open marine system, assets in play focus on a Thailand based radio system for weather reports – reports geared to fishermen and their livelihoods. Other assets often in use are medical facilities and micro-finance institutions - used to offset costs associated with extreme cases of deteriorating health, i.e. when hospitalization is needed. Informal borrowing is used in less extreme cases to purchase medicines.
ADAPTATIONS	- Adapting to increase temperatures locally has prompted the planting of trees for shade around homes and active centers of trade; - Use of formal medical facilities; and - Application of communication knowledge when applicable.
EFFECTIVENESS OF THE STRATEGY	In general, adaptations have yielded little results in lieu of building resilience to 'general health' losses. Follow-on impacts on moderate to extreme cases yield higher debt, lower health levels, and lower income levels from lost productivity. Safety levels at sea have increased significantly; this also contributes to securing livelihoods by minimizing the loss of material assets.

Knowledge bases and the use of such around local medicines (from the natural resource base) are on a downward trend. Noted by villagers is that the 'knowledge' is being lost, 1) because the surrounding ecosystems are degraded, i.e. traditional medicines are no longer available, and 2) an upward trend respective of availability and access to modern health services. Additionally, the mobilization of 'health and safety' assets is centered on addressing the impact of a hazardous condition, and to a far lesser degree on building awareness and resilience to this.

ECOSYSTEM SERVICE LOSSES

KNOWLEDGE INPUTS	There is a wealth of knowledge inputs around law, policy, and governance processes related to the natural resource base. In some cases where villages have been engaged in natural resource management activities, knowledge on ecosystem restoration and processes of sustainable management are resident but vary greatly, e.g. good to minimal.
ASSETS USED	Assets used to deal with ecosystem services losses focuses on the use of human assets and institutions (government and non-government based) to communicate and report problems associated with the legal governance of the resource base, e.g. illegal fishers, loggers and intrusions on agricultural land. In some cases, individual social capital is used to exert pressure over how and who will benefit more from ecosystem services/ or who will absorb the losses more; to a lesser extent, group social capital is put into play in the same way.
ADAPTATIONS	- Minor inputs into community based natural resource management, e.g. mangrove reforestation to lessen impacts of storms for communities living on the coastal fringe; and - Few individuals have moved towards 'organic' farming to preserve soil fertility and water quality.
EFFECTIVENESS OF THE STRATEGY	Inputs have had positive impacts on curbing 'abuse' internally, but not from external actors. This has strained relationships between locals and gov. agencies/ officials. There is a growing interest in CBNRM and an understanding of CBNRM roles and responsibilities, but inputs to facilitate this are small. In general, losses equate to higher debts, lower levels of health, and lower income levels for most families.

Dealing with the loss of ecosystem services is seen by researchers and villagers as one of the most important, yet problematic areas to deal with such losses. It should be noted that efforts into water resource management, as seen from a livelihood point of view, are not done in a way to protect/ rebuild ecosystem services – rather in a way to ensure water availability for rice production needs. This vein of thinking also holds true when referring to how farmers are dealing with losses in soil fertility for agricultural purposes, e.g. increased inputs of commercial fertilizers. Notably, movements towards preserving and or improving soil fertility and water quality and quantity through organic farming technologies have been hampered by recent drought conditions, i.e. a lack of usable fodder for compost production.

RESPONDING TO LOSSES AND ADAPTATION NEEDS THROUGH DEVELOPMENT SERVICES

Village level participants worked toward the development of 'Hazard Statements'; statements that outline their capacity gaps to deal with climate change impact in conjunction with sustainable development issues. Following, around these statements development service stakeholders were identified – those that were involved in addressing the hazard statement, subsequently, their services profiles and relationships were documented, i.e. the Development Service Profile (DSP). Using the village hazard statements, DSPs were also developed at the commune, and again at district levels with provincial level participation. The following are five (5) composite hazard statements formed from the many, developed at the village level (see Annex 1 and 2 for detailed information):

- ✚ Lack of capacity to secure fisheries and agriculture activities in villages to bring continuity to food security;
- ✚ Lack of capacity to meet water resource needs economically during flood and drought cycles outside of rice production needs;
- ✚ Lack of capacity to lower the impact of drought on home based food production systems to ensure food security throughout the year;
- ✚ Lack of capacity to access development services appropriately, e.g. micro-finance institutions, livelihood technologies, and natural resource management; and
- ✚ Lack of capacity to engage in local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs.

In general, noted in the DSPs is that there are a multitude of services providers addressing different areas of 'climate' hazards; hazards that are interconnected with social and economic risks. Responding to a lack of capacity to secure fisheries and agriculture activities in villages to bring continuity to food security, development service provisions focus on knowledge and technical skills building, e.g. fisheries law, to backyard fish farming, and direct livelihood start-up inputs, e.g. fish fry. However, inputs have not led to the active use of capacities, or the sustainability of efforts – skills remain primarily as knowledge. Lacking from the DSP is support to bring together livelihood efforts into a business format – using organizational development skills, financial management skills, and the ability to recognize and act upon adaption needs and opportunities. DSPs are often composed of one time informational events, and or have a replacement focus on compensating for direct losses, e.g. replacement of fish fry.

Consistently highlighted by villagers is their lack of capacity to meet water resource needs economically during flood and drought cycles outside of rice production needs. DSPs are highly focused on maintaining water needs for rice production, e.g. dike maintenance/ building, water gate operations, to the supply of pumps and fuel to access water reservoirs. DSPs related to supporting water needs, both physically and economically for backyard food production and natural food chains are weak. Inadvertently, water salinity in many village areas is controlled by dike and flood gate management - holding back the intrusion of seawater into freshwater sources during the wet season, but this is ineffective during the dry season and not sufficiently capable of supporting current backyard gardening, aquaculture and animal husbandry needs – needs very important to village food security. Notably, meeting domestic freshwater needs for animals and humans are costly... this water often has to be bought from vendors. Note that the digging of wells to capture freshwater in most of the research areas is highly problematic: the geophysical context lends to saltwater intrusion easily.

The aforementioned has a direct relation to the 'next' hazard statement – a lack of capacity to lower the impact of drought on home based food production systems to ensure food security throughout the year. There are a range of development services focused on this issue; in essence the 'gap' is that development services providers lack the resources to reach all those in need, and for those that can be research, support lacks continuity and comprehensiveness, i.e. most often services are one time knowledge building events. Thus, knowledge digested is not being supported in a way that moves it from a state of information to that of strategic planning and sustainable implementation. When considering the lack of capacity to access development services appropriately, this connects well to the aforementioned, and to similar troubles and challenges. For example, villagers make use of micro-finance institutions, but seldom make use of these funds to enhance and or build resilience to their livelihoods, nor are these funds tied to support services to assure funds could be applied to such effectively, e.g. skills training and oversight.

When considering access to livelihood technologies; villagers have pointed out that whatever form of develop help comes along, they either take the chance of engaging or not. Notably, this is not an informed decision or one of based on participatory inputs, rather a decision based on one way communications – provider to recipient. Considering accessing natural resource management development services, researchers noted a continuum of results. In areas where strong elements of good participation³ and communication existed, the quality of the resource base itself, and that of livelihood assistance programs were meeting adaptation and village development needs and delivering results, e.g. the Phum Mouy Village, Peam Krasoab Commune, Koh Kong Province. The opposite is evident when consider the situation in the village of Boek Krang, Prey Nup Commune, Sihanoukville Province. At this end of the spectrum, absent is a DSP that offers the complete range of needed capacities for multiple levels of interactions - village, commune, district to provincial levels. Noted are existing gaps in a range of needed knowledge and capacities to supported community based natural resource management (CBNRM) actions, e.g. community facilitation, ecology and CBNRM technology, organizational development skills, to the building of financial mechanisms needed to sustain efforts indefinitely.

The ultimate question asked most often of the research teams is... are we/ they gaining resilience to climate change? This question cannot be answered definitively given the limitations of the research, but what can be said is that there are several general observations/ relationships emerging that influence if a community is coping with climate change or adapting and building resilience to this (Figure 4). Seen is that the ability for a rural community to cope with climate change largely depends on the condition and diversity of the natural resource base they live within. If living in a degraded area, needed is sustained access to relief services just to survive. If living within a diversified ecosystem, provisional ecosystem services can provide communities with adequate resources to cope; even build small levels of resilience if they have appropriate access to development services. Ultimately, villagers participating well in their development and natural resource management efforts, they are adapting to climatic changes. Unfortunately, few within the research area are building resilience; widespread is a downward trend of resident resilience to a multitude of natural and socio-economic hazards over the last five years.

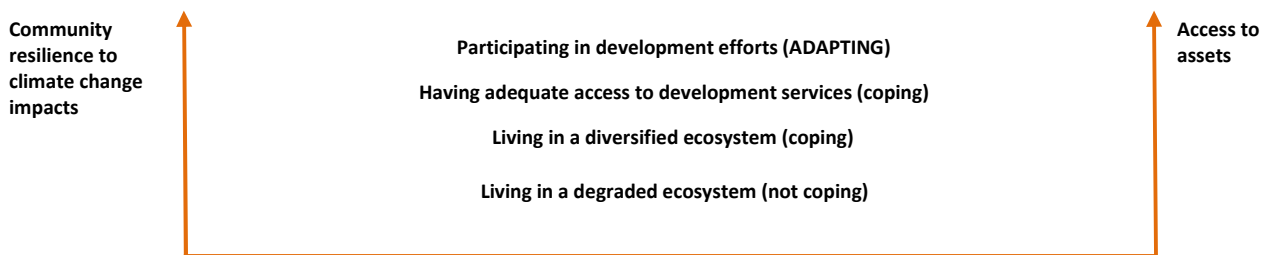


Figure 4 General linkages between community, and the degree and form to which they can access assets, natural and development services, to gain resilience to the impacts of climate change.

³ Good participation is characterized by strong elements of shared responsibility, mutual understanding and inclusive solution finding and decision-making.

REFLECTING ON LOSSES AND CLIMATE CHANGE ADAPTATION

First and foremost, all participants in this study have noted that climate change adaptation does not work in a box. The need for adaptation and the form of adaptive response taken is shaped by land use and land management patterns, by development patterns, and expressions of interest by the individual and that of groups and their influence over a given situation. Most local level adaptations to the field of losses presented focus on the immediate; little thought nor assets are mobilized or invested to turn these responses into medium and or long term positive adjustments. Moving from the local level upward, adaption responses in terms of investment and development service provisions mimic closely that of a narrowly supporting economic development framework – growth through input, and that of a ‘relief’ response – replacement of loss, rather than the building of broad base resilience to climate change impacts.

Noted has been the lack of attention given neither to boosting or maintaining ecosystem services, nor to fostering two-way collaborative relationships to improve all aspects of natural resource management and community empowerment. We can also note that the degree of resilience obtained links strongly to the degree in which a village participates in its development and their efficiency in utilizing and accessing assets. Field experiences have drawn clear links between climate change impact, ecosystem carrying capacities, and the level of input into natural resource management. Although most coping/ autonomous adaptation strategies maintain basic levels of subsistence, this is steadily decreasing for villages that have low levels of participation in and access to development services offered... lesser for villages with less ecosystem diversity... lesser for those living in degraded ecosystems.



... ‘Separated from my husband 13 years ago, left with 5 children, I am able to cope with the changes in the village by having a small vegetable garden, raising chickens, and fishing when I can. My children have only reached grade 3 – as long as they can read and write, that is good enough... then they have to take on productive work just so we have food. Despite this situation I still participate in village development initiatives... and contributing what small money I can. Thinking of adapting to climate change... we can’t do more than just try to survive the day.’

Tach Heang from the commune of Prey Nup,

Photo and interview by Minette Arzadon, 2010

Respective of social and cultural hazards, reported by villagers is that no specific adaptive responses are taken to lower related risks to women, e.g. safety, health, and nutrition; to a minor degree consideration is given to children’s safety during extreme weather and climatic events. Hence, social and cultural risks are not recognized as a priority to invest resources in to lowering levels of risk/ vulnerability involved. For female headed household, there is a heightened sense of concern, but little to no support to move forward with. Understandably, for most the daily goal is to secure basic levels of health and resistance to climate change impacts... not resilience, e.g. basic food for the day. Risks associated with non-access to the natural resource base are well understood – but more so from a production/ extractive stance. For most villagers,

participation is not a very clear concept and most see 'being asked for information' or 'to do something' as a positive step for the day... more often than not, participation is undertaken when such can derive a bigger financial reward for the day than their normal livelihood and or food gathering activities. Important to note is that when local participants were asked to think of hazards associated with not participating well in development initiatives, this was as foreign of a concept to them as that of climate change. Posing this question at levels upward from the village; such was met at times with a skewed view, even disempowering understanding, of how participation respective of roles and responsibilities is to be expressed.

In the context of climate change adaptation, researchers tried to identify factors of choice, effectiveness, and supporting systems. The effectiveness of adaptation strategies has been quantified without too much grey area involved, as with supporting systems. However, factors of choice are highly dependent on what is driving adaptation, i.e. influences in the process leading to adjustments both forwards and backwards. In the following section, this and other factors of influence will be discussed in a way that we can begin to distinguishing between those as a result of climate change, and those as a result of transforming structures and processes, e.g. culture, institutions, and governance; including the degree of additionality such brings to climate resilience.



DRIVERS OF ADAPTATION: FACTORS AND INFLUENCES DETERMINING OUTCOMES AND BENEFITS

This section is based on a culmination of synthesized field based data, and that brought forth in a multi-stakeholder working-day that reviewed preliminary field results, and brought further understanding to climate change adaptation in relation to factors of choice, and matters of influence. It is very important to note that influences driving 'factors of choice' are highly complex, thus this sections will begin with building a general understanding, then adding the many complexities revealed and brought forward by those participating in this research.

In a most simplified explanation, driving forces behind climate change adaptation are stimulated by an experienced natural hazard and its impact shaped by factors of exposure and sensitivity; factors influenced by the state of the surrounding ecosystems, forms of livelihoods, and the level of infrastructure. The form of response to an impact by stakeholders is shaped by 'assets', those available to cope with in a given situation – autonomous adaptation, and by access to 'assets', those that support movement towards planned adaptation within a defined set of options (Figure 5). The active expression of the response determines the result, i.e. level of resilience to climate change built, or lost.

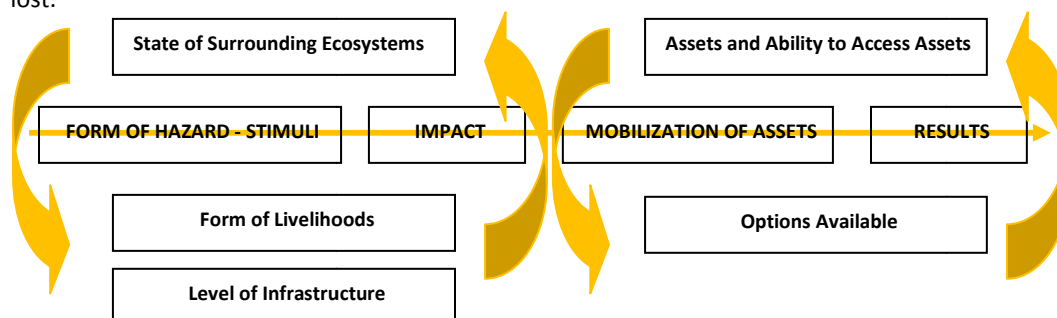


Figure 5 Basic climate change adaptation framework outlining drivers and influences that shape adaptation strategies and outcomes.

However, Figure 5 is only an emerging framework, and highly simplified. Added complexity to this 'equation' deals with how access to assets, and the use of these are influenced – social, cultural, economic, institutional and political influences; often determining if the natural asset base (ecosystems) will be further degraded or improved, who will benefit, and to what degree of resilience is gained or lost. These influences indicate that climate change adaptation does not exist in a vacuum, nor is it static; rather that it is tightly intertwined with how sustainable development is expressed and achieved at the level of community, country and society continuously.

During the 'working day', participants made note that there is a division to what stakeholders are adapting to... that between pushing livelihood productivity forward to address poverty and food security issues, and that dealing with climate related natural hazards. Also noted is that there is a general overlap, and a consensus – climate change exacerbates pre-existing challenges to improving natural resource based livelihoods and local resilience to a number of interlinked hazards. Thus, a deeper look into climate change vulnerability and constituents of adaptation influence yield a more comprehensive 'drivers of climate change adaptation framework' outlining plausible internal and external influences that shape adaptation strategies and outcomes (Figure 6)⁴.

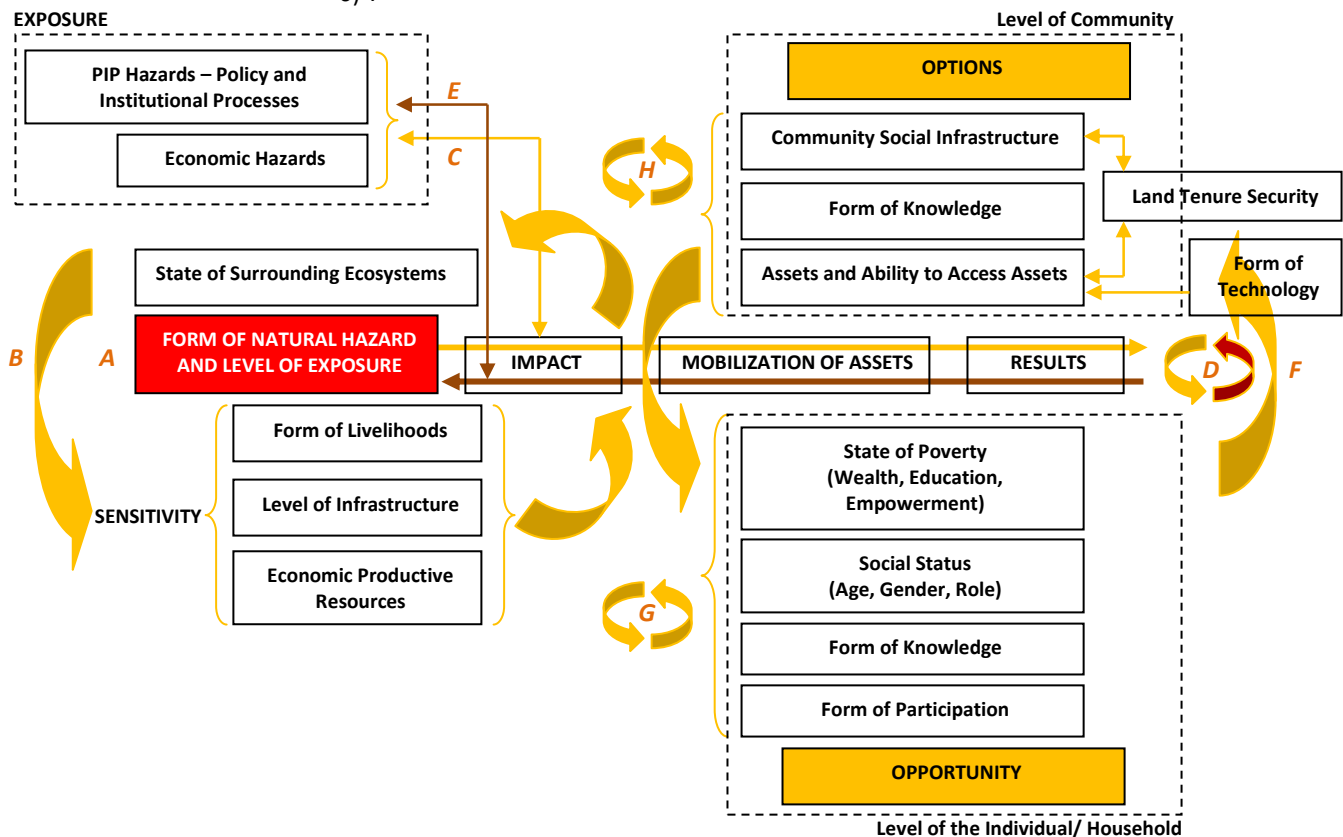


Figure 6 Comprehensive climate change adaptation framework outlining key drivers, and internal and external influences that shape adaptation strategies and outcomes (*letters in italics refer to content discussed in this section*).

⁴ Figure 6 is a composite view compiled through the efforts of, a range of village to provincial representatives from the provinces where research was conducted, 2) national non-governmental organizations working in the field of climate change adaptation, and 3) representatives of national governmental bodies, international non-governmental institutions and consultants with mandates to support climate change adaptation (see Annex 3 for participant list).

(A) The form of the natural hazard (not disaster) and level of exposure has been discussed in other sections; what is important to further discuss is how this links to the level of impact experienced. (B) This in itself has a cyclic pattern of influence starting with the level of stability and natural wealth within the surrounding ecosystems, and elements of sensitivity⁵ related to people's general resilience to adversity, e.g. the nature of their livelihoods and the productive natural resources they use, and the level of infrastructure supporting and protecting these livelihoods and the communities physically. On one level, the form and degree of impact is a function of sustainability as it would relate to the use and management of ecosystems, and that of a natural resource base livelihood operating sustainably, i.e. within the bounds of an ecosystem carrying capacity. Improvements on either side of the equation tend to result in a lesser impact. (C) However, within this form of 'regulatory' mechanism, the system is shaped by its exposure to external hazards such as policy and institutional processes e.g. land use and management patterns, development patterns, and economic factors, influencing the behaviors of stakeholders. It should be noted that the level of climate change impact cannot be determined without considering the given constituents together.

Climate change adaptation at the local level often begins with the mobilization of assets, and how this is done, supported, and or influenced determines the result. However, participants in this study have also noted that the end results of adaptation (D) also influence policy and institutional processes (E); and adjustments made influence the cyclic pattern put forth (B); level of impact experience, and the nature of what stakeholders are adapting to.

The aforementioned clearly indicates the dynamic and ever changing nature of climate change impacts... subsequently this is also true when considering adaptation strategies structured around the mobilization of and accessing of assets, e.g. factors of influence, limitations, and advantages. To researchers and participants in the working day, adaptation strategies and their outcomes also operate in a cyclic process of influences; those operating at the level of the individual and or household, and those at the community level (F). Internally, each has a set of component factors that influence one another (G-H) as shown in Figure 6. What is important to note is that at the level of the individual and household, internal factors (G) influence the level of OPPORTUNITY one has to access assets in order to gain climate change resilience; conversely, the level of risk they are exposed to losing resilience as climate change impacts heighten. At the level of community, internal factors influence the type of climate change adaptation OPTIONS available to the community as a whole (H). As such, land tenure security and the movement of usable and accessible technology into a community influences greatly the level of climate change resilience achieved.

From the aforementioned, noted conceptually through participants' experiences is a complex arrangement of degrees, levels, contexts, and feedbacks around society, culture, economics, and even nature. Intuitively, given limitations respective of the scale and depth of the research initiative, one-on-one interviews and stakeholder inputs match what has been put forth in principle. But people, communities, and stakeholders do not always fit well into little boxes. However, achieved through participation has been the building of a better understanding of how climate change adaptation is driven. Additionally, key internal and external influences that shape adaptation opportunities and options have been identified. Building on this understanding, the following section reflects on the 'adaptation experiences and insights' put forth in this and previous sections to answer questions around that of onward 'risks' associated with adaptation

⁵ Sensitivity: Defined as "the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli.

responses, how mal-adaptation can be identified and prevented, and what is needed to support better support good adaptation responses at the local level. Additionally, provided by research participants is a set of short to medium term actions that could help in overcoming identified barriers to climate change adaptation in the coastal areas covered by the research.

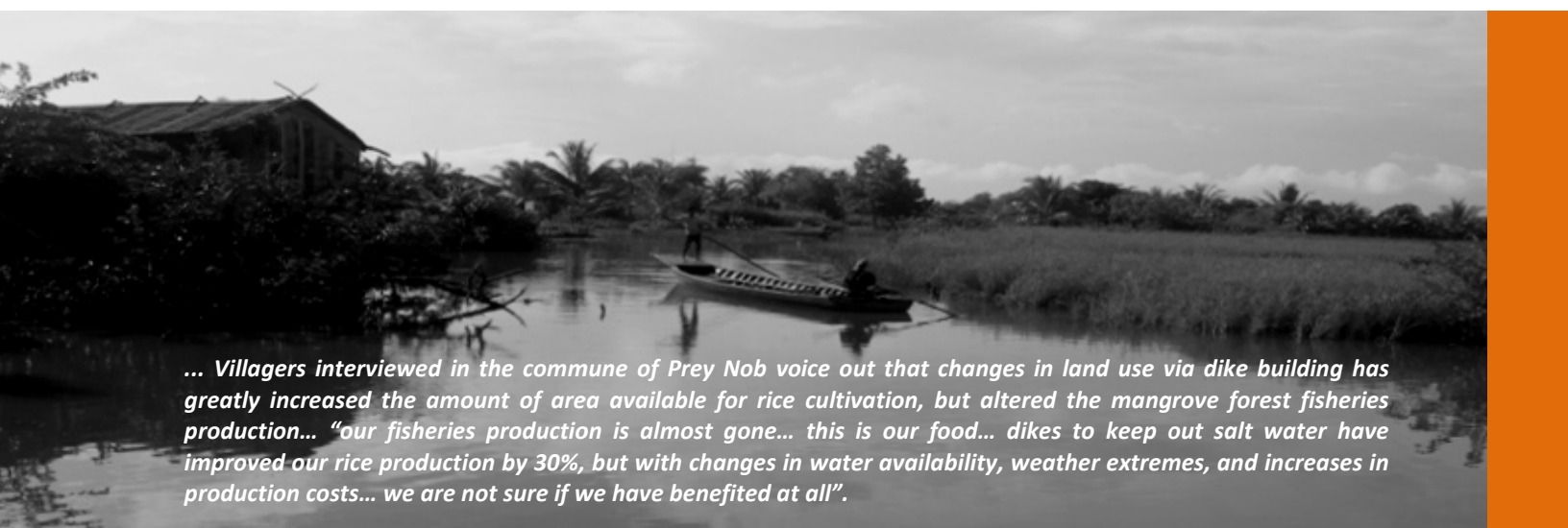


REFLECTING ON ADAPTATION EXPERIENCES: CHOICES MADE, RISKS, AND FORWARD STEPS

CHOICES MADE

Climate change adaption is a very reactive response at the village level, often deteriorating the natural resource base, creating cycles of debt, and at times creating disunity amongst resident social and governance structures. For the most part, local adaptation responses are coping strategies – coping with crushing poverty⁶, and a lack of viable opportunities and options to build resilience to climate change impacts. Intuitively, this drives mal-adaptation. Gaining resilience to climate change is highly dependent on the degree of poverty one starts with; a higher incidence of poverty will most often equate to more mal-adaptation. However, it is important to state that mal-adaptation is not 100% a factor of choice, but a matter of situation stemming from a lack of capacities to enact good adaptive ideas.

We can also note that at higher levels of governance, the commune, district, and province, the degree of adaptation planning increases accordingly. In many ways this can be attributed to a disconnection from the need to meet daily subsistence needs as an individual, and a connection to role and responsibility processes to support local development. However, this does not mean that mal-adaptation cannot happen when taking a planned approach. As an example from the field, seen is that land use changes and water management activities can bring ‘benefit’, e.g. increase land area for agricultural cultivation, but with climate change impacts, production costs, and production losses due to extreme weather events, the intent can produce a reversal of benefits.



... Villagers interviewed in the commune of Prey Nob voice out that changes in land use via dike building has greatly increased the amount of area available for rice cultivation, but altered the mangrove forest fisheries production... “our fisheries production is almost gone... this is our food... dikes to keep out salt water have improved our rice production by 30%, but with changes in water availability, weather extremes, and increases in production costs... we are not sure if we have benefited at all”.

⁶ Poverty is taken in a broader context: A lack of basic human needs, such as clean water, nutrition, health care, education, clothing and shelter, and a lack of ability to participate effectively in one’s own development – claiming and benefiting from true expressions of human rights and human dignity.

RISKS

How do 'we' know if good or mal-adaptation has occurred? For this study, good adaptations meant a reduction in vulnerability to climate change impacts without causing further risks to the well being of ecosystem functions, local livelihoods, and to the well being of society as a whole. Conversely, mal-adaptation was noted if climate change vulnerability has increased as a result of an adaptive practice. At the village level, risk, vulnerability and climate change impact are all equated to various forms of loss, and village responses to these are just to meet daily needs... if this is done then it would be seen to them as a good strategy, if not... try again tomorrow. At district levels of planning, a good adaptation response, for example, is noted when the level of rice production rises per hectare; mal-adaptation when governance over the resource base becomes problematic. Perhaps these simple and real examples from the field indicate in some way that to know if mal-adaptation has occurred or not definitively, is a matter of 'whose perspective', their context, and what context has been left out when reporting gains or losses. Hence, it is context that has to change to bring about efficient planning and support for adaptation, irrespective of the level of stakeholder.

How can we prevent mal-adaptation? Highlighted in several places in Figure 6 is the 'form of knowledge', 'form of participation', 'opportunity', 'options' and many other factors that influence adaptation outcomes. These influences can be broken down into the following constituents – and if supported in a positive way, mal-adaptation can be avoided:

- Information, and development services flowing into and out of targeted areas;
- Patterns of vulnerability created by gender, income and social position;
- Diversity of livelihood systems within a targeted area or region;
- Ability of people to secure and access alternative sources of food, productive goods, and non-farming sources of income;
- Social and institutional capital, access, and cooperation (education, self-help groups, government departments, banks, NGOs and social networks etc.);
- Physical infrastructure (communication and early warning systems, roads, houses, water supply systems, dikes, and reservoirs etc.);
- Ability of households in the targeted area to obtain secure sources of water for domestic use; and
- Natural resource conditions, use, and management.

Preventing the risk of mal-adaptation occurring begins with strengthening positive influences and addressing those less desirable, e.g. 1) through enhancing the connectivity of knowledge, use of participatory planning, and comprehensive support to deliver planned adaptation and development actions, and 2) by using the aforementioned to target the most vulnerable and to avoid crisis situations – situations that require reactive responses. Unavoidably, this links to how development services providers can better support local development and adaptation needs.

FORWARD STEPS

Development services are constrained by their own capacity to deliver adaptation support, be it financially, the lack of appropriate technology, even the lack of human resources to reach so many in need. True, there are some desperately need and costly needs within the coastal provinces, e.g. robust efforts to boost infrastructure around water management, storage, and water delivery. However, there are some small adjustments to the delivery of their profiles that could help avoid mal-adaptation responses, and build resilience to climate change:

- **RECOMMENDATION 1** - Fostering two-way communication and collaborative relationships between service providers and recipients. This small step could improve the connectivity of knowledge, e.g. around ecosystem services and natural resource management. Two-way communication can also improve people's participation in their development; highlighted as a major factor to successful adaptation. Collaboration can also bring about the efficient use of limited resources – combining resources to create good models sites for extension learning purposes, even innovation to guide others away from mal-adaptation;
- **RECOMMENDATION 2** - Harnessing local committees and associations to improve the movement of knowledge in and out of vulnerable areas. Actions should create a form of collaboration between the actors involved, i.e. ensuring knowledge needs are met in content and form, and collaboration on how such can be disseminated and updated systematically;
- **RECOMMENDATION 3** - Increasing participation in, and or initiating community forms of natural resource management beyond law enforcement, e.g. the rehabilitation of ecosystems. Actions should also extend to the formal recognition of community based groups; their rights, roles and responsibilities, and returns;
- **RECOMMENDATION 4** - Ensuring that micro-finance, said to be used for livelihood purposes, is tied to oversight and appropriate capacity development activities by relevant development services providers; and
- **RECOMMENDATION 5** – Ensure capacity development consistently targets the most vulnerable, e.g. poorest of the poor and women headed households, to avoid crisis situations that often lead to mal-adaptation responses.

Important to this study was bringing together a diverse set of stakeholders to think through barriers and challenges to climate change adaptation, and to produce a set of recommendations based on the situational context of the coastal areas where the study was conducted. During the working day, stakeholders representing the village, commune, district and the provincial level felt it was important to look deeper into resolving the lack of capacity to secure fisheries and agriculture activities in the village to bring continuity to food security:

ACTION POINT 1 - OUR NEEDS to build resilience

- Fisheries and agriculture training courses, information dissemination, and multiple model site establishment;
- Supporting infrastructure – dikes, reservoirs, and water delivery systems;
- Functional and managed ecosystem – streams, rivers, natural canals, watersheds, and PEOPLE; and
- Land use planning and management done in a way that brings fairness, diversity and stability to rural natural resource based livelihoods.

OUR BARRIERS AND CHALLENGES to ensure resilience

- Undervaluation of natural and human resources;
- Undervaluation of participation, and participatory processes;
- Land tenure security and private land ownership; and
- Sustained financial support.

Participants from the National NGO sector and those from the national government and International NGOs and bilaterals felt it very important to further focus on issues of participation, i.e. the lack of capacity to engage in local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs – each with differing, yet complementary views. From the national NGO sector:

ACTION POINT 2 - OUR KNOWLEDGE NEEDS to build resilience

- Understanding better the seasonality of water usage in order to enhanced management and infrastructure needs;
- Learning better ways to transfer skills and technology to local stakeholders;
- How to build positive value towards multi-stakeholder interactions – changing of Minds, Attitudes, and Processes (MAP).

OUR BARRIERS to ensure resilience

- Stakeholder tendencies to avoid talking about RIGHTS;
- Unresolved issues related to ownership over natural resources; and
- Low levels of literacy.

From participants representing national government agencies, and International NGOs and bilaterals:

ACTION POINT 3 - OUR NEEDS to build resilience

- Development service profiles that highlight processes of empowerment and knowledge building, e.g. knowledge of legal protection and advocacy, to knowledge of useful networks and how to link effectively to these, to understanding better how to turn knowledge and skills into capacities;
- Development service profiles that create an enabling environment for participation, e.g. participatory planning facilitation, alternative livelihood options and opportunities, to partnership building that brings about Authority Partnerships.

OUR BARRIERS to ensure resilience

- Incomplete knowledge of formal networks – are the functioning, why, why not, how can they be harnessed to support change;
- Incomplete knowledge around informal networks – how their capacities can be enhanced to support local empowerment and provide dependable safety nets to people in heightened times of climate stress; and
- Exacerbated poverty levels, private sector influences, and 'Authority' attitudes.

CONCLUDING THOUGHTS

Barriers dealing with knowledge gaps and how to move knowledge towards active capacities are persistent amongst communities and development service providers. The challenge to overcoming these is further compounded by existing mindsets, attitudes and process underlined to facilitate stakeholder cooperation. Today, development service profiles in the research area include a comprehensive set of capacity support initiatives geared towards livelihoods, but these remain less effective than thought by their providers, and they seldom target women headed households – households in desperate need of help.

Outlined in this section have been many recommendations to support climate change adaptation, from probable small steps forward, to an outline of climate change resilience building needs, and barriers to overcome. A look back through the pages of this 'report', underlined is the need to bring inclusiveness to climate change adaptation decision-making, and a need to sharing in the responsibility of building climate change resilience by all stakeholders. This will require strong and concerted efforts to move away from **PASSIVE PARTICIPATION** wherein decisions are made by powerful 'external' stakeholders, and local communities participate by being told what is going to happen or has already happened; and towards a state of **INTERACTIVE PARTICIPATION** wherein stakeholders groups and individuals (men, women, youth, and the elderly) participate

equitably in joint analysis, leading to joint action, and the formation of new cooperative groups or the strengthening of existing ones. Additionally, local stakeholders must feel and be empowered to take control of knowledge and assets, and use this appropriately in the decisions they make.

Cambodia does have valuable knowledge to deal with its development and climate change adaptation needs, from basic technologies to strong foundational capacities to turn knowledge into actions – it's now a matter of bringing connectivity amongst knowledge banks, and connectivity amongst people.

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CLIMATE CHANGE ADAPTATION - FACTORS OF CHOICE, EFFECTIVENESS, AND SUPPORTING SYSTEMS

ANNEX 1 SIHANOUKVILLE PROVINCE FIELD RESEARCH DATA

FIGURE 1 Natural resource flow and hazard spot maps.

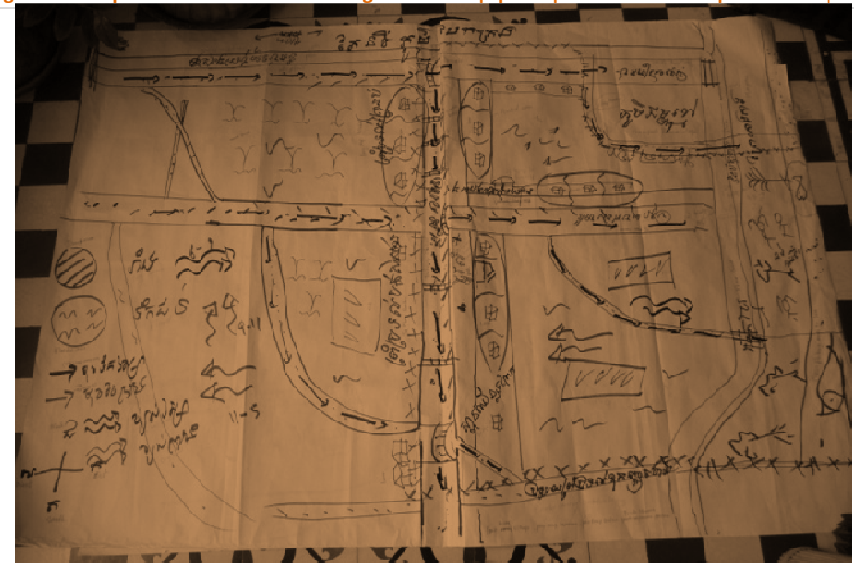
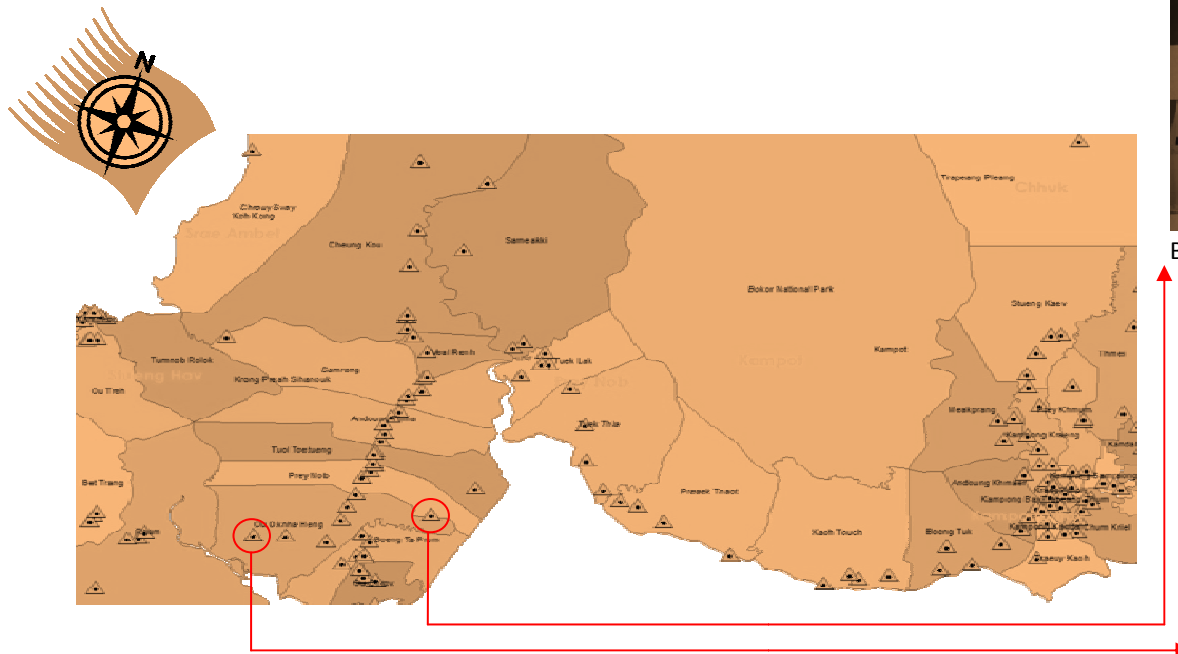
TABLE 1	Synopsis of opening Focus Group Discussions with the Boek Krang Village, Prey Nob Commune, and Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District.
TABLE 2	Village perceptions on ecosystem service changes - Boek Krang Village, Prey Nob Commune, Prey Nob District.
TABLE 3	Village perception on ecosystem service changes - Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District.
TABLE 4	Livelihood seasonal calendar for Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.
TABLE 5	Livelihood productivity and productivity input profile for Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.
TABLE 6	Livelihood Seasonal Calendar for Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.
TABLE 7	Livelihood productivity and productivity input profile for Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.
TABLE 8	Hazard, vulnerability, and action profile for Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.
TABLE 9	Hazard, vulnerability, and action profile for Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.
TABLE 10	Development Service Profile (DSP) done by the Boek Krang Villagers related to addressing the lack of capacity to secure and enhance fisheries and agriculture activities in the village, i.e. diversify livelihoods and bring continuity to food security - Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.
TABLE 11	Development Service Profile (DSP) done by the Boek Krang Villagers related to addressing the lack of capacity to managed and meet water resource needs during flood and drought cycles outside of rice production needs - Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.
TABLE 12	Development Service Profile (DSP) done by the Boek Krang Villagers related to addressing the lack of capacity to to access development services appropriately, e.g. micro-finance institutions, livelihood technologies, and natural resource management - Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province
TABLE 13	Development Service Profile (DSP) done by the Prey Nob Commune representatives related to addressing the lack of capacity to secure and enhance fisheries and agriculture activities in the village, i.e. diversify livelihoods and bring continuity to food security - Prey Nob Commune, Prey Nob District, Sihanoukville Province.
TABLE 14	Development Service Profile (DSP) done by the Prey Nob Commune representatives related to addressing the lack of capacity to managed and meet water resource needs during flood and drought cycles outside of rice production needs - Prey Nob Commune, Prey Nob District, Sihanoukville Province.

TABLE 15	Development Service Profile (DSP) done by the Prey Nob Commune representatives related to addressing the lack of capacity to access development services appropriately, e.g. micro-finance institutions, livelihood technologies, and natural resource management - Prey Nob Commune, Prey Nob District, Sihanoukville Province.
TABLE 16	Development Service Profile (DSP) done by the Ou Ta Sek Villagers related to addressing the need to lower the impact of drought on home based food production systems to ensure food security and food safety throughout the year - Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.
TABLE 17	Development Service Profile (DSP) done by the Ou Ta Sek Villagers related to addressing the need for local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs - Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.
TABLE 18	Development Service Profile (DSP) done by Ou Oknha Heng Commune representatives related to addressing the need to lower the impact of drought on home based food production systems to ensure food security and food safety throughout the year - Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.
TABLE 19	Development Service Profile (DSP) done by Ou Oknha Heng Commune representatives related to addressing the need for local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs - Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.
TABLE 20	Development Service Profile (DSP) done by Prey Nob District representatives related to addressing the need to lower the impact of drought on home based food production systems to ensure food security and food safety throughout the year - Prey Nob District, Sihanoukville Province.
TABLE 21	Development Service Profile (DSP) done by Prey Nob District representatives related to addressing the need for local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs - Prey Nob District, Sihanoukville Province.

COMMON ABBREVIATIONS AND ACRONYMS

CDA	Community Dike Association	MoE	Ministry of Environment
CEDAC	Cambodian Center for Study and Development in Agriculture	MoH	Ministry of Health
CFFPC	Flooded Forest Protection Committee	Mol	Ministry of Investment
CFI	Community Fisheries Inc.	MoRD	Ministry of Rural Development
DANIDA	Danish International Development Agency	MoWA	Ministry of Women's Affairs
FACT	Fisheries Action Coalition Team	MoWRAM	Ministry of Water Resources and Meteorology
FAO	United Nations Food and Agriculture Organization	RHAC	Reproductive Health Association Center
MAFF	Ministry of Forests and Fisheries	WRUC	Water Resource User Committee
MFI	Micro-Finance Institution		

Figure 1 Natural resource flow and hazard spot maps.



Boek Krang Village, Prey Nob Commune, Prey Nob District.

Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District.

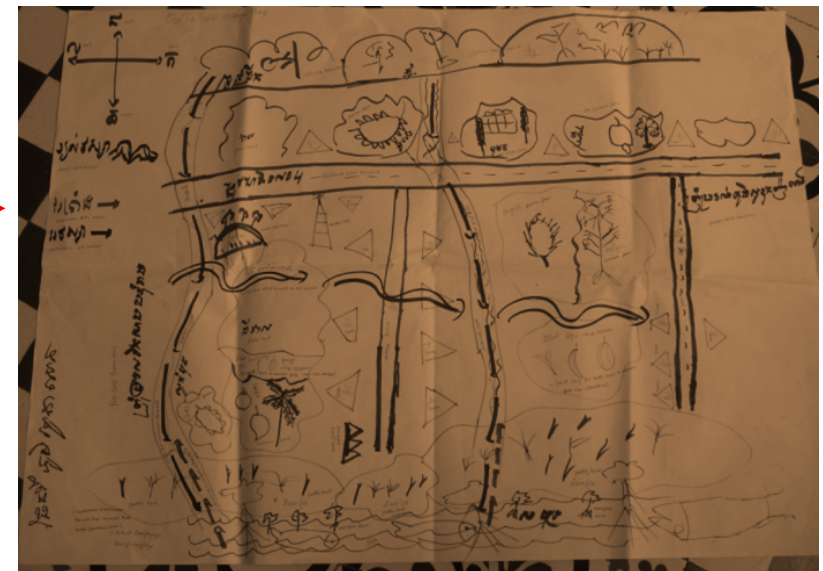


Table 1 Synopsis of opening Focus Group Discussions with the Boek Krang Village, Prey Nob Commune, and Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District.

Environmental Changes Overtime	Perceived Impact on Livelihood Strategy
- Extended wet seasons	
- Intensified storms during the wet season	- Shift in rice variety – long stalk to low stalk
- Insect infestation	- Increased pesticide and herbicide use
- Livestock health problems due to heat	
- Increase temp in line with the loss of forest cover	
- Decreases in soil fertility	- Increased use of chemical fertilizers
- Natural water flow reductions impacting agricultural activities	- Movement to other natural resource bases for extraction
- Decreases in natural fish production (marine and fresh water)	- Continued exploitation of marine fish above sustainable rates
- Absence of NTFP	- Use of the lake for fish to replace losses in livelihood
- Ecosystems contributing less to food security	- Increases in agricultural inputs to maintain production levels
- increase incidence of poverty	
Family and Community Relations	Participation in Development Activities
- High poverty - Less solidarity - High competition for resources - More planning related to livelihoods	*No opportunity!!!
Other impacts because of environmental changes: - Increases in health related problems, e.g. diarrhea, fever, dehydration, etc.	

Table 2 Village perceptions on ecosystem service changes - Boek Krang Village, Prey Nob Commune, Prey Nob District.

Ecosystem Provisions	How do you Benefit?	Benefit Changed Over Time?		Why the Change?
		Before	Now	
Marine waters - Natural fish production	- Income 90% - Consumption 10%	☺ Before dikes were built to stop marine water intrusion	☹ ☹ Loss of marine habitat	Illegal fishing Chemical fertilizer and pesticide Decrease forest cover Comment: Shift from marine to fresh water (land use conversion)
Mangrove Forest	- Construction materials, food etc.	☺ Abundant	☹ Reduction in forest	Exploitation of products and deforestation
Fresh water habitat - Fresh water production of food	- Income 80% - Consumption 20%		☹	Fresh water Natural fish populations have decrease (exploitation) Compensate through aquaculture and technology
Agriculture ecosystem - Livestock (cows) - Birds - Fruits	- Income 70% - Consumption 30%	☺ ☺	☺ ☺ ☺	Increase in agriculture for food production Increase in fresh water for duck farming Possible because of fresh water retention
Inland Forests - Soil for agricultural production - NTFP - Water retention for agriculture - Grass lands/ fodder - Rain water	- Nutrients for crop production - Food consumption 30% - Income 70% - Water for the home garden - Transportation - Agriculture production (rainy season) - Livestock feeds - Compost for vegetable production - Income - Agriculture use and equates to saving money	☹ Salt water No crop production ☹ ☺ Fisheries ☹ Agriculture ☺ ☹ ☹	☹ ☹ Drop in agricultural production ☹ ☹ ☹ ☹ ☹ ☹ ☹ ☹	Natural system cannot keep up Dike-loss of ecosystem function Dike 9land use change Use of chemicals (more efficient and fast for growth) Land conversion has limited useable grasses, and climate variability One month storage only – at best Noted increase in flooding problems and prolong drought periods

Table 3 Village perception on ecosystem service changes - Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District.

Ecosystem Provisions	How do you Benefit?	Benefit Changed Over Time?		Why the Change?
		Before	Now	
MARINE WATERS - Livelihood for invertebrates - Transportation routes	- Food consumption and income - From mainland and from island to islands	☺: plenty	☹: high pressure by all villages in the area	Shift from upland forest resource base to the marine system because of upland deforestation
MANGROVE FOREST	- Birds, charcoal	☺: abundance of mangrove	☹: high mangrove deforestation for charcoal production	
FRESH WATER HABITAT - Livelihood base of fish and invertebrate products for local consumption - Tourism - Water	- Food and income from that above consumption rate which can be sold - Income supplement - Transportation route for marketable goods - Water well recharge	☺:adequate/ alternative for food and income ☹: not well developed but some benefits e.g. alternative source of income and food supply ☹:no proper well source to collect	☹: still have access but low production ☹☹: Currently the money flows away from com into the hands of the Dept. of Environment ☺: Water available. pumping from the main well closer to the village for collection	High pressure on the resource because of a movement away from forest dependency Resulting from the drying up of the natural up-stream flow of water to the downstream for community use - canal is dry!
AGRICULTURE ECOSYSTEM - Residential lands - Livelihood/ cultivation	- Home space, backyard farming (fruits), food mostly for home consumption - Fruit production e.g. watermelon, cucumber, durian, and some rice farming (limited)	☹: Land belongs to outsiders ☹: Did not have to pay land rent	☺:Land tenure achieved ☹☹: Dramatic drops in production because less land is available, i.e. They have to pay for the use of land now which cuts into their income base.	The village was moved to allow for an economic land concession, but in return land tenure was offered. Owning the land has resulted in an Increase in investment into backyard farming enterprises – including the digging of well to support these activities.

INLAND FORESTS - Flood protection - Storm protection and basic shelter - NTFP for home and commercial sale - Relocation sites in times of trouble	- Soil stabilization/ retentions for farming purposes - Building/ infrastructure protection - Used more for medical purposes - Temporary shelter from floods	☺: Forest was abundant. NO storm effects, plenty of timber for construction use as well as NTFP for sale	☹☹: Restrictions on forest cutting – timber no longer available for home repair or construction ☹☹ Only some NTFPs are available for medicines - none available for income purposes.	Deforestation has reduced the carrying capacity of the forest ecosystem; in turn we now have damage to our property and livelihoods because of storm damage/ high winds and a non productive forest. Economic Land Concessions have been granted, thus the forest was cleared and then left barren.
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Table 4 Livelihood seasonal calendar for Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.

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

Table 5 Livelihood productivity and productivity input profile for Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.

Productivity		Inputs	
Before	Now	Before	Now
Agricultural		Agricultural	
RICE (None – up to 2007) - Traditional rice farming at 2ton/ha	RICE - Improve rice 3ton/ha - Traditional rice 3ton/ha WHY THE CHANGE? - Sea come - Dow stream for improve rice - Upstream for traditional rice - Erratic rainfall impacts rice product	RICE - Did not have to use commercial fertilizers, enough natural fertilizers were available - - Used natural fertilizer - No borrow	RICE - Soil has become too acidic - Need to borrow money for agricultural inputs to maintain production FGD – need for - Technology and training - Post production facilities - Improved infrastructure etc.
Fisheries		Fisheries	
MARINE/ BRACKISH WATER FISH - MARINE FISH 1 to 2kg/ day - 100m of net can catch 1-2kg fresh fish/ day	FRESHWATER FISH (no marine fish available – dikes) - Fish declined - Extend net to 200m WHY THE CHANGE? - Fewer fresh water fish	MARINE/ BRACKISH WATER FISH - Use of 100m nets	FRESHWATER FISH (no marine fish available – dikes) - Use of 200m nets Comment – we are not sure how we have benefited from the dikes – we have no access to marine fish and increase pressure on what little freshwater fish stocks has resulted in a collapse of the fishery.
Animal Husbandry		Animal Husbandry	
PIG - 60kg to 6 months raising pig DUCKS - Abundance of duck eggs (sell as eggs and as ducks after raising)	PIG - 60 to 70kg in 4 months raising pig WHY THE CHANGE? - Shorter time period because of the use of commercial feeds DUCKS - Fewer duck eggs, less production WHY THE CHANGE? - Loss in biodiversity so natural feeds are not available, i.e. before the dike fish were available in the streams, now we need to buy feeds	PIG - Natural feeding - rice grains, banana tree, rice - No need to borrow money for feeds DUCKS - No need to buy food for ducks - No need to borrow money for feeds	PIG - Use mixed food 1/2kg per day - Borrowing money to cover feed costs FGD - Food 3,000 Riel/ kg - Borrow money from AMRET to do paddy land and animal raising DUCKS - Need to buy food for ducks - Need to borrow money for feeds – starts a cycle of debt

Labor		Labor	
CONSTRUCTION - ~\$25/ day FISHERY EMPLOYEE - Casual Labor – \$2.5/ day - Crew Member - 10% gross income~ \$25/ day	CONSTRUCTION - ~\$25/ day FISHERY EMPLOYEE - Decrease in fish catch, decrease in needed labor - Casual Labor – \$2.5/ day - Crew Member - 10% gross income~ \$5-10 WHY THE CHANGE? - Exploitation of workers and higher production cost	CONSTRUCTION AND FISHERY EMPLOYEE - Lots of labor	CONSTRUCTION AND FISHERY EMPLOYEE - Limited labor
Garment Worker - (none)	Garment Worker - Mostly women going out of the community to look for work WHY THE CHANGE? - Low income in household		Garment Worker - Salary \$45-65/ month - Send money for home averaging to 100,000 Riel/ month

Table 6 Livelihood Seasonal Calendar for Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.

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

Table 7 Livelihood productivity and productivity input profile for Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.

Productivity		Inputs	
Before	Now	Before	Now
Agricultural		Agricultural	
☺ RICE - A lot of rice land - Good soil fertility - Production will be good for two years before the land needs to rest - Regular rainfall - 1ha/ 3 tons of rice - 300-500 Riel/1kg	☹ RICE - Reduction in land for cultivation - Reduced natural fertility - Irregular rain fall - 1ha/ 1 ton of rice - 800 Riel/1kg	☺ - Use of natural fertilizers - Low use of chemical fertilizer - 50kg ha - Low use of pesticide - 1 bag/ ha	☹☹ RICE - Little availability of natural fertilizers - Intensive use of chemical fertilizers much - Use for 1ha in 4-5 bags of chemical fertilizers ☹☹ VEGETABLES/ FRUIT - Paying plowing fees at 1ha/10,000 Riel - Paying for harvesting labor - Buy chemical fertilizers 3 bag/1 ha
☺ CUCUMBER - Had land for crops - 1 to 2ton/season (considered as a high yield) - 500 Riel/1kg	☹ CUCUMBER - Reduced land area for cultivation – non for rent - High price for land rent		
☺ WATER MELON - 2-3 million Riel/season = 70kg - 1000 Riel/1kg	☹☹ WATER MELON - Harvest water melon 1-2 million Riel/ season - Because of no soil improvement and climate change		
☺ CASSAVA - 1ha= 2 million Riel	☹☹ CASSAVA - harvest 500kg/1ha - 800 Riel/1kg		
☺ LONG BEAN - 700,000 to 800,000 Riel/ season=70kg - 1000 Riel/1kg	☹ LONG BEAN - 60kg/season - 1500 Riel/1kg		
Labor		Labor	
☺ GENERAL LABOR - No garment employees – no social or family problems associated with the negative side of the industry	☹☹ GENERAL LABOR - Lack of livelihood activities within a growing village - Gain family support of about US\$ 70/month or \$30-35 twice a month from out sourced labor – in Phnom Penh and or garment producing areas	- No specifics noted	- No specifics noted
☹ AGRICULTURE LABOR - Knowledgeable persons on agriculture - Had the needed technology in place for productive activities	☹ AGRICULTURE LABOR - Lack of livelihood activities/ comes with a lack of knowledge on livelihoods – options, technology, assets to begin - Labor market for 150,000 Riel/month (MEN) 75.000 Riel/ month (WOMEN)	- No specifics noted	- No specifics noted

Table 8 Hazard, vulnerability, and action profile for Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.

Hazard	Frequency of the Event	Vulnerability		Actions taken to Reduce the Impact	Capacities that Supported the Action	Result of the Action
		1 ^o Impact	2 ^o Impact			
NATURAL EVENTS AND THE ENVIRONMENT - Storm (wind)	- 3x a year	- Crop loss or damaged, storm damages fruit production like banana prop up tree	- Damaged houses	- Group planting or harvest damaged crops for sale - Don't stay inside the house	- Local technology	- No significant difference
- Flood	- 2 to 3x a year, cycle	- Crop loss	- Health issues like diarrhea	- During floods they open the dike gates to lower flooding impact, but this also lowers water volume for agriculture - HEALTH - prepare fresh water storage for consumption - Clean the house surroundings right after flooding - Buy drinking water during these times	- Livestock for sale - Savings and loans - Water Association - Water containers; only 1 month capacity, adequate during floods/ not during drought periods	- No defense towards flooding and agriculture losses - Dike only to contain water in dry season
- Drought	- 1/3 of the year	- Crop loss in general but also affecting most forms of livelihood, e.g. loss of fodder to feed livestock	- Health issues, not serious but requires money to deal with	- Buy water for personal consumption - Dig small ponds around the house for household needs (washing) and for livestock – sometimes we have to perchance water for the livestock - Use rice and vegetables for livestock food to compensate for grass/ fodder loss	- Water available for purchase - Outside employment - Sell livestock - Savings	- Ponds provide new fish for sale - Livelihood cycle continues (with minimal resilience)
- Heat (increase temperature)	- Significant in 2010	- Impact on health, e.g. diarrhea, fever etc.		- Grow big trees to shade the house		
- Pests	- Problematic from 2007 to 2008	- Almost total loss of rice crop due to rats and insects	- Sever income loss	- Catch rats - Outside labor employment (last option) - Use savings to buy new seeds and start over - Borrow from MFI to continue farming	- MFI - Local seed banks or buy from families, sometime purchase of seeds through the market	- Cannot afford pesticides for insects - Meet basic daily needs only
ACCESS TO RESOURCES AND PARTICIPATION IN DEVELOPMENT - MFI	- Continual	- Forced to sell key assets to pay loans,	- Creates social and economic problems	- Use of informal loan systems, or group loans	- If can't get a loan from MFI, they borrow money from a	- MFI - 3.5% a month, requires land title or a

- Livelihood and NRM development	- Infrequent	- -No loan if can't provide the requirements - Poverty and little chance for advance or collective actions	- within the village – loss of unity for collective actions - Less participants because outside influences respective of livelihoods are not focused on meeting household needs, rather the needs of outside interest	- Participation in focused on information respective of flooding to operate flood gates - There is sever poverty in this village, thus no means to participate (Just try to meet subsistence needs). Those that have the means to participate – only their needs are meet.	- private money lender (10% a month) - No action other than participating in small information gather and awareness events for food or the chance of being paid for their participation – far beyond daily subsistence	- guarantor – if one cannot pay the loan they usually leave the village and leave the debt with the guarantor - Informal loans cost 10% per month – perpetuates a cycle of poverty and social problems in the village - No movement forward out of the poverty cycle
Hazard Type	Perception of Vulnerability		Key Impact	Actions taken to Reduce the Impact	Capacities that Supported the Action	Result of the Action
CULTURE AND SOCIETY In relation to key natural/ environmental hazards (shown is the most vulnerable): - FLOOD - PESTS - DROUGHT and HEAT	Women are impacted more; generally physically weaker, often in their child bearing years, and are focused on activities in the household Males are impacted more; they are the one who deals with this problem Women are impacted more; generally physically weaker, often in their child bearing years, and are focused on activities in the household			No actions taken	No supporting services for women and children in the village (remote village)	No specifics noted/ no change

Table 9 Hazard, vulnerability, and action profile for Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.

Hazard Type	Frequency of the Event	Vulnerability		Actions taken to Reduce the Impact	Capacities that Supported the Action	Result of the Action
		1 ^o Impact	2 ^o Impact			
NATURAL EVENTS AND THE ENVIRONMENT - Flood (natural & manageable) - Drought - Pests - Storms/ intense wind and rain - High and prolonged temperatures	Seasonal	- Reduction in livelihood activities resulting in lower monthly income/cash availability/ stability	- Lack of food, variable weather conditions and lack of income to combat sickness brought on by the aforementioned	INCOME IMPACT - Use lake and marine resources to augment needs - Sell livestock during this period - Seek outside employment (permanent not seasonal) - Sell labor during drought periods - Exploit forest resource - timber	INCOME IMPACT - Access to the natural resource base - Training on animal production and husbandry - Daughters in the family for outside labor (garments), sons for outside labor (construction) and local agricultural labor	INCOME IMPACT - Maintain income needs - Ability to perchanche high value foods for those families engaged in outside labor - Supplemental income from outside sources to support on-farm needs, e.g. labor and equipment
	Seasonal, but now shifting time periods (when and duration)	- Agriculture efforts related to wet-dry seasons stops resulting in same impact as flood but magnified	- Extended magnitude and length of the period associated with impacts of food insecurity (as drought) but with clear signs of protein deficiencies, decreases in food consumption, and malnutrition	HEALTH IMPACT - Make use of local health centers/ village health services - NOTE: lack of local medicines due to forest exploitation - Plant local trees for shading to reduce heat - Increase personal hygiene	HEALTH IMPACT - Having health services available - Available assets to sell/ savings/ or borrow (informal micro finance) to pay for medical treatment/ service	HEALTH IMPACT - In most cases families are able to maintain 'health' but at extra costs that now limits their options for investment in livelihood enhancements to education.
	Yearly but steadily increasing year on year	- Loss of crop production, approximately 60% of fruits and vegetables affected resulting in dramatic decreases in income		PEST IMPACT - Use of pesticides (has some health impacts due to improper use) - Find other employment to augment income loss, e.g. pepper collecting - Borrow money from Micro Finance Institutions (MFI) to buy equipment for fishing etc.	AGRICULTURAL IMPACT - Use of cash and skills to diversify income base - Use land for collateral to support the aforementioned	
	Come at the onset of the rainy season – getting stronger in the past 5 years	- Loss of crop production, approximately 90% of fruits and vegetables affected resulting in dramatic decreases in income		AGRICULTURAL IMPACT - Replant crops via borrow money from MFIs or using saved money to recover	ANIMAL LOSS - Use of traditional knowledge learned from grandparents	GENERAL COMMENT - Strategies often end in higher debts for most families, lower health levels, and lower income levels
	Yearly but temperatures are higher and the number of days increasing	- Decreases in general health for humans	- Loss of animals - pigs, chickens ,ducks, cows all equating to losses in family income	ANIMAL LOSS - Buy medicines to treat them - Find village animal health service (traditional and formal) to treat animal - Increase animal hygiene	GENERAL COMMENT - Use of self experiences related to storm and weather patterns that affect both agriculture, and animal based livelihoods, and human health, i.e. good preparation such as feed and water storage and saving money	

ACCESS TO RESOURCES AND PARTICIPATION IN DEVELOPMENT - Exclusion from decision- making	Continual frequency	- Low production for natural resources having dramatic impacts on household food security and income levels (diminishing natural resource base from a lack of management)	- Higher physical risks to natural hazards as stated - Decreased participation in development activities, decreased control of livelihoods	- Participate in local activities such as this research project - None – participation is often based on ‘getting something for the day’, i.e. means of survival for those lower in social and economic standing	- Most activities from with the village require small contributions in cash or in kind. Thus, time/ labor is the usual asset offered	- Maintain or improve social status at the village level for very few - Improved relations/ help for the most poor
Hazard Type	Perception of vulnerability	Key Impact	Actions taken to Reduce the Impact	Capacities that Supported the Action	Result of the Action	
CULTURE AND SOCIETY In relation to key natural/ environmental hazards (shown is the most vulnerable): - Drought Children- 1 st Women- 2 nd Men- 3 rd - Pests Men- 1 st Women- 2 nd Children- 3 rd - Storms/ intense wind and rain Children- 1 st Women- 2 nd Men- 3 rd - High and prolonged temperatures children- 1 st	Children are seen as being more vulnerable to drought given their lack of awareness to dehydration and means to address this. For women, their vulnerability is based on their weaker status because they most often have the lowest nutritional intake of all family members and are burdened with both reproductive and productive work. Men are seen as being more vulnerable to pests for they are the ones that come in direct contact with the pest and the chemical used to eradicate them. Women are next in line because they process the pesticide laden vegetables and fruits. For children - the lack of awareness of safety issues around weather and climate extremes is problematic. Women become vulnerable to storms, not out of a lack of awareness but because they are put in harm’s way given their reproductive roles, e.g. gathering children during such events. For children - the lack of awareness of safety issues around weather and climate extremes is problematic. For men, they are considered	- Physical injury (Children) - Medium term household food insecurity and losses in productivity (Women) - Long term detritions of health (Women) - Physical injury (Men) - Physical injury (Children) - Physical injury (Women) - Physical injury (Children) - Medium term	<i>No specific actions taken in relation to children, women, and men – business as usual. Actions taken relate to those indicated under Natural Events and the Environment, i.e. family strategies.</i> - Respond in any way they can - Move out of harm’s way if possible	<i>Non specific capacities to support actions taken in relation to children, women, and men – business as usual. Actions taken relate to those indicated under Natural Events and the Environment, i.e. family strategies.</i>	<i>Results of any actions taken are indicated under Natural Events and the Environment section</i>	

men- 2 nd women- 3 rd	vulnerable because they work outside.	household food insecurity and losses in productivity (Women) - Long term detritions of health (Women) - Erosion of income/ savings			
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Table 10 Development Service Profile (DSP) done by the Boek Krang Villagers related to addressing the lack of capacity to secure and enhance fisheries and agriculture activities in the village, i.e. diversify livelihoods and bring continuity to food security - Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Good - sometimes ----->	Commune Council	- Dialogue with development partners	Increased Ability
	Good - frequent <=>	Village Authorities	- Dialogue with development partners	
	Good - frequent <=>	MAFF - Fisheries	- Provide training on aquaculture, provides juvenile fish for grow out - Current plans to create fish pond for villages (50% supplement to actual costs)	
	Okay - seldom <----->	MoRD	- Provision of a concrete bridge	
	Good - frequent <=>	CFI (NGO)	- Project in relation to fish, mangrove, bird protection - Crest Protected Area	
	Good - sometimes <-----	FACT (NGO)	- Provided a study tour on pig and chicken raising	
	Good - frequent <-----	FAO	- Capacity building on fish raising - Provide training on money saving, rice bank, and animal raising - Future plans to provide fish and chickens for grow-out	
	Good - frequent <=>	AMK, AMRET, ACLEDA (MFIs)	- Lend money with low interest rate compared to money lender (3%/ month for group loan, 1.5%/ month for individual loan)	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder.				

Table 11 Development Service Profile (DSP) done by the Boek Krang Villagers related to addressing the lack of capacity to managed and meet water resource needs during flood and drought cycles outside of rice production needs - Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.

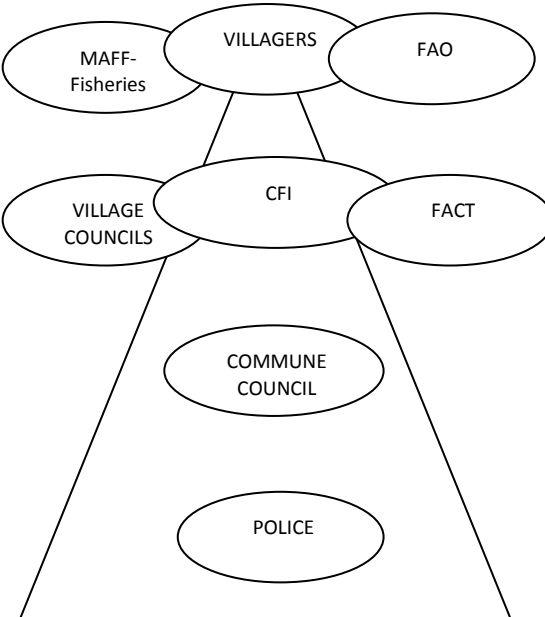
	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Good - frequent ←	CFI – Community Fisheries Inc.	- Helps will dealing with illegal fishing, e.g. reports illegal fishing to commune/ district - Planting mangroves - NRM extension work with villagers	Increased Ability 
	Good - frequent ←	FAO	- Provide training on fish raising; provides fish seeds - Conducted a study tour on NRM in Koh Kong Province	
	Good -frequent ↔	FACT	- Provides training on fish raising - Provides fish fingerlings for grow-out	
	Good - Frequent ↔	Village Council	- Provides training on NRM - Helps in reducing illegal fishing activities	
	Good - Frequent ↔	Police	- Helps in reducing illegal fishing activities - Helps with NRM initiatives	
	Okay - frequent →	Commune Council	- NRM training and facilitation	
	Good - frequent ←	MAFF - Fisheries	- Training on flooded forest protection and fish protection - Helps in reducing illegal fishing activities	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder.				

Table 12 Development Service Profile (DSP) done by the Boek Krang Villagers related to addressing the lack of capacity to to access development services appropriately, e.g. micro-finance institutions, livelihood technologies, and natural resource management - Boek Krang Village, Prey Nob Commune, Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Village	Good - sometimes ←---	MAFF - Fisheries	- Provide training on aquaculture	Increased Ability
	Okay - sometimes ---→	Commune Council	- Dialogue with development partners	
	Good - frequent →	Village Council	- Dialogue with development partners	
	Good -frequent ←	Community Fisheries Inc. (CFI)	- Dialogue with devilment partners and facilitate the process of operating the water gates	
	Okay - sometimes ←---	FAO	- Training on post harvesting - Plan to develop a resolving fund for livestock and agriculture support (based on the meeting) - Plan to provide training on agriculture and aquaculture	
	Okay - sometimes ←---	FACT	- Training on post harvesting - Plan to develop a resolving fund for livestock and agriculture support (based on the meeting) - Plan to provide training on agriculture and aquaculture	
	Good - frequent ↔	ACLEDA, AMFI (MFIs)	- Difficult to access physically (Movement in rate - 3% down to 2.8%/ month)	
	Good -frequent ↔	AMRET MICRO FINANCE	- Loans have increased on average of 100,000 Riel/year - the more the loan, the less interest 3.3%/ month for 1 million Riel loans	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder.				

Table 13 Development Service Profile (DSP) done by the Prey Nob Commune representatives related to addressing the lack of capacity to secure and enhance fisheries and agriculture activities in the village, i.e. diversify livelihoods and bring continuity to food security - Prey Nob Commune, Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Commune Villages	Good - frequent ←	Flooded Forest Protection Committee (CFFPC)	- Created by MAFF – Fisheries, engages in trying to stop illegal fishing activities, replanting of mangroves and fish protection - Work with the police force to deal with illegal activities	Increased Ability ↑ <pre>graph TD; CV([COMMUNE VILLAGES]) --- MAFF_A([MAFF - Agriculture]); CV --- MAFF_F([MAFF - Fisheries]); CV --- WRC([WATER RESOURCE COMMITTEE]); MAFF_A --- DLT([Department of Labor and Vocational Training]); MAFF_F --- CDA([CDA]); MAFF_F --- CFFPC([CFFPC]); MAFF_F --- FAO([FAO]); WRC --- FACT([FACT]);</pre>
	Good - frequent ↔	Water Resources Committee	- Control and monitors water levels in the canals	
	Good -frequent ↔	MAFF - Agriculture	- Provide training on the use of pesticides and soil enhancement -	
	Good - frequent ↔	MAFF - Fisheries	- Facilitate and collaborate with CFFPC to protect the resource base	
	Good - frequent ↔	Department of Labor and Vocational Training (Dept. Labor)	- Training on crop and livestock production - Vocational training e.g. sewing - Provision of government loans (1.5%/ month) - Work with the unemployed to seek jobs	
	Good - frequent ↔	Community Dike Association (CDA)	- Monitors water levels in the canals and informs authorities if the water gates need to be opened or closed - Help build dikes and canals (small scale) while big dikes are managed/ built by the government - Collects fees for water use - Fixes dikes (small & big) when repairs are under 100,000 Riel, MoWRAM for costs over 100,000 Riel	
	Good - frequent ←	FAO	- Provide agriculture, aquaculture and livestock training - post harvest training for fish production - Support handicraft/ furniture making initiatives - Future plans to support farming/ fishing families through financial, technical, and asset support - RFLP/ FAO Project – planning phase to set up an extension training program - 11 villagers attended trained	
	Good - sometimes ←---	FACT	- Plan to provide training on agriculture and study tours - no action yet, just scoping the opportunity for learning	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder.				

Table 14 Development Service Profile (DSP) done by the Prey Nob Commune representatives related to addressing the lack of capacity to managed and meet water resource needs during flood and drought cycles outside of rice production needs - Prey Nob Commune, Prey Nob District, Sihanoukville Province.

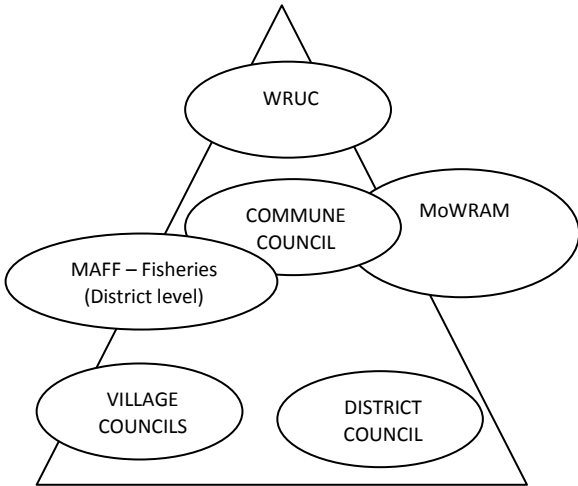
	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Commune Villages	Good - frequent	MAFF - Fisheries	- Provides water pump engine and gasoline to commune when there's drought	Increased Ability 
	Good - frequent ↔	MoWRAM	- Provides water pump engine and gasoline to commune when there's drought	
	Good - frequent ↔	Water Resource User Committee (WRUC)	- Self financing committee - Water use fee 1ha of land/50,000 Riel/ year paid by villagers for dike and gate operation/ repair (small) - Try to manage water levels in the cannels in the flood and drought seasons – managing the content of salt water respective of agriculture and fishery needs at differing times of the year.	
	Good - seldom ←	Village Council	- Propose/ suggest to village commune to release the water to the sea; the suggestion must come from 2/3rds of the villages or the gates will not be open	
	Good - seldom →	District Council	- Forwards water gate requests to the Water Resource Use Committee (permission)	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 15 Development Service Profile (DSP) done by the Prey Nob Commune representatives related to addressing the lack of capacity to access development services appropriately, e.g. micro-finance institutions, livelihood technologies, and natural resource management - Prey Nob Commune, Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villages within the Commune	Good - frequent ↔	Ministry of Women's Affairs (MoWA's)	- Provides vocational training on sewing	Increased Ability
	Good - frequent ↔	NRM and Environment (MoE)	- Provides pigs, cow, fish stock for raising, and fruit seeds	
	Good - frequent ↔	Reproductive Health Association Center (RHAC) & EQUITY FOUNDATION	- Provides transportation costs for medical purposes - Medical check up - Provides vehicle to village health volunteers and education on health and violence - Follow up work with Community Health Center	
	Good - frequent ↔	Mol – Office of Planning and Investment	- Planning and training on investment - Facilitate village/commune development	
	Good - frequent ↔	Community Health Center (CHC)	- Health service and information on nutrition - Provides transportation costs when women need to go to the health centers (maximum of 3 times/year)	
	Okay - frequent ←	FAO	- Provide animals and fish seeds, and handicraft training (e.g. table, etc.) - Provide training on animal and fish raising, to the establishment of rice banks and savings groups	
	Good - frequent ↔	MAFF - Agriculture	- Provide water pump engines, rice seeds, and pesticides - Provide training on animal raising and vegetable production	
	Good - Frequent ↔	Red Cross	- Give money to offset expenses in times of calamity, rice and food stuffs	
	Okay - frequent ←	MFIs - AMK PRASAC/ ACLED/ AMRET/SAMIC	- Loan provisions	
	Good - frequent ↔	Department of Education	- Provides for financial needs of poor students (materials etc.)	
	Good - frequent ↔	Department of Labor and Vocational Training (Dept. Labor)	- -provides vegetable seeds - -provides loan	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 16 Development Service Profile (DSP) done by the Ou Ta Sek Villagers related to addressing the need to lower the impact of drought on home based food production systems to ensure food security and food safety throughout the year - Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Okay - seldom ←.....	CEDAC, ADHOC (NGO)	- Extension knowledge services related to biogas	Increased Ability
	Good - frequent ↔	ACLEDA, AMNET (MFIs)	- Money loans	
	Bad - seldom→	ADHOC	- Training on reducing violence within the village	
	Good - frequent ←	Reproductive Health Association Center (RHAC)	- Training on HIV - AIDS prevention, child health care, and the provision of medicines for children (nutrition supplements and vitamins)	
	Good - frequent ↔	Village Council	- Information transfer - Promote people to and how increase food production	
	Good - seldom ←.....	MAFF - Fisheries	- Provide training on fish and crop production - NRM extension services	
	Good - sometimes ←---	MoWA	- Training and awareness building on violence reduction and HIV - Educate on drug abuse and personal hygiene	
	Okay - sometimes ←.....	Commune Council	- Provision of fish fry for grow-out - Training on animal husbandry	
Village Council	Good - frequent ↔	Commune Council	- Food production planning	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 17 Development Service Profile (DSP) done by the Ou Ta Sek Villagers related to addressing the need for local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs - Ou Ta Sek Village, Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
VILLAGE	Good - frequent ←	Village Council	- Train and enhance villagers capacity on how to protect and manage natural resources - Collect or confiscate illegal fishing gears	Increased Ability <pre>graph TD VILLAGERS --> VILLAGE_COUNCIL[VILLAGE COUNCIL] VILLAGERS --> COMMUNE_COUNCIL[COMMUNE COUNCIL] VILLAGE_COUNCIL --> MAFF_Fisheries[MAFF - Fisheries] VILLAGE_COUNCIL --> DISTRICT_COUNCIL[DISTRICT COUNCIL] COMMUNE_COUNCIL --> COMMUNE_POLICE[COMMUNE POLICE] COMMUNE_COUNCIL --> MoE[MoE] DISTRICT_COUNCIL --> MAFF_Forestry[MAFF - Forestry] COMMUNE_POLICE --> MAFF_Forestry MoE --> MAFF_Forestry</pre>
	Okay - seldom ←	District Council	- Train and enhance villagers capacity on how to protect and manage natural resources	
	Good - frequent ↔	Commune Council	- Train and enhance villagers capacity on how to protect and manage natural resources - Train village leaders to train others on NRM (Trainer of Trainers)	
	Bad - sometimes ←	MAFF - Forestry	- Extension work for forestry protection	
	Good - frequent ↔	MAFF - Fisheries	- Arrest illegal fishers	
	Bad - Frequent ←	MoE	- Arrest those involved in illegal activities (small scale operators – do not arrest those bigger operators from the outside)	
	Good - frequent ↔	Commune Police	- Involved actively via collaboration with villagers in stopping illegal activities	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 18 Development Service Profile (DSP) done by Ou Oknha Heng Commune representatives related to addressing the need to lower the impact of drought on home based food production systems to ensure food security and food safety throughout the year - Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villages	Good - sometimes ←---	FACT	- Provide community study tours on agriculture, animal raising, and NRM	Increased Ability
	Good - frequent ←	DANIDA	- Provide funds to implement NRM projects, provision of seeds and livestock for grow-out, and associated training, training on small business development	
	Good - frequent ↔	Police/ Solders	- Arrest those illegally extracting natural resources	
	Good - frequent ↔	Local Authority	- Arrest those illegally extracting natural resources - Join all activities in the community	
	Good - seldom ↔	DoWA's	- Training on the prevention of violence and health - Small business training	
	Bad; seldom →	MoE	- Extension services on environmental law and protection – poor collaborations	
	Good; seldom ↔	MoWRAM	- Provision of water pumps, support for dike reconstruction, and the development of irrigation systems	
	Good; frequent ↔	MAFF - Agriculture	- Training on rice, animal, vegetable production - Provide vaccinations for cows and buffalos - Provide pesticides and technical training - Provide exposure trips for commune council members	
	Good; sometimes --→	MAFF - Fisheries	- Arrest those illegally extracting natural resources - Fisheries law extension – awareness building - Provide fish fry for grow-out	
	Bad; seldom ←	MAFF – Agriculture (Provincial and National level)	- Yearly environmental law awareness building campaign - Provision of seeds - Arrest those illegally extracting natural resources - Only engage the community when needed	
	Good; sometimes ↔	MoRD	- Reconstructs of path ways - WATSAN extension work, Well digging - Established a committee to maintain path ways	
	Bad; seldom →	News Media	- Environmental law awareness building - Watch-dog for illegal activities against the environment	
	Good; sometimes ↔	Commune Council	- Collaboration with other commune council in cracking down illegal natural resource extraction activities	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 19 Development Service Profile (DSP) done by Ou Oknha Heng Commune representatives related to addressing the need for local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs - Ou Oknha Heng Commune, Prey Nob District, Sihanoukville Province.

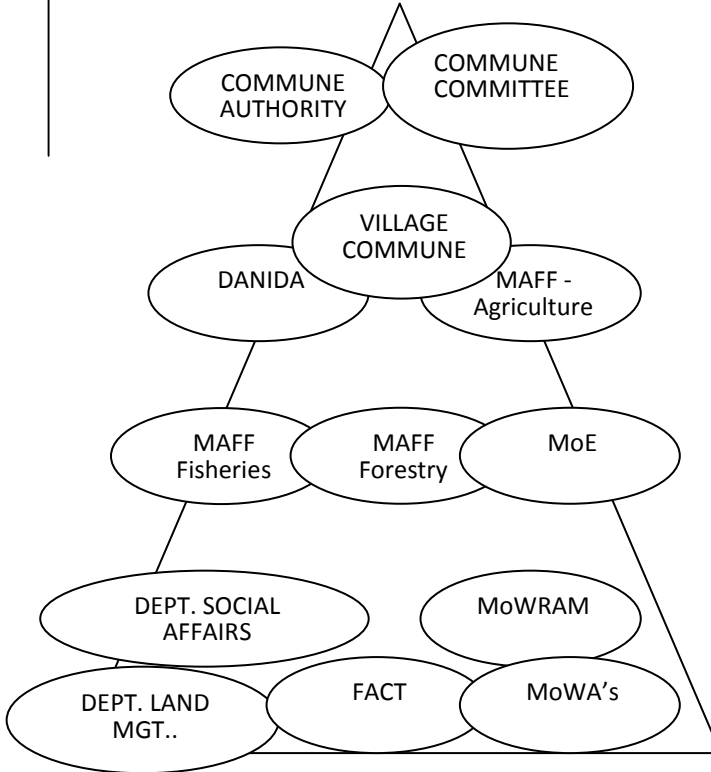
	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villages	Good - frequent ↔	DANIDA	- Provides agricultural materials (seeds, fertilizers, etc), and training on fish raising - Help in rehabilitating dikes and establishing ponds - Facilitate community forestry and fisheries planning, as well as small business development	Increased Ability ↑ 
	Good - sometimes ←---	FACT	- Provide training on NRM	
	Okay - seldom ↔	MoE	- Awareness building -on environment law - Promote community participation in mangrove reforestation (also provides the seedlings)	
	Good - seldom ↔	MoWRAM	- Rehabilitations of dikes, canals, and the irrigation system as a whole - Provide fish fry for grow-out	
	Okay - seldom ←	Department of Land Management	- Extension work respective of land management laws - Determine community boundaries	
	Okay - seldom ←	MAFF - Forestry	- Provides tree seedlings for planting - Determines forest boundary and assists in law enforcement activities	
	Good - frequent ↔	MAFF - Fisheries	- Provide fish fry for grow-out and associated training - Promotes other agricultural / aquaculture activities - Provides extension on fisheries law and for the development of community fisheries	
	Good - frequent ↔	Commune Authority	- Facilitates fisheries extension work respective of law enforcement, the transfer of NRM knowledge, and law enforcement activities directly	
	Okay - seldom ←	MoWA's	- Provides training on small business development to reduce the illegal activities on natural resources - Extension on NRM laws to women	
	Okay - seldom ←	Department of Social Affairs	- Train on crop production to reduce illegal activities respective of natural resource extraction	
	Good - frequent ↔	Commune Committee	- Collaborates with agencies on law enforcement related to natural resources - Assist in community development and community regulations – including NRM planning	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 20 Development Service Profile (DSP) done by Prey Nob District representatives related to addressing the need to lower the impact of drought on home based food production systems to ensure food security and food safety throughout the year - Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Communes	Good; sometimes ←---→	Cambodian Red Cross	- Provides food, materials or equipments after natural disasters	Increased Ability
	Good; frequent ↔	Local Authority	- Promotes rural development and collaborates with other stakeholders to develop the communities - Implements the poverty reduction strategies of the government, and solves all conflicts	
	Good; frequent ↔	MoRD	- Constructs paths and develops projects	
	Good; frequent ↔	MoH	- Provides training on WATSAN, and health protection - Develops health centers, treats and vaccinates people	
	Good; frequent ↔	MoWRAM	- Constructs dikes and canals/ develops irrigation systems	
	Good; frequent ←---→	MAFF - Agriculture	- Provides agricultural seeds including animals - Assist in Integrated Pest Management - Technical assistance on agricultural production	
	Good; sometimes ↔	MoE	- NRM training on implementation processes – including education on environmental impacts	
	Good; frequent ↔	MAFF - Fisheries	- Disseminates fisheries law information - Assist in stopping illegal fishing, mangrove degradation, and helps in community fisheries dev.	
	Good; frequent ↔	MAFF - Forestry	- Disseminates information on and enforces forestry laws, and facilitates re-forestation activities	
	Good; frequent ↔	News media	- Disseminates drought hazard, climate change, storms and other hazards warnings	
	Good; frequent ↔	Department of Land Management	- Facilitates land tenure resolutions - Disseminates information of land laws - Resolves land conflicts	
	Good; frequent ↔	Department of Education - District	- Provides health education	
	Good; sometimes ←---→	FACT	- Provides fund to stop illegal fishing activities -	
	Good; frequent ↔	DANIDA	- Provides funds for protected area management training, canals and dike reconstruction - Provides fish fry for grow-out	
	Good; frequent ↔	Reproductive Health Association Center (RHAC)	- Disseminates information on community health protection - Provides minor health services	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 21 Development Service Profile (DSP) done by Prey Nob District representatives related to addressing the need for local level participation in natural resource management initiatives to sustain a diverse set of local livelihood strategies and family nutritional needs - Prey Nob District, Sihanoukville Province.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Communes	Good; frequent →	District Authority	- Conduct annual Integrated District Meeting to sell the commune's Investment Plan. Inviting all Development Partners and relevant department	Increased Ability
	Okay; sometimes ←---→	MoRD	- Provide for infrastructure building/ rehabilitation, e.g. large scale dikes	
	Okay; sometimes ←---→	MoE	- Promotes the protection of natural resources through education	
	Okay; sometimes ←---→	MAFF - Forestry	- Provides law enforcement training and seedlings for reforestation	
	Okay; sometimes ←---→	MoWRAM	- Maintains dikes and canals - Controls water levels in Prey Nob	
	Okay; sometimes ←---→	MAFF - Agriculture	- Helps maintains dikes and canals	
	Okay; sometimes ←---→	MAFF - Fisheries	- Protects mangrove forest and fisheries, combats illegal fishing - Provides fingerling fish for grow-out - Established community fisheries organizations	
	Okay; sometimes ←---→	Department of Planning	- All action plans in the district are prepared by the Planning Department especially training activities	
	Good; frequent →	Police	- Protects natural resources in participation with community in accordance with commune orders	
	Good; frequent ←	Local Mangrove Management Committee	- Protects mangrove	
	Good; frequent ←	Community Fisheries Organization.	- Works with Local Authority and District to combat illegal fishing	
	Good; frequent ←	Community Forestry Org.	- Works with Local Authority and District to combat illegal timber harvesting	
	Good; sometimes ←---→	FACT	- Establishes or facilitates community fisheries	
	Good; sometimes ←---→	DANIDA	- Provides fund for forest protection	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

CLIMATE CHANGE ADAPTATION - FACTORS OF CHOICE, EFFECTIVENESS, AND SUPPORTING SYSTEMS

ANNEX 2 KOH KONG PROVINCE FIELD RESEARCH DATA

FIGURE 1	Natural resource flow and hazard spot maps	
TABLE 1	Synopsis of opening Focus Group Discussions with the Stung Veng Village, Peam Krasaob Commune, and Tachat Village, Toul Kokir Commune, Mondol Seima District.	
TABLE 2	Village perception on ecosystem service changes - Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province	
TABLE 3	Village perceptions on ecosystem service changes - Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province	
TABLE 4	Livelihood seasonal calendar for Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province	
TABLE 5	Livelihood productivity and productivity input profile for Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province	
TABLE 6	Livelihood seasonal calendar for Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province	
TABLE 7	Livelihood productivity and productivity input profile for Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province	
TABLE 8	Hazard, vulnerability, and action profile for Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province	
TABLE 9	Hazard, vulnerability, and action profile for Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province	
TABLE 10	Development Service Profile (DSP) done by the Stung Villagers related to addressing the lack of fresh water needed to reduce village expenditures on water resources for both domestic consumption and agricultural and livestock production, i.e. in a way that actions contribute to food security improvements - Stung Veng Village, Peam Krasaob Commune, Mondol Seima District	
TABLE 11	Development Service Profile (DSP) done by the Stung Villagers related to improving dike structures to protect their agricultural and livestock based livelihoods from an influx of marine water in village lands during storm and flooding periods - Stung Veng Village, Peam Krasaob Commune, Mondol Seima District	
TABLE 12	Development Service Profile (DSP) done by the Stung Villagers related to their lack of capacity to be protected their safety and assets from storm when engaged in fishing activities (out at sea and within the village) - Stung Villager, Peam Krasaob Commune, Mondol Seima District	
TABLE 13	Development Service Profile (DSP) done by the Peam Krasaob Commune related to addressing the lack of fresh water needed to reduce village expenditures within the commune on water resources for both domestic consumption and agricultural and livestock production, i.e. in a way that actions contribute to food security improvements - Peam Krasaob Commune, Mondol Seima District	

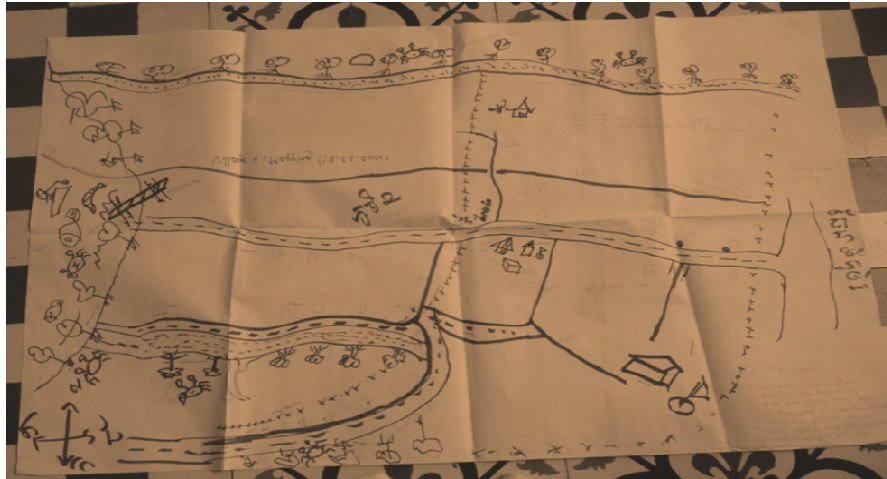
TABLE 14	Development Service Profile (DSP) done by the Peam Krasaob Commune related to improving dike structures within the commune to protect their agricultural and livestock based livelihoods from an influx of marine water in village lands during storm and flooding periods - Peam Krasaob Commune, Mondol Seima District.	
TABLE 15	Development Service Profile (DSP) done by the Tachat Villagers related to their lack of capacity to maintain an adequate supply of domestic water and that which can be used in agricultural production during the dry season/ periods of drought (great importance to food security) - Tachat Village, Toul Kokir Commune, Mondol Seima District.	
TABLE 16	Development Service Profile (DSP) done by the Tachat Villagers related to their lack of knowledge and capacity to implement environmental friendly strategies that could effectively control the impact of pests and wild animals on agricultural crop production - Tachat Village, Toul Kokir Commune, Mondol Seima District.	
TABLE 17	Development Service Profile (DSP) done by the Toul Kokir Commune related to the importance of lower the impact of drought on agricultural production to ensure sustainable household incomes and to reduce poverty throughout the year - Toul Kokir Commune, Mondol Seima District.	
TABLE 18	Development Service Profile (DSP) done by the Toul Kokir Commune related to their lack of knowledge and capacity to implement environmental friendly strategies that could effectively control the impact of pests and wild animals on agricultural crop production - Toul Kokir Commune, Mondol Seima District.	
TABLE 19	Development Service Profile (DSP) done by the Mondol Seima District and Koh Kong Provincial representatives over the importance of addressing marine water flowing into villages resulting in agricultural crop production damage and damage to other livelihood activities that contribute to poverty alleviation - Mondol Seima District.	
TABLE 20	Development Service Profile (DSP) done by the Mondol Seima District and Koh Kong Provincial representatives related to lower the impact of drought on home base food production to ensure food security and safety throughout the year - Mondol Seima District.	

COMMON ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank	MoRD	Ministry of Rural Development
CRC	Cambodia Red Cross	MoWA	Ministry of Women's Affairs
CZM	Coastal Zone Management	MoWRAM	Ministry of Water Resources and Meteorology
DANIDA	Danish International Development Agency	NRML	Natural Resource Management and Livelihoods
GEF	Global Environment Facility	UNDP	United Nations Development Programme
IUCN	World Conservation Union		
MAFF	Ministry of Forests and Fisheries		
MoE	Ministry of Environment		

Figure 1 Natural resource flow and hazard spot maps.

Stung Veng Village, Peam Krasaob Commune, Mondol Seima District



Tachat Village, Toul Kokir Commune, Mondol Seima District

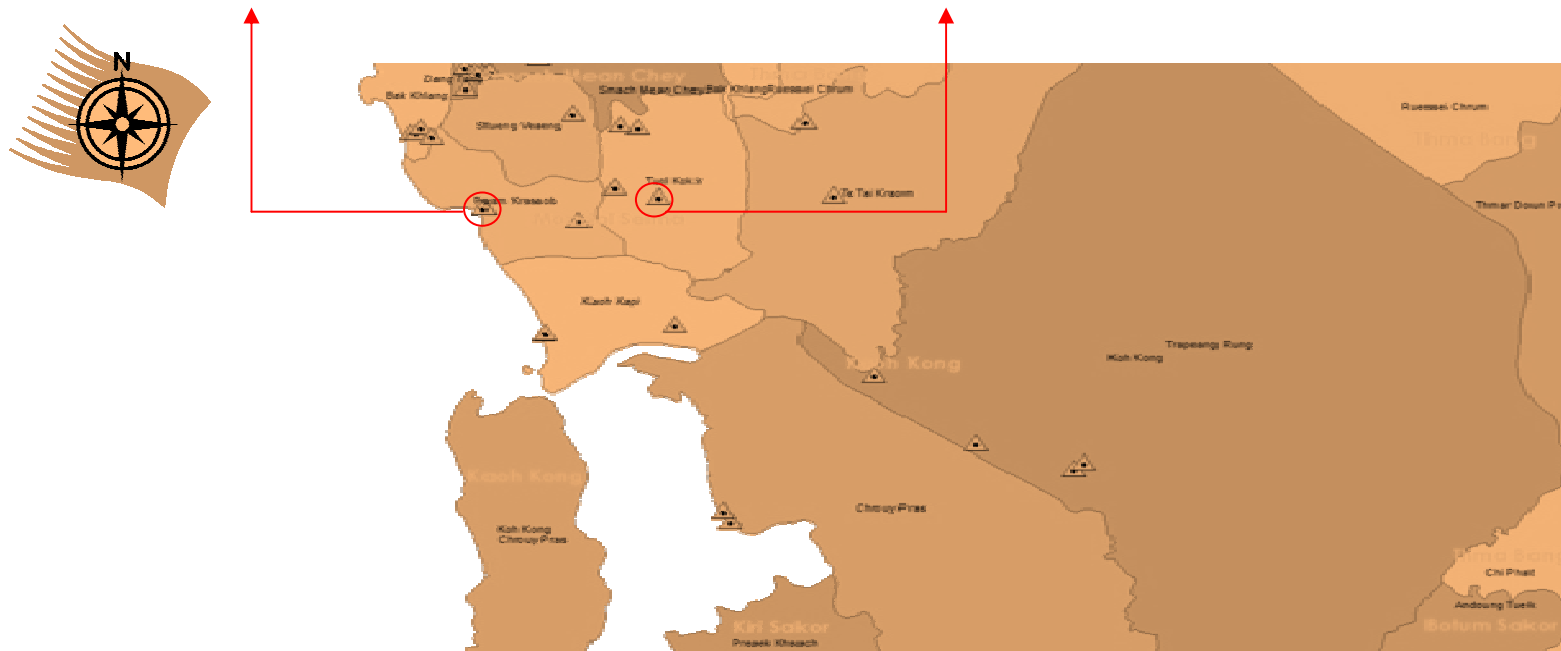


Table 1 Synopsis of opening Focus Group Discussions with the Stung Veng Village, Peam Krasaob Commune, and Tachat Village, Toul Kokir Commune, Mondol Seima District.

Environmental Changes Overtime	Perceived Impact on Livelihood Strategy
- Marked decrease in rainfall for 2010	- Increase pressure on natural resource extraction from the marine and freshwater ecosystems
- Increase in coastal storms over the past few years	- Cannot protect our assets – shift to less technical assets
- Degree of yearly flooding from marine water is getting worse	- Little attempt to expand agricultural based livelihoods
- On set of prolonged drought conditions – year on year increases (drought even during the ‘rainy season’)	- Increase dependency and extraction of water from natural streams and wells
- Prolonged and increased periods of high temperature	- Increased mangrove and coastal forest reforestation efforts for shade – may have a benefit to livelihoods in the medium term
- Marine water intrusion into inland crop areas (fruit and vegetables)	- Less interest in farming fruits and vegetable at scale
- Well water/ ground water is no longer drinkable	- Less money available to expand livelihoods – money sent on buying drinking water from outside the village
- Land fertility has decreased- so has agriculture production compared to the previous years	- Movement to marine based livelihoods, e.g. collect crabs and shrimps
- Decreases in marine and freshwater fish, crab, snail species	- Less profit, intensify gear use
- During the dry season, lake water increases in salt content and the natural streams are dry	- Increased dependency on well water for back yard farming
- Increase presence of pests damaged agriculture crops	- Intensified use of pesticides
Family and Community Relations	Participation in Development Activities
- No specific response	For the Stung Veng Village, they are active in coastal management because of the village’s presence in a national park. This has also brought livelihood assistance programs for community members to participate in various agricultural and Natural Resource management trainings. For the Tachat Village, participation in development activities is very limited – no opportunity/ little development service access
Other impacts because of environmental changes: Increases in health related problems, e.g. diarrhea, fever, dehydration, etc.	

Table 2 Village perception on ecosystem service changes - Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province.

Ecosystem Provisions	How do you Benefit?	Benefit Changed Over Time?		Why the Change?
		Before	Now	
MARINE WATERS AND MANGROVE FOREST - Marine and brackish water food products	- Livelihood from fishing, collect snails, crabs...etc.	☺ Prosperity of natural marine fish, snail, crab, shrimp, etc.	☹☹ Villagers are having a difficult time collecting marine products and earning income	In the past, fishing from 'outsiders' was prohibited and enforced, however in the present time this de-facto law is not being enforced – thus competition and exploitation pressure has risen; space for aquaculture activities for villagers has also decreased. Introduction of sand dredging has upset natural balances Law implementation: When villagers cut mangroves they Request this from the local authority and contribute to mangrove reforestation activities.
	- Aquaculture based livelihood raising fish, snail, crab, etc.	☹ The fresh water flow into the marine system has been diked thus impeding brackish water and marine based aquaculture	☹☹ The fresh water flow into the marine system has been diked thus impeding brackish water and marine based aquaculture	
	- Use of mangrove forest timber for house building and other construction activities, charcoal production	☹:On the decline due to illegal cutting	☺ Enforcement of law to protect the mangroves from deforestation	
	- Monkeys within the mangrove forest as a source of food security during lean times	☹ more monkeys before	☹ Enforcement of law to protect the mangroves and their inhabitants	
TOURISM - Via established guest houses and restaurants	- High employment—tour board - Small goods trade - Crab based aquaculture livelihoods	☹☹ Not well capitalized on because of a lack of awareness	☺ Increased awareness has lead to increase employment, increase income/ alternative income source	Before tourism took hold, villagers would migrate out of the community to search for work, now they have a good alternative source of income near the home.
AGRICULTURE/ RURAL BACKYARD ECOSYSTEM - Residential lands - Livelihood/ cultivation	- Fruits and vegetables for home consumption that reduces household expenses and increases household nutrition	☹☹ Village was formally based on an island thus no basis for backyard farming - everything came from the market (fruits, vegetables)	☺ Moved to the mainland, thus backyard farming is possible – so are the benefits derived	Although we now have land tenure and are capable of growing fruits and vegetables in our backyards, but absence is fresh water to cultivate properly.

Table 3 Village perceptions on ecosystem service changes - Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province.

Ecosystem Provisions	How do you Benefit?	Benefit Changed Over Time?		Why the Change?
		Before	Now	
FRESH/ BRACKISH WATER LAKE - Source of fish, crab, shrimp, snails - Source of fresh water in the rainy season	- Fishing based livelihood - Fresh water in the rainy season for domestic use	☺ The system is full of 'natural' inhabitants for harvesting, and the fresh water – marine water cycle was regular	☹☹ 'Natural' inhabitants have dramatically decreased and the water cycle is not predictable – marine water period is much longer	Increase pressure on 'natural' inhabitants by fishers coming from outside the village. Shortened fresh water period a result of drought
NATURAL STREAMS - Water and food source	- Natural streams provide fresh water for domestic use, animal husbandry, and agricultural production	☺ Adequate water for livelihoods	☹☹ Dramatic decrease in water volume	Noted has been the amount of deforestation in the area equating to drops in water volume
	- Fertile land around the streams for vegetable production	☺ Good forest cover	☹☹ Decrease forest cover near the lake and freshwater streams	Noted has been the amount of deforestation in the area equating to drops in water volume
MANGROVE FOREST - Provide timber, fuel wood, shelter food products from natural inhabitants - Provide for a fresh and natural environment - NTFP	- Provides shelter/ habitat for animals that our livelihoods depend upon - Charcoal production based livelihood	☺ Diverse set of benefits gained – home and commercial use	☹☹ Temperature within the forest has increased, and in general less benefits are being derived	Illegal cutting of the forest by villagers, but mostly by companies based outside of the village... concession that resulted in mass deforestation. Additionally, villager practice slash and burn agriculture in the area.
FRESHWATER STREAMS - Water	- Used for agricultural production and household consumption	☺ Adequate	☹☹ Decrease in water volume	Noted has been the amount of deforestation in the area equating to drops in water volume
AGRICULTURAL LAND - Land for dwellings - Soil/ land for agriculture - Area for fish ponds	- Ownership by household – an asset - Livelihood base for fruit trees, vegetables, and rice production - Aquaculture based livelihood	☺ Good productivity, good soil fertility	☹☹ Low productivity, year on year decreases in soil fertility	Deforestation, an increase in the use of chemical fertilizer that is costly, as well as new infestations of insects and other pests, i.e. use of pesticides has contributed to lower soil fertility and decrease benefits from livelihoods
INLAND FOREST - Soil/ land for agriculture	- Fruits and vegetable production as a livelihood base	☹ Before we could not grow a lot of crops because of the dense forest	☺ Now we can grow fruits and vegetables because there are no trees to impede the activity	Slash and burn agriculture and timber harvesting as a livelihood has contributed to the emergence of this form of livelihood.

Table 4 Livelihood seasonal calendar for Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province.

Livelihood	Monthly Calendar											
	1	2	3	4	5	6	7	8	9	10	11	12
NOTE: No rice production available in this village because of the soil content. Salty. Just the small home gardening (chili, lemon, etc.) but few families do this.												
MARINE FISHING - Crabs, shrimps - Crabs are mostly targeted. Fishers use traps and nets January to April - peak season July to August – storms limit fishing activities												
MANGROVE, HAND FISHING - Mud crabs and clams - Popular with both men and women whom do not have their own boats	←											→
TOURIST BOAT - Village/s divided into 4 groups, 17 boats/ group - Each group operates 7days/month												→
FISHING AND CONSTRUCTION LABOR - For construction workers, they stop during the rainy season and become a fishing crew member - Fishing crew labor – usually from Nov- Aug												→
*Climate Pattern	Dry Season				Wet Season					Dry Season		

Table 5 Livelihood productivity and productivity input profile for Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province.

Productivity		Inputs	
Before	Now	Before	Now
Marine and Mangrove Fishing		Marine and Mangrove Fishing	
☺ FISH Type: 1 st class -10 to 20 kg/day (catch/ day) -15,000 Riel/ Kg Type: 2 nd class -10 to 20 kg/day (catch/ day) -13,000 Riel/ Kg Swimming crab - 50kg/ day	☺ ☺ FISH Type: 1 st class -3-5 kg/day (catch/ day) -10,000 Riel/ Kg Type: 2 nd class -5-10 kg/day (catch/day) -5,000 Riel/ Kg Swimming crab – unknown average catch/ day	Nets (8,500 Riel/ 180m), traps (1,800 Riel each) Crab bait (fish) - 1kg/ 300 Riel	Nets (9,200 Riel/ 180m), traps (3,000 Riel each) Crab bait (fish) - 1kg/ 1,500 Riel We have increased our fish net gear by double, and our traps by 5 times. If we don't increase the amount of fishing gears deployed we cannot catch enough for our basic needs. We are also fishing farther off shore and note dramatic declines in fish stocks.
☺ SQUID FISHING - Catch about 20kg/ day, 4,500 Riel/ kg	☺ SQUID FISHING - Catch about 20kg/ day, 6,500 Riel/ kg	Collected by hand	Collected by hand
☺ MUD CRAB (TRAP) - 10 kg/ day - Size: 0.5kg/ crab, 20-30,000 Riel/ Kg	☺ ☺ MUD CRAB (TAP) - 2 to 3 kg/ day - Size: 0.5kg/ crab, 20,000 to 30,000 Riel/ Kg	The mud crab was abundant and was caught by hand – no gear	Each fisher might set between 50 to 100 traps (each trap costing 3,000 Riel). Because of the catch decline the trap has been useful because it allows us to engage in other livelihood activities while waiting for the trap. Fish bait in the traps also helps and is a recent adaptation.
COCKLE/ CLAMS -just for consuming when people go fishing	☺ COCKLE/ CLAMS - 100kg/ day, 150 to 200 Riel/ kg	1 boat 4km= 2-3,000,000 Riel	No specific response
Tourism		Tourism	
At the beginning of the ecotourism project many boat operators went to work in the area for it was unregulated. Pricing was also not regulated, but up to the individual.	☺ Boat operators are regulated and prices are fixed, and contribute a share of their revenue to the community project, i.e. not all boat operators are from the community	Boat, fuel and labor Gasoline: 1,800 Riel/ L	Boat, fuel and labor + informal organizational inputs via new regulations Gasoline= 4,000- 4,200 Riel/ L

Table 6 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												

Table 7 Livelihood productivity and productivity input profile for Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province.

Productivity		Inputs	
Before	Now	Before	Now
Rice Crop		Rice Crop	
☺ RICE - Yield 1.5T/ ha, adequate and regular water supply - Limited pest problems - Fertile soil	☹☹ RICE - Yield 1T/ ha, decrease due to drought and water problems - Degraded soil fertility - Marine water intrusion into rice fields during harvest time (not a past problem) - Rains come late and stay later, i.e. climate variability shift	RICE - Use of natural fertilizer from cattle - No pesticide use	RICE - Use of natural fertilizer from cattle - Pesticide use is mandatory to maintain yield
Agricultural		Agricultural	
☺ CORN - Villagers did not use this fruit as an income source – consumption only	☺ CORN - Same as before	CORN - Seed/ kg - 7,000 Riel	CORN - Seed/ kg - 8,000 Riel
☺ RAMBUTAN FRUIT - 400,000 to 500,000 Riel/ per season	☺ RAMBUTAN FRUIT - Same as before	PLANTATION RAMBUTAN - Never use fertilizers	PLANTATION RAMBUTAN - Requires fertilizers – 280,000 Riel/ season (for watermelon as well)

		WATER MELON - Seed - 20,000 Riel/can	WATER MELON - Seed -35,000 Riel/ can
Mangrove Fishing		Mangrove Fishing	
☺ CRAB - 10 kg/ day from 50-60 traps - 6,000 Riel/kg avg. ☺ SHRIMP - 4-5kg/night= 4-5000 Riel/kg ☺ FISH - 4 to 5kg/ night - 2,000 Riel/kg - Few active fishers	☹☹ CRAB - 2 – 3 kg/ day – traps are no longer appropriate - 10,000 Riel/ Kg (MOST FREQUENT OF FISHING ACTIVITY DUE TO HIGHER PRICES) ☹☹ SHRIMP - 1 - 2kg/ DAY - 8,000 Riel/kg ☹☹ FISH - Pumping of sand and oil, fish have gone further off shore - Increase in number of fishers and boats	- ☹ - For each fisher, approximately 50 to 60 traps @ 2,500 Riel each - Boat and engine – gasoline 1,200 Riel/ L	- ☹☹ - Not often used, approximately 20 to 30 traps per fisher if used, each trap @ 3,000 Riel each - -Boat and engine – gasoline 4,500 Riel/ L
Animal Husbandry		Animal Husbandry	
☺ CHICKENS - The majority of the villagers raise chickens, 8,000/kg - Chickens feed natural foods and rice (no commercial feeds) , low death rate, no illness - 5 to 6 months till market	☹☹ CHICKENS - 1,500 Riel/kg, high death and illness rate – perhaps related to variable weather (changing often) - 5 to 6 months till market - Note: no pig raising as it require a lot of investment like rice	- Very Limited	- Very Limited - Locals are making use of human medicines to treat illness in chickens because if they use animal pills they would have to pay for this.

Table 8 Hazard, vulnerability, and action profile for Stung Veng Village, Peam Krasaob Commune, Mondol Seima District, Koh Kong Province

Hazard	Frequency of the Event	Vulnerability		Actions Taken to Reduce the Impact	Capacities That Supported the Action	Result of the Action
		1 ⁰ Impact	2 ⁰ Impact			
NATURAL EVENTS AND THE ENVIRONMENT - Storm	- 3-4 times per year - 2010 more storms by weaker	- Destroy houses and other infrastructure	- Prevents / hinders fishing activities and increase gear losses	- Building houses lower to the ground - Planting mangroves to protect shore line and trees within the village to act as a wind break - Use of a early warning signal through the radio to inform fishers of sea and weather conditions	- Savings, NGO support for rice seedling replacement and rice banks - Community support fund to grow/plant trees - Villagers have knowledge on how to grow/plant trees and also contribute money to the	- Decrease in sea based hazards via radio warnings (Thai radio) - Less storm damage to houses as a result of building lower – too early to know if tree planting will have a

- Flood (marine and fresh water)	- Marine water flows into the village – December to February - Freshwater floods during the rainy season	- Fresh water inflow cause marine based organisms to move further seaward – loss in mangrove livelihood productivity	- Marine water flow into the village results in animal deaths and crop damage	- Construction of dikes, but under height to handle large storms - Commune and community plans to increase dike height	effort - Community commit/ labor in kind but not funds to purchase soil and other dike building needs	positive impact - When the dike is high enough, it will stop the marine water flooding
- Drought	- Normal for the dry season	- Salt water intrusion in to well water	- Loss of crops and livestock due to the lack of fresh water, and a reduction in savings because this is used to buy water	- Buy the water for everyday living	- Household cash to access fresh water sources	- Household consumption needs are met
- Heat	- Seasonal	- Impact on health, e.g. increase disease, diarrhea, and fever	- Fishing production declines	- Make use of medical facilities - Plant trees within the village area to cool homes - In need of better boats to go fish further off shore safely where fisheries production is less affected by heat/ warming waters (no funds)	- Access savings to pay for medical needs - Commune and villagers collaborate on tree planting	- -When the planted trees grow larger they should reduce household temperatures - Access to larger boats could improve fishery incomes
ACCESS TO RESOURCES AND PARTICIPATION IN DEVELOPMENT -	- N/A	- N/A	- N/A	- Participation has greatly increased over the years. This has also improved the fairness of how villagers benefit from the natural resource base, and the support they get from development agencies respective of their livelihoods.		
Hazard Type	Perception of vulnerability	Key Impact	Actions taken to Reduce the Impact	Capacities that Supported the Action	Result of the Action	

CULTURE AND SOCIETY In relation to key natural/ environmental hazards (shown is the most vulnerable): - Storm Men 1 st Women 2 nd Children 3 rd - Flood Children 1 st Women 2 nd Men 3 rd - Drought Children 1 st Women 2 nd Men 3 rd - Heat Children 1 st Women 2 nd Men 3 rd	Because men go to fish in the sea and sometimes women go with their husbands. The children are not impacted that much because they stay at home. The main vulnerability is the boat sinking and most children can't swim The impact is more on the children because they can't swim and are vulnerable to drowning. Noted is that women are weaker than men and they take care of the children most of the time – hence in harm's way more often. Noted is that children do not know how to protect themselves from drought, and that women are more at risk because they are weaker due to double burdens and lack of nutrition/ basic health care. Noted is that children do not know how to protect themselves from drought, and that women are more at risk because they are weaker due to double burdens and lack of nutrition/ basic health care.	Loss of life, material property, e.g. boat and fishing gear	Use of radio information and communicate with key resource persons and other fishers on safety conditions	Access micro-finance institutions, e.g. ACLEDA BANK, PRASAC MICRO FINANCE to buy the radio Many fishers will not take loans greater than 10% of their income to protect themselves from expanded debt	Few negative events at sea because of improved communication systems
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Table 9 Hazard, vulnerability, and action profile for Tachat Village, Toul Kokir Commune, Mondol Seima District, Koh Kong Province

Hazard	Frequency of the Event	Vulnerability		Actions taken to Reduce the Impact	Capacities that Supported the Action	Result of the Action
		1 ^o Impact	2 ^o Impact			
NATURAL EVENTS AND THE ENVIRONMENT - Drought	- One time a year for 2 months -dry	- Decline in agricultural production that rely on stream water	- Animals/ livestock mortality	- Replanting of crops - Construction of small ponds to hold water during drought periods	- Use of local knowledge - Loans from MFI - Animal husbandry training	- Improved water availability for crops near artificial ponds

	season			- Increase animal care, e.g. vaccinations by village animal health service	- provided by district and provincial agriculture officers - Replacement of livestock through financial loans	- along streams, also provides water stocking for home use, e.g. rain water harvesting and containment - Marked reductions in animal mortality
- Soil erosion	- Continual – heightened in the wet season	- Decrease in crop productivity – impact on livelihoods and food security	- Crops are weakened and fall easily to insect damage and crop diseases	- Use of chemical fertilizer and pesticides to boost resiliency - Plant trees to retain soil in high runoff areas - Crop rotation/ multiple cropping - Use of mulch/ compost	- Training on agriculture technology - Having livestock to sell to meet financial demands when crop production is reduced - Availability of outside employment	- Improvements in family income stability and food security
- Pests	- Continual	- Decrease on crop production, decrease in income, increase family debt	- Decrease in food consumption within the household; also impacting family health	- Revert to fishing to make up for food shortfall in the household (consumption only) - Seek outside employment - Trade labor for food	- Savings and the use of MFI - Need for small trade locally	- Survival
- Heat	- Focused in the dry season	- Increase in disease and fever related health problems	- Reduction in crop production	- Use of health center/ hospitals - Selection of crops that resist drought and or high temperature	- Having livestock to sell to augment extra household expenses - Borrow from MFI - Borrow from grandparents or related families	- Projected increase in family health only if services are increased... to date no marked gain in resilience
ACCESS TO RESOURCES AND PARTICIPATION IN DEVELOPMENT -	- continual	- Lack of support for livelihoods - Few livelihood options, no income	- Lack of fair regulatory support in relation to accessing natural resources	- No specifics, just keep increasing the amount of fertilizer and pesticides used	- MFIs, training from MAFF	- Decreases in production
Hazard Type	Perception of vulnerability		Key Impact	Actions taken to Reduce the Impact	Capacities that Supported the Action	Result of the Action

CULTURE AND SOCIETY			
In relation to key natural/ environmental hazards (shown is the most vulnerable): - Drought Children 1st Women 2nd Men 3rd - Soil Erosion Men 1st Women 2nd Children 3rd - Pests Men 1st Women 2nd Children 3rd - Heat Children 1st Women 2nd Men 3rd	Children have little capacity to protect themselves, where as women will eat less than other family members when there is a short fall in food – pregnancy further complicates the impact. Men are more concern about soil erosion because they are responsible for crop production – indicating a cultural segregation in productive roles Accordingly, heightened risk is a fact of how much an individual comes in contact with pesticides. Children have little capacity to protect themselves, where as women will eat less than other family members when there is a short fall in food as a result in increase family health expenses	Loss of income, increase in food insecurity Loss of income, increase in food insecurity, increase burden towards keeping farm lands productive Not a significant risk to health directly, indirectly this impacts family stability via income losses Does not have a significant impact on productivity activities, rather on production amounts with follow-on income reductions etc.	Actions equate to those mentioned under NATURAL EVENTS AND THE ENVIRONMENT, however no actions are taken to significantly reduce risks to women and children... not recognized as important risks unless it is a female headed household (focus in on productive activities that earn income... to a lesser degree on meeting household food needs/ women go without to make up the shortfall)

Table 10 Development Service Profile (DSP) done by the Stung Villagers related to addressing the lack of fresh water needed to reduce village expenditures on water resources for both domestic consumption and agricultural and livestock production, i.e. in a way that actions contribute to food security improvements - Stung Veng Village, Peam Krasaob Commune, Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Good -seldom ←	CRC	- Provided rice and other materials for household initiatives in the village	Increased Ability
	Good - frequent ↔	AMK	- Provide loans to recover from hazards – buy food and water – Micro-Finance Institution	
	Good - frequent ←	RACHHA (MFI)	- Provide loans to recover from hazards – buy food and water – Micro-Finance Institution	
	Good - frequent ↔	ACLEDA BANK	- Provide loans to recover from hazards – buy food and water – Micro-Finance Institution - Provision of basic loans	
	Good - seldom ←	MAFF – Fisheries	- Cracking down the illegal fishing - Collaborate with MoE on community development - NRM training - Aquaculture training	
	Good - frequent ↔	MoE	- Trade food for mangrove restoration efforts - NRM training - Assist with stopping illegal fishing - Assist in mangrove management	
	Good - frequent ↔	Village Council	- Assist in land titling - Support well construction - Communicate with development partners on behalf of the village - Assist with stopping illegal fishing - Proposed road and dike construction initiatives	
	Good – frequent ↔	Commune Council	- Same as the Village Council	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 11 Development Service Profile (DSP) done by the Stung Villagers related to improving dike structures to protect their agricultural and livestock based livelihoods from an influx of marine water in village lands during storm and flooding periods - Stung Veng Village, Peam Krasaob Commune, Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Good - frequent ↔	Village Council	- Initiate dike construction - Collaborate with other institutions/ organization to fund and build dikes	Increased Ability <pre>graph TD; CC([COMMUNE COUNCILORS]) --- VC([VILLAGE COUNCILS]); CC --- V([VILLAGES]); VC --- MoE([MoE PROV, DIST, NATIONAL LEVEL]); V --- MoE; MoE --- SCCD([SUFFICIENT COMMUNE DEVELOPMENT (THAILAND REP)]); MoE --- MAFF([MAFF - Agri. PROV & DIST]); SCCD --- MoRD([MoRD PROV & DIST]); MAFF --- MoRD;</pre>
	Good - frequent ↔	Commune Council	- Initiate dike construction - Collaborate with other institutions/ organization to fund and build dikes	
	Good - seldom ←.....	MAFF - Agriculture	- Provide training on vegetable production - Provides agricultural materials/ equipments/ livestock (chickens)	
	Good - seldom ←.....	MoRD	- Facilitate latrines building	
	Good - frequent ↔	MoE	- Establish savings group - Help with mangrove rehabilitation - Provides rice	
	Good; seldom ←.....	Sufficient Commune Development (Thailand based)	- Provides fish stock and young chickens for grow-out - Assist in road and dike constructs - Provide food to villagers during crises	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 12 Development Service Profile (DSP) done by the Stung Villagers related to their lack of capacity to be protected their safety and assets from storm when engaged in fishing activities (out at sea and within the village) - Stung Villager, Peam Krasaob Commune, Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Good; frequent ↔	Village Councilors	- Storm and weather reminders for fishermen	Increased Ability
	Good; frequent ←	MoE	- Train villagers to how to grow trees to create protection barriers against storms - Provide rice for labor to grow/plant mangroves - NRM management - Assist with preventing illegal fishing and other environmental offenses	
	Good; frequent ←	RADIO	- Broadcast storm and weather information	
	Good; frequent ↔	Commune Council	- Provides building materials after disasters to rebuild lost assets - Reminds people about protection strategies against storms	
	Good; frequent →	ACLEDA, PRASAC, AMK (MFIs)	- Provide loans for people to recover from disasters/ hazards (usually fishing materials, food and general expenses)	
	Good; sometimes ←---	UNDP	- Creation of saving groups for livelihoods - Provides loan 1000\$/group of 5 people	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 13 Development Service Profile (DSP) done by the Peam Krasaob Commune related to addressing the lack of fresh water needed to reduce village expenditures within the commune on water resources for both domestic consumption and agricultural and livestock production, i.e. in a way that actions contribute to food security improvements - Peam Krasaob Commune, Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villages and within the commune structures	Good - frequent ↔	Private Water Suppliers	- Sell fresh drinking water to villages	Increased Ability ↑
	Good - sometimes ←	Coastal Zone Management - project ended	- Provide pipelines to supply household water - Maintain existing wells in the commune	
	Good - frequent ↔	Peam Krasaob Protected Community and Commune Investment Fund	- Contributes money earned from eco-tourism services to the commune council	
	Good - frequent ↔	Commune Water Project – Delivery Pipe	- Budget from the Peam Krasaob Protected Community and Commune Investment Fund is used to create water pipelines to villages	
Commune Water Project – Delivery Pipe	Good - frequent ←	District Authority	- Integrate pipeline projects with commune investment plans	
	Good - seldom ←	MoRD, MoRAM, MoE and MoWA	- Discussion on going respective of building wells with the commune – technical problems are holding the effort back	
District Authority	Good; frequent ←	Provincial Authority	- Facilitate the flow of support from development partners to the District/ Commune	
Peam Krasaob Protected Community and Commune Investment Fund	Good; frequent ↔	PMCR A Non Government Organization Project – Ended (Acronym not known)	- Only constructed a well within the commune for washing purposes	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder ** Other agencies such as the Asian Development Bank have surveyed the area respective of installing large water holding tanks – no action to date				

Table 14 Development Service Profile (DSP) done by the Peam Krasaob Commune related to improving dike structures within the commune to protect their agricultural and livestock based livelihoods from an influx of marine water in village lands during storm and flooding periods - Peam Krasaob Commune, Mondol Seima District.

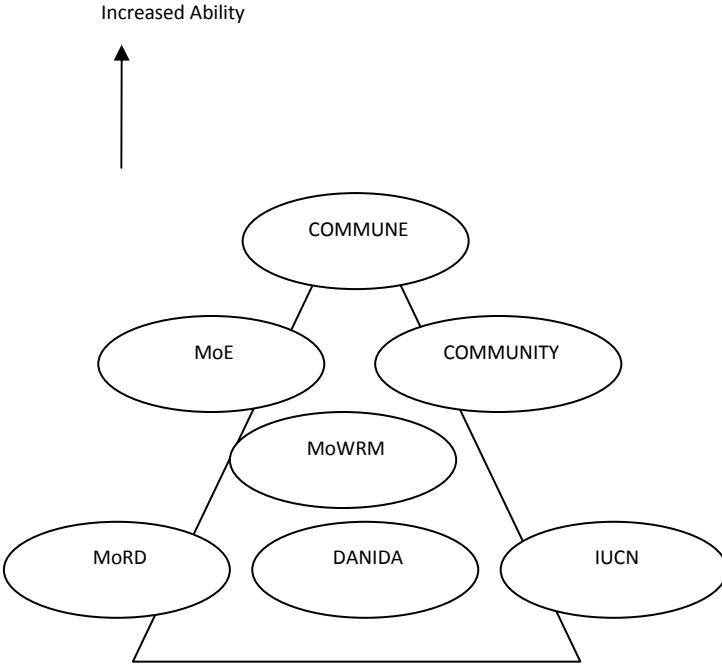
	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villages	Good - frequent ↔	MoE	- Mangrove reforestation and protection to protect against dike damage - Assist communities with national tourism initiatives - Provide exposure trips to the commune related to tourism - Facilitate communication between Non Government Organizations and community	Increased Ability 
	Good - seldom ←	MoWRM	- Dike construction in 2007	
	Good - frequent ↔	Commune Council	- Train villagers on dike maintenance - Provide funds for establish the dike - Information dissemination on dike issues - Fund sourcing for dike repairs and new establishments	
	Good - sometimes ←---	Sufficient Commune Development (Thailand based)	- Training on animal raising - fish, chicken, and pigs - Handicraft training - Provide study tours to villagers - Dike repair support - Provide agricultural seeds and young animals for raising - Provide compost training	
	Good - frequent ↔	DANIDA	- Provide water pipes - Provide materials for collecting fresh water	
	Good - sometimes ←--→	IUCN	- Dike construction - Developed women saving group - Mangrove reforestation - Provide study tours to villagers on NRM - Provide community education materials	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 15 Development Service Profile (DSP) done by the Tachat Villagers related to their lack of capacity to maintain an adequate supply of domestic water and that which can be used in agricultural production during the dry season/ periods of drought (great importance to food security) - Tachat Village, Toul Kokir Commune, Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Good - frequent ↔	Village Council	- Develop water canal building projects - Assist villagers in construct and maintenance of marine water dikes - Collaborate with the commune on path construction - Facilitate villagers in pond construction for aquaculture purposes	Increased Ability ↑ COMMUNE COUNCIL VILLAGERS VILLAGE COUNCIL MoE DISTRICT COMMITTEE MAFF - Forestry MAFF - Fisheries
	Good - seldom ←	MAFF - Fisheries	- Training and extension services on NRM - Disseminate information on fisheries law - Provide fish fry for grow-out	
	Good - frequent ↔	Commune Council	- Facilitate bridge and path construction - Promote the maintenance of natural streams - Provide water filters - Provide funds to perchance animals - Provide vegetable seeds to households	
	Good - frequent →	District Committee	- Provide training on agricultural production - Provide crop seeds, and young animal for grow-out	
	Good - frequent ↔	MoE	- Collaborates on controlling illegal activities related to natural resources - Facilitate NRM initiatives - Assist villagers in maintaining marine water dikes	
	Good -seldom ←	MAFF - Forestry	- Extension services on forestry and stream protection	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 16 Development Service Profile (DSP) done by the Tachat Villagers related to their lack of knowledge and capacity to implement environmental friendly strategies that could effectively control the impact of pests and wild animals on agricultural crop production - Tachat Village, Toul Kokir Commune, Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villagers	Good - frequent ↔	MAFF-District Agricultural Office	- Provide pest management training - Provide training and information on the use of fertilizers and pesticides	Increased Ability VILLAGES/ COMMUNE COMMUNE COUNCIL PRIVATE SUPPLIERS (PESTICIDES & MAFF - DISTRICT AGRICULTURE OFFICE
	Okay - seldom ←--→	Commune Council	- Mobilize villagers – ineffective at solving the problem	
	Good - frequent ←	Private trader/ market base	- Provide training and information on the use of fertilizers and pesticides – selling of the same	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder ** NOTE: There have been a lot of proposed actions by various agencies, but none have responded to the problem.				

Table 17 Development Service Profile (DSP) done by the Toul Kokir Commune related to the importance of lower the impact of drought on agricultural production to ensure sustainable household incomes and to reduce poverty throughout the year - Toul Kokir Commune, Mondol Seima District.

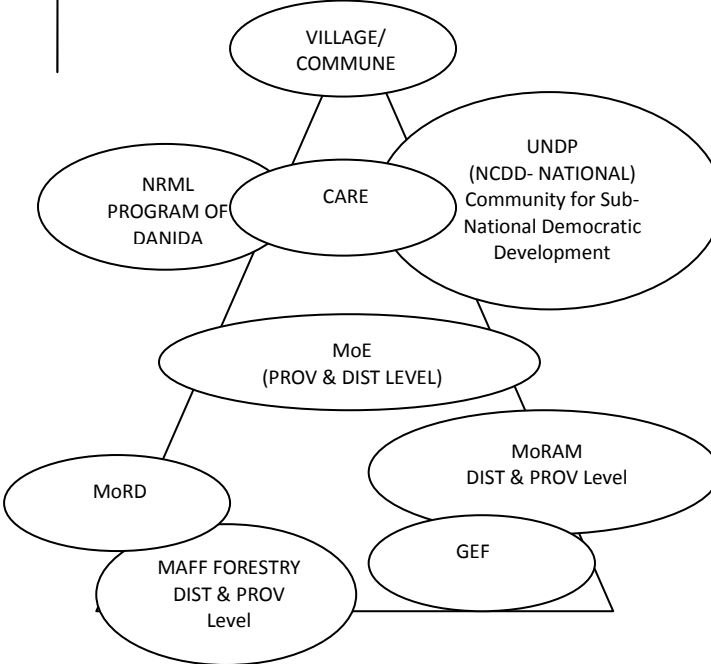
	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
Villages within the commune	Okay - seldom ↔	MoWRAM – District and Provincial Level	- Training on dike construction and construction support	Increased Ability 
	Okay - frequent ↔	MoRD	- Provision of small loans	
	Good - frequent ↔	MoE	- NRM support	
	Okay - frequent ↔	MAFF - Forestry	- Extension work on forestry laws and forestry management - Plan and provide trees for reforestation efforts - Collaborate with the commune in developing community forestry initiatives	
	Good - frequent ↔	CARE	- Dig community wells - Provide water purification tables and storage containers - Provide training on WATSAN	
	Good; frequent ↔	Global Environmental Facility (GEF) – Small Community Grants Programme	- Commitment to funding water gate development, dike building-and pond construction (no action to date) - Plans to construct a fresh water reservoir (no action to date)	
	Good; frequent ↔	UNDP	- Facilitate fund acquisition and administration - Supply information on fund use in project implementation and expenditure accounting - Provide help in the area of water and sanitation	
	Good; frequent ↔	NRML - DANIDA	- Natural Resource Management and Livelihood (NRML) program; providing funds for NRM and improve livelihoods - NRM extension training - Training on the use of pesticide	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 18 Development Service Profile (DSP) done by the Toul Kokir Commune related to their lack of knowledge and capacity to implement environmental friendly strategies that could effectively control the impact of pests and wild animals on agricultural crop production - Toul Kokir Commune, Mondol Seima District.

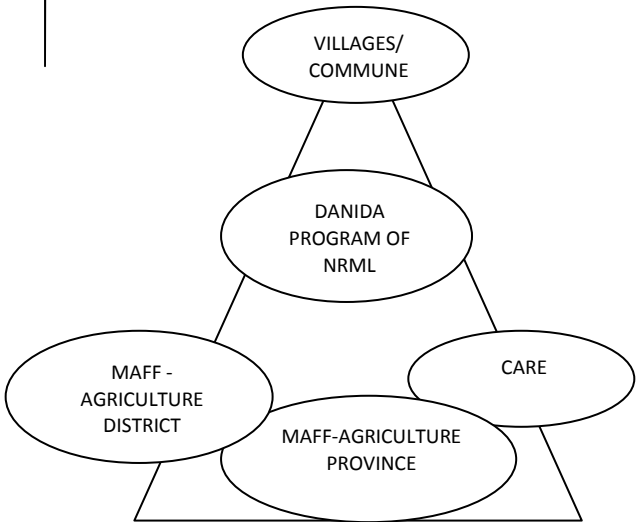
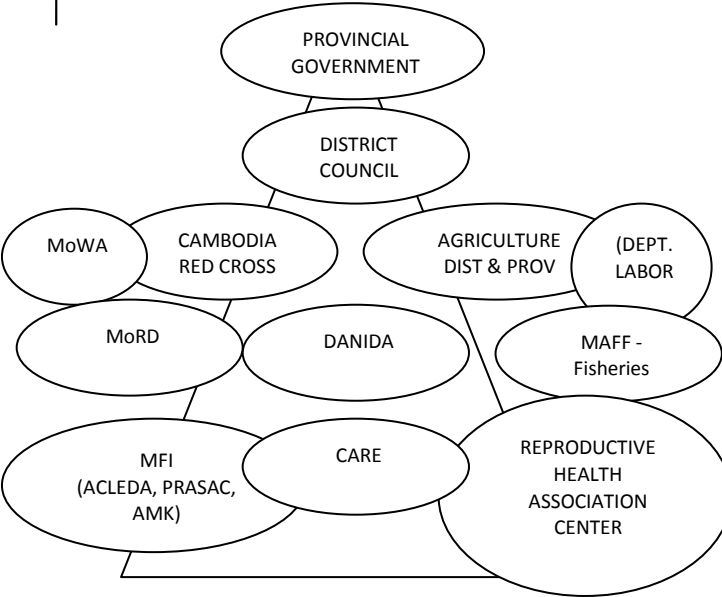
	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
VILLAGE/ COMMUNE	Good - frequent 	MAFF - Agricultural District Office	- Provide training on pesticide use - Provide training on intensive agriculture technology - Provide training on how to produce natural insecticide and apply this to crop production - Provide training on IPM (Integrated Pest Management) - Provide training on Integrated Farming Systems - Provide training on compost making - Provide training on the use of marine water resistant crop varieties	Increased Ability 
	Good - frequent 	MAFF - Agricultural Provincial Office	- Same as the Agriculture District Office	
	Good - frequent 	NRML - DANIDA	- Provide awareness building on the impact of chemical pollution on human health - Provide information on predator prey relationships in crop management	
	Good - frequent 	CARE	- Provide wells that can be used in agricultural production - Provide training Integrated Farming Systems - Providing livestock for grow-out	
	Good - frequent 	DANIDA	- Facilitate dike construction - Dig freshwater canals as reservoirs - Dredging services for lakes - Provide vegetable seeds and animal stock - Provide training on vegetable farming	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 19 Development Service Profile (DSP) done by the Mondol Seima District and Koh Kong Provincial representatives over the importance of addressing marine water flowing into villages resulting in agricultural crop production damage and damage to other livelihood activities that contribute to poverty alleviation - Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
District Communes	Good - frequent ↔	MAFF-Agriculture, District and Provincial Offices	- Train of agricultural district officers in crop production and animal raising techniques - Training farmers on crop production and animal raising - Provide animal vaccinations - Provide training on home gardening, and mushroom production	Increased Ability ↑ <pre>graph TD; PC(PROVINCIAL COUNCIL) --- DC(DISTRICT COUNCIL); PC --- CC(COMMUNE COUNCIL); DC --- CC; CC --- COMMUNITY(COMMUNITY); CC --- MoWRAM(MoWRAM); CC --- MoRD(MoRD); CC --- MAFF-AGR(MAFF-AGRICULTURE); CC --- MAFF-FISH(MAFF-FISHERY); CC --- MoE(MoE); CC --- MAFF-FOR(MAFF-FORESTRY); MoWRAM --- MoRD; MoWRAM --- MoE;</pre>
	Good - frequent ↔	MoRD	- Support for the digging of wells - Small scale support for small scale irrigation canals	
	Good - frequent ←	Provincial Council	- Planning with the district on dike construction - Working with district agencies during times of disaster	
	Good - frequent ↔	Local Communities	- Participate and coordinate with the district on dike construction	
	Good - frequent ↔	MAFF – Forestry – District and Provincial Offices	- Collaborates on controlling illegal activities related to natural resources - Assisted in NRM extension activities - Facilitate tree planting	
	Good - frequent ↔	MoE	- Coordinate dike building - Promote NRM - Promotes WATSAN	
	Good - frequent ↔	MAFF – Fisheries – District and Provincial Offices	- Coordinate dike construction - Collaborates on controlling illegal activities related to fisheries - Manage Community Fisheries Development activities - Providing training on shrimp processing - Assist in contacting NGOs to provide loan for villagers	
	Good - frequent ↔	Commune Council	- Participate and assist with district coordination of development activities	
	Good - frequent ↔	MoWRAM	- Collaborate with the district agencies respective of dike building - Facilitate the development of water gate systems and canals	
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

Table 20 Development Service Profile (DSP) done by the Mondol Seima District and Koh Kong Provincial representatives related to lower the impact of drought on home base food production to ensure food security and safety throughout the year - Mondol Seima District.

	*Relation	Stakeholder	Development Service Profile	Ability of the Stakeholder to Address the Issue Base
District Communes	Good; frequent	Cambodian Red Cross	- Provides materials/ equipment during disaster relief operations - Give money and food to people impact by hazards (heat, drought, storms)	Increased Ability 
	Good; frequent	MoWA (Ministry of Women’s Affairs)	- facilitate the creation of new livelihood activities - WATSAN training - Reduce violence against women - Provides women with vocational training	
	Good; frequent	Provincial Council	- Coordination and collaboration with District on all project implementations	
	Good; sometimes	MoRD	- Well and latrine digging -	
	Good; frequent	MAFF-Fisheries, Provincial and District Offices	- Assist in fishery processing, aquaculture and in the development of Community Fishery organizations	
	Okay; seldom	MFIs (ACLEDA, PRASAC, AMK)	- Provide loans in times of stress at the local level to recover from the impacts of hazards or improve on small business trade	
	Good; seldom	Reproductive Health Association Center	- Coordinate with the district in implementing project with commune in health protection and treatment	
	Good; sometimes	CARE	- Provide vocational training to community	
	Good; sometimes	DANIDA	- Support projects on livelihood improvement - Assist communes with implementing NRM	
	Good; frequent	MAFF – Agriculture, provincial and District Offices	- Provide train on crop, animal and mushroom production - Assist district in providing crop seeds and animal stalk	
Good; sometimes	Department of Labor and Vocational Training (Dept. Labor)	- Facilitate small scale employment - Assist district with vocational training		
* Relation defined in terms of quality and frequency of contact; the arrows indicate direction of communication between villages and the indicated stakeholder				

CLIMATE CHANGE ADAPTATION - FACTORS OF CHOICE, EFFECTIVENESS, AND SUPPORTING SYSTEMS

ANNEX 3 WORKING DAY - LIST OF PARTICIPANTS

NAME	POSITION	INSTITUTION
Cha Lann	Deputy District Governor	Mondul Seima District, Koh Kong Province
Kim Sokhem	Commune Chief	Tolul Konki Commune, Koh Kong Province
Gnourng Sam Ath	2 nd Deputy CC	O Ouknha Heng Commune, Sinhanouk, Province
Chin Saravuth	Community Fisheries Development Office – Provincial Chief	Fisheries Administration Cantonment, Sinhanouk, Province
Seng Sa Em	Water Resource Office - Provincial Chief	Koh Kong Provincial Department of Water Resources Management
Tourt Chamroen	Capacity Development Advisor	CORD Asia
Toby Carson	Advisor	The Learning Institute
Tan Vichra	Project Assistant	Cambodian Institute for Research and Rural Development
Jan Erik Wann	Director	Forum Syd
Chey Sothun	Assistant	The Learning Institute
Hem Chanrithy	Deputy Chief	Vocational Training Center
Heng Chanthoeun	Deputy Director of Department	Ministry of Environment
Sao Sambat Morakath	Environment Scientist	TEAM Consulting and Management
Heng San Dap	Provincial Officer	Koh Kong Forestry Administration Cantonment
Tep Chansothea	Researcher	The Learning Institute
Thol Buntha	Officer	The Learning Institute
Ly Vuthy	Deputy Director of Department	Ministry of Agriculture, Forestry and Fisheries - Community Fisheries Development, Fisheries Administration
San-Mari Eslihuysen	Program Officer	CEDAC – Community Economic Development Assistance Cooperation
Molum Kosal	Researcher	WorldFish Centre
Liam Fee	Consultant	United Nations Habitat
Men Rithysen	Field Facilitator	Coastal Recourse Institute - Asia Cambodia
Nayor Peung Bun	National Fisheries Officer	MAFF-Fisheries Administration
Sok Sorphoarn	Research Officer	The Learning Institute
Rudelle DeSouza	Intern	The Learning Institute
Vlademar Holmgren	Climate Change Alliance - Advisor	United Nations Development Programme
Meas Sothuon Vanthanak	Researcher	The Learning Institute
Pech Sithan	Program Manager	The Learning Institute
Minette A Vierende	Assistant	SOFEDV - Sustainable Oceans and Forests Through Equitable Development
Robert W. Solar	Consultant	United Nations Environment Programme