OPERATIONAL FRAMEWORK
FOR ECOSYSTEM-BASED ADAPTATION TO CLIMATE CHANGE FOR VIET NAM
A POLICY SUPPORTING DOCUMENT

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PREFACE

Climate change is one of the biggest threats to socio-economic development. The increasing frequency of natural disasters and extreme weather events caused by climate change threaten the livelihood, infrastructure, property, and natural ecosystems of many communities.

Ecosystems provide diverse services to human beings, and contribute to sustainable development. Restoration and protection of natural ecosystems does not only ensure economic benefits, but can also provide an economically efficient way to adapt to climate change impacts. Ecosystem-based adaptation (EbA) is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change.

Viet Nam is considered one of the countries most severely affected by climate change. The Government of Viet Nam is very active in responding to climate change and focuses on adaptation solutions that mitigate its impacts on communities, socio-economic system and natural ecosystems.

As a response to the need for guidance, World Bank (WB), the World Wild Fund for Nature (WWF) and the Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE) under the guidance of Ministry of Natural Resources and Environment (MONRE) jointly developed an operational framework for EbA for Viet Nam. The operational framework builds upon past experiences with EbA initiatives and existing processes in Viet Nam, and is supported by a literature review on EbA for GMS countries. The framework is customized for the Vietnamese context and is based on multiple consultations with different stakeholders at national, regional, and provincial levels.

MONRE would like to express its sincere thanks to national and international experts and relevant agencies and organizations for their contributions to the development and refinement of the framework. MONRE has the honor to present herewith the Operational Framework for Ecosystem-based Adaptation to Climate Change for Viet Nam to ministries, provinces, and relevant departments as well as practitioners to reference while developing policies to respond to climate change in the future or under the currently changing climate context.

Nguyen Minh Quang
Minister of Natural Resources and Environment
November 2013

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GLOSSARY OF KEY TERMS USED

Adaptation: The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2001).

Adaptive Capacity: The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (IPCC 2001). Adaptive capacity of individuals and communities are shaped by their access to and control of important resources and assets, such as access to land, access to water etc.

Climate Change: Changes in climate over a prolonged time. The IPCC (2011) defines climate change as a change caused by natural internal processes or external forcings, or by persistent anthropogenic changes in the composition of the atmosphere or land use. This definition differs slightly from the UNFCCC definition which only focuses on anthropogenic change referring to climate change as a change of climate that is directly or indirectly caused by anthropogenic forces altering the composition of the atmosphere; and which is in addition to natural climate change. Climate change include the observed and projected increases or decreases in regional and local temperatures, changes in timing and amount of rainfall, sea level rise etc.

Climate Impacts: The consequences of climate change or climate hazards on natural and human systems.

Ecosystem-based Adaptation: is "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change" (CBD 2013). Ecosystem-based Adaptation uses sustainable management, conservation, and restoration of ecosystems to build resilience and decrease the vulnerability of communities in the event of climate change.

Ecosystem services: Benefits that people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling (Millennium Ecosystem Assessment 2005).

Exposure: The level at which a country/region experience the risks of climate change based on its geographic location. For example, coastal communities will have higher exposure to sea level rise and cyclones, while communities in semi-arid areas may be most exposed to drought.

Hazard: A hazard is defined as a harmful event that affects communities or ecosystems. A climate hazard is an event cause by climate change with the potential to cause harm, such as heavy rainfall, drought, storm, or long-term change in climate variables such as temperature and precipitation.

Multi Criteria Analysis (MCA): A structured approach used to determine overall preferences among different alternative options, where the options accomplish several objectives that may not always complement one another (Department for communities and local government, London 2009). In MCA, desired objectives are specified and corresponding attributes or indicators are identified. The measurement of these indicators is often based on a quantitative analysis (through scoring, ranking, and weighting) of a wide range of qualitative impact categories and criteria.

Risk: The likelihood of a hazard happening that will affect natural or human systems.

Scenario analysis: A method that describes the logical and internally consistent sequence of events to explore how the future might, could, or should evolve from the past and present (van der Sluijs et al. 2004).

Sensitivity: The degree to which the community is affected by climate stresses. Communities dependent on rain-fed agriculture are much more sensitive to

changes in rainfall patterns than ones where the main livelihood strategy is labor in a mining facility, for instance.

Spatial analysis: A set of methods whose results change when the locations of the objects being analyzed change (Longley et al. 2005).

Spatial planning: A method used to influence the future distribution of activities in space (European Commission 1997). It goes beyond traditional land-use planning to integrate and bring together policies for the development of land-use and other policies and responses that influence the use of land (Office of Disaster Preparedness and Management, UK 2005). Spatial planning is critical for delivering economic, social and environmental benefits by creating more stable and predictable conditions for investment and development, by securing community benefits from development, and by promoting prudent use of land and natural resources for development.

System dynamics: An aspect of systems theory used to understand the dynamic behavior of complex systems. The basis of the method is the recognition that the structure of any system—and the many circular, interlocking, sometimes time-delayed relationships among its components—is often just as important in determining the system's behavior as the individual components themselves.

Vulnerability: "The degree to which a system is susceptible to, or unable to cope with the adverse effects of climate change, including climate variability and extremes (IPCC 2001)." Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity. In EbA the ecosystems and their vulnerabilities are included in the analysis together with the vulnerability of communities.

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ABBREVIATIONS AND ACRONYMNS

ADB	Asian Development Bank
CC	Climate Change
CBD	Convention on Biological Diversity
CEA	Cost-Effectiveness Analysis
DARD	Department of Agriculture and Rural Development
DONRE	Department of Natural Resources and Environment
DPI	Department of Planning and Investment
EbA	Ecosystem-based Adaptation to Climate Change
FGD	Focus Group Discussion
GIZ	German International Cooperation and Development Agency
GMS	Greater Mekong Sub-Region
IMHEN	The Vietnam Institute of Meteorology, Hydrology and Environment
InVEST	Integrated Valuation for Environmental Services and Trade-offs
IPCC	Inter-Government Panel on Climate Change
ISPONRE	Institutue of Strategy and Policy on Natural Resources and Environment
IUCN	International Union on Consrvation of Nature
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
MOT	Ministry of Transportation
MPI	Ministry of Planning and Investment
M&E	Monitoring and Evaluation
MCA	Multi-criteria Analysis
NTP-RCC	National Target Programme to Respond to Climate change
PPC	Provincial People's Committee
SEDP	Socio-Economic Development Plan
SIDA	Swedish International Development Agency
SP-RCC	Support Programme to Respond to Climate Change
UNCCD	United Nation Convention on Combating Desertification
UNFCCC	United National Framework Convention on Climate Change
WB	World Bank
WWF	World Wide Fund for Nature

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1. INTRODUCTION

1.1. CLIMATE CHANGE IMPACTS IN VIET NAM

Climate change is one of the biggest threats to humanity in the 21st century, profoundly influencing global and local economies, and, in some cases, pushing people into povery. People worldwide are already facing natural disasters caused by climate change, with the rural poor being the most affected. Adaptation to climate change has emerged as an urgent priority for global sustainable development.

Viet Nam is already experiencing the impacts of climate change and is predicted to be one of the most vulnerable countries to climate-induced hazards. According to the Intergovernmental Committee on Climate Change report (IPCC 2007), Viet Nam is considered as one of the countries most severely affected by climate change. The Mekong Delta of Viet Nam is forecasted as one of three deltas that are most vulnerable to sea level rise. Climate change causes an increased frequency and intensity of natural disasters, especially hurricanes, floods, and droughts. The annual average temperature of Viet Nam has increased by about 0.5°C in the last 50 years; and sea level has increased about 20cm in the same time[1]. Past El Nino and La Niña occurrences have already seriously impacted Viet Nam, and climate change has exacerbated the severity of natural disasters, especially storms, floods, and droughts.

Viet Nam's long coastline, geographic location, as well as diverse topography and climates make it one of the most hazard-prone countries in the Asia-Pacific, particularly to tropical cyclones, storms, and flooding (World Bank 2011). Given its mega deltas and a high concentration of the country's population and economic assets (including irrigated agriculture) in coastal lowlands and deltas, Viet Nam has been ranked among the five countries likely to be most affected by climate change by the end of this century. If sea level increase by one meter, about 39 percent of the Mekong Delta, more than 10 percent of the Red River Delta, around 2.5 percent of the Central Coast, and more than 20 percent of Ho Chi Minh City would be inundated, directly impacting thousands of people and creating huge economic losses.[2]

Climate Change has emerged as an impediment to sustainable development in Viet Nam and is predicted to have a significant impact on natural resources (water, land, forests, clean air, ecosystems, etc.), the economy (transport and urban infrastructure, energy production, agriculture, timber, etc.) and the social wellbeing (human health, displacement, and migration) of its people. Climate change is expected to heavily impact several key socio-economic sectors including agriculture, forestry, fishery, energy, transportation and health. Climate change adaptation, thus, is a critical development issue in Viet Nam. Equally critical is the way in which adaptation takes place.

[1]MONRE, Viet Nam Climate change and SLR scenarios 2012.
[2]MONRE, Viet Nam Climate change and SLR scenarios 2012.
[3]Viet Nam Assessment report on Climate change, VARCC, ISPONRE & UNEP 2009.

1.2. POLICY FRAMEWORK IN VIETNAM TO RESPOND TO CLIMATE CHANGE

1.2.1. Policy Framework for Climate Change Responses

The Government of Viet Nam has shown a strong commitment to combating climate change since the early 1990s, developing climate-related national strategies and action plans, integrating climate change in development plans and committing to important international protocols and frameworks targeting climate change. In 1992, Viet Nam signed the UN Framework Convention on Climate Change (UNFCCC), which was ratified in 1994. In 1998 it signed the Kyoto Protocol (ratified in 2002), and it ratified the UN Convention to Combat Desertification (UNCCD). Finally it signed the Hyogo Guidance for Action on disaster mitigation for 2005-2015. Figure 1 summarizes key climate change policies underscoring the role of ecosystem-based approaches in reducing vulnerabilities.

Viet Nam has in place numerous policies, strategies, and action plans that stipulate the need for addressing climate change issues together with natural resource management. In 2008, Viet Nam launched the National Target Program to Respond to Climate Change (NTP-RCC), a five-year plan prioritizing climate change responses nationwide. The scope and content of the NTP-RCC includes mitigation, adaptation (including disaster risk management), and crosscutting issues (e.g. monitoring, implementation, financial mechanisms for implementation, awareness raising, capacity building, and human resource development).

For effective climate change response and sustainable development in the current context, a National Climate Change Strategy with a century-long vision was formulated to form the basis for other strategies and development planning. The Prime Minister approved this National Climate Change Strategy in late 2011 with the following key objectives:

- Sustainable utilization of national resources;
- Carry out adaptation measures and mitigation options for greenhouse gas emissions;
- Safeguard people's lives and properties;
- Ensure the sustainability of development goals;
- Strengthen resilience of human and natural systems to climate change;
- Develop a low-carbon economy to protect and enhance the quality of life; and
- Ensure national security and sustainable development.

Following the National Climate Change Strategy, at the end of 2012 the Prime Minister approved the National Action Plan to Respond to Climate Change for the period 2012-2020. The purpose of the National Action Plan is to carry out the National Climate Change Strategy and achieve its objectives and tasks.

In 2012, the prime minister also approved a Green Growth Strategy. This strategy aims to achieve sustainable economic development by moving towards a low carbon economy and by restoring and protecting natural capital. Green growth shall lead to the increased investment in conservation, development and efficient use of natural capital, reduction of greenhouse gas emissions, and improvement of environmental quality, thereby stimulating economic growth.

The latest important climate change policy is Resolution No.24-NQ/TW, which was approved in June 2013. This resolution is among the highest-level political documents in Viet Nam as it stipulates the climate change considerations that all relevant laws and policies must abide by. This document holds even more importance given that awareness of the need to protect natural resources and the environment as well as responding to climate change still differs among different sectors and the public.

The rigorous implementation of strategies and plans in Viet Nam shows the clear commitment by the national government to combat climate change and highlights the growing recognition of natural capital and resources as well as ecosystem services in the national agenda. Though there are crucial barriers in terms of lack of knowledge, tools, capacities, and funding, the National Climate Change Strategy, the Green Growth Strategy and the latest Resolution No.24-NQ/TW provide essential momentum for the adoption of

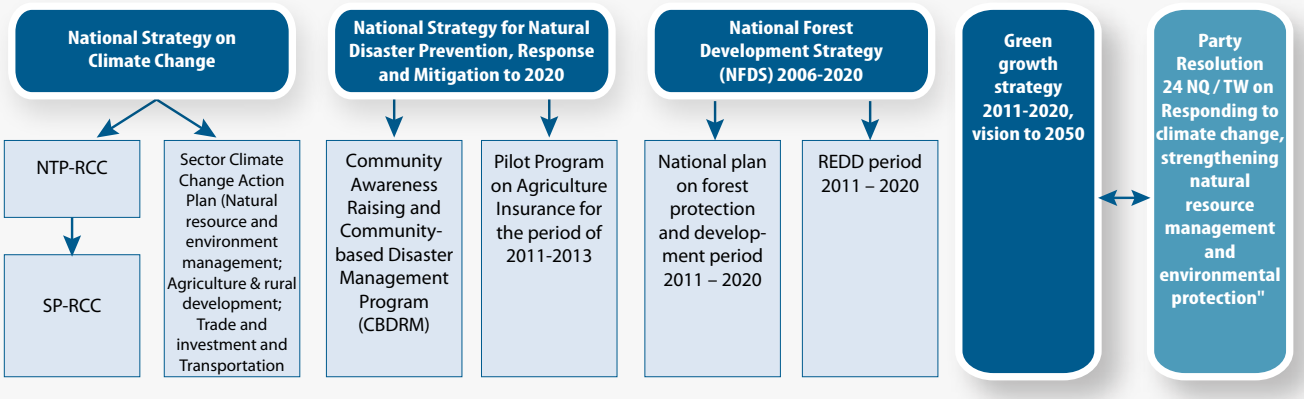

Figure 1. National Policies and Programs guiding Climate Change Actions in Viet Nam (Sourcce: WWF 2013)

ecosystem-based approaches to climate change action for Viet Nam. Importantly, however, decision makers in Viet Nam still need to be convinced that green or EbA measures are capable of meeting their adaptation objectives. This will require a systematic consideration of the applicability, limitations, and risks of EbA options as compared to traditional, often "hard," infrastructure alternatives.

1.2.2. Ecosystem-based Adaptation and Its Relevance in Viet Nam

For Viet Nam, EbA can provide adaptation solutions that are consistent with national development and adaptation goals such as coastal protection, conservation of natural resources, and sustainable development. EbA is defined by the Convention on Biological Diversity (CBD 2009) as "the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change." EbA addresses the crucial links between climate change and ecosystem services, considering natural resource management through a lens of enhancing human resilience. As one potential element within a broader portfolio of adaptation measures, EbA uses sustainable management, conservation, and restoration of ecosystems to ensure the provision of ecosystem services to facilitate human adaptation to the adverse impacts of multiple pressures, including climate change (Chapin et al. 2009; CBD 2009; Piran et al. 2009).

The biological diversity in Viet Nam is concentrated in three main ecosystems: terrestrial ecosystems (forest ecosystems), wetland ecosystems, and marine ecosystems. Among them, the forest ecosystem has the highest species diversity, and is home to diverse animals, wild plants, and microorganisms that are of high economic and scientific value. There are 30 types of natural wetlands categorized in two groups: (1) inland wetlands (19 types), (2) coastal wetland (11 types), and 9 types of artificial wetland. The Mekong and Red River Deltas are the largest wetland areas in Viet Nam. Having an over 3,260 km coastline, the total sea area is more than three times the area of the land territory in Viet Nam. Viet Nam's marine ecosystem contributes to more than 5.3 million tons of marine fisheries and can provide about 47 percent of the protein needs of the Viet Namese citizen every year. Therefore, the solution to adapt to climate change based on natural ecosystems is considered consistent with the economic-social system of the country. Moreover, the millennium goals of sustainable economic development, poverty alleviation, and biodiversity conservation are hugely dependent on the natural resources of the country.

Currently, engineering infrastructure or hard options like sea walls and dikes are more widely promoted than EbA solutions in Viet Nam. Planners and decision-makers in Viet Nam and elsewhere usually distinguish three general categories of adaptation pathways: hard or sometimes referred to as grey adaptation, soft adaptation, and green or Ecosystem-based Adaptation (EbA). Currently hard (infrastructure-based) solutions are preferred in Viet Nam, especially for coastal protection, mainly due to a lack of awareness and evidence of other alternatives. Compared to hard adaptation efforts, EbA is generally considered to be more accessible to rural communities, and it offers co-benefits such as soil management, water regulation, carbon sequestration, and livelihood diversification opportunities. EbA builds upon and utilizes approaches that already exist and are

central to natural resource management, community-based conservation, and sustainable development. Major livelihood sources and the revenue-generating sectors of Viet Nam (such as the agriculture, energy and timber industries) are highly dependent on climate-sensitive ecosystem services - the role of which has been recognised in various national development agenda. Viet Nam's recent achievements in EbA implementation have been highly acclaimed by Vietnamese policy makers and international development partners such as the World Bank, the Asia Development Bank, the Swedish International Development Cooperation Agency and the German International Cooperation and Development Agency.

1.3. NEED FOR AN OPERATIONAL FRAMEWORK FOR EbA

The key needs in Viet Nam include increasing awareness and capacity for adaptation including EbA, guidance on considering, assessing, implementing and mainstreaming EbA measures, and building an evidence base on how EbA contributes to reducing vulnerability. The guidance proposed through the EbA operational framework supports Viet Nam in the assessment and implementation of EbA responses and in the integration of this approach into the planning and policy systems.

Ecosystem-based Adaptation is a relatively new concept that is based on the principle that healthy and resilient ecosystems contribute to reduce climate change vulnerability in communities that depend on ecosystem services for their livelihoods. Ecosystems provide services that support the communities to adapt to "shocks" caused by climate change (Nathalie et al. 2011). Implementation of EbA can also create social, economic, cultural, and environmental benefits and contribute to the conservation of biodiversity. The EbA measures can be implemented individually or as part of the overall adaptation strategy and builds on the existing and indigenous knowledge of the local communities.

Although some EbA inititatives have been implemented in the coastal area of Viet Nam, these initiatives are at very small scale. There is still a need for broader awareness regarding EbA and guidance for EbA design and implementation. Technical guidance on developing and implementing EbA solutions will assist in awareness raising and capacity building to implement EbA solutions, and promote the replication of EbA strategies nationwide.

[4] Hard approaches are characterized as capital-intensive, constructed-engineered solutions; soft approaches are characterized as focused on institutions, behavioral and policy approaches such as regulatory framework; and green approaches are characterized by an ecosystem-based/environmental management approach (The World Bank 2010b; EEA 2010).

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2. OPERATIONALIZING A FRAMEWORK FOR ECOSYSTEM-BASED ADAPTATION FOR VIETNAM

The framework is structured to provide step-wise procedural guidance on i) identifying adaptation in general and EbA specifically; ii) assessing the changes in ecosystem services under different development and climate change scenarios; and iii) prioritizing EbA solutions. Monitoring and Evaluation is considered an important element of the framework.

The framework acknowledges that EbA may not always be the most suitable adaptation responses in all contexts and that the final decision on adaptation responses depends on the different contexts and factors at play.

2.1. OBJECTIVE OF THE EbA OPERATIONAL FRAMEWORK

The framework is designed to provide detailed steps guiding a vulnerability assessment of the socio-ecological system. Additionally, it offers suggestions for tools and methods that can be used to analyze and prioritize appropriate adaptation options, which enable communities to adapt more effectively. The objective of the framework is to provide a user-friendly resource that:

- Provides step-wise guidance on vulnerability assessment to climate and non-climate related impacts on the socio-economic system;
- Supports policy makers, organizations and individuals working, on and interested in, climate change responses and policy integration; and
- Introduces updated and effective tools and methods for identification of EbA measures and implementation progess.

2.2. USERS OF THE FRAMEWORK

The EbA operational guidance is primarily developed for usage at the provincial government agencies; that is, the sub-national level.[6] This document also targets national policy planners and other interested practitioners in Viet Nam.

- Departments having state management function and advising in developing policies and guidelines for adaptation and mitigation measures under MONRE; MARD; MPI and others;
- The DONRE; DARD and DPI and others that are responsible for policy mangement and implementation at provincial level;
- Non-government organizations working on conservation and development; and
- Research institutes, universities and consultancy firms working on and interested in climate change in Viet Nam.

[6] This recommendation is identified after the field-testing of the operational framework in Ben Tre province.

2.3. EbA OPERATIONAL FRAMEWORK AND ITS APPLICATION

The framework provides detailed guidance on three major stages and their subsequent steps:

Stage 1: **Vulnerability assessment** of Social Ecological Systems;

Stage 2: Identification and Prioritization of **EbA Measures**;

Stage 3: **Implementation** of EbA Measures and Recommended Principles for **Monitoring and Evaluation**.

In addition, section 3 provides recommendations for mainstreaming of EbA strategies in policies and plans.

The summary below provides a snapshot of stages 1-3, the associated steps and a short description of the recommended tools. Examples of application of these tools have been provided, where relevant, based on the field-testing. Appendices display the suggested methods, tools, and sources for implementation of these three stages. It is important to note that the tools suggested here are just examples and may change with time and context.

2.3.1. Stage 1: Vulnerability Assessment of Social-Ecological Systems

The first step of the framework is to implement a vulnerability assessment, which is necessary to set the context of adaptation, including who and what components of the SES are vulnerable and what are the risks or threats. The framework uses an ecosystem lens to provide an integrated understanding of vulnerability drivers as well as who is vulnerable to specific climate hazards.

Table 1. Expected outputs and suggested tools and methods for Stage 1

Steps	Outputs	Methods and tools
1. Identifying the adaptation objectives.	(i) Ecosystem based adaptation is considered an adaptation objective at the seleted site.	Stakeholder consultancy (Tool 2).
2. Understanding the context of communities, their demographic, socioeconomic conditions, key sources of livelihood, and how it is supported by the ecosystem services	(i) A community profile of the study area; (ii) Ranked list of ecosystem services that are important to the communities; (iii) Groupings of key beneficiaries from the ecosystem services.	Secondary data collection. (Tool 1). Focus group discussion (FGD) (Tool 3). Seasonal calendar (Tool 3.1). Resource mapping (Tool 3.3).
3. Understanding and mapping ecosystem and ecosystem services in the study area.	(i) A community developed map of ecosystem and ecosystem services; (ii) Digital Map of the study area showing key ecosystem services and their current distribution and amount.	Expert judgment (Tool 5). FGD (Tool 3). Community resource mapping (Tool 3.3).
4. Understanding current threats or risks from climate change to the communities.	(i) Hazard map and hazard ranking; (ii) Seasonal calendar with climate risks; (iii) Historical timeline; (iv) List of coping strategies.	Focus Group discussion (Tool 3). Participatory hazard mapping (Tool 3.3). Historical Timeline (Tool 2.2).

Steps	Outputs	Methods and tools
5. Understanding threats from non-climate risks and different socio economic dynamics including potential development plans to the communities.	(i) A list of socio economic socio-economic factors that make the community vulnerable; (ii) Potential development plan and its projected impact.	Policy review (Tool 1). Key informants interview/ focus group discussion (Tool 3).
6. Understanding threats from current climate and non-climate risks to the Ecosystems and Ecosystem services (ES).	(i) Products: Current climate and non-climate risks and impacts identified.	Secondary research (Tool 1). Focus Group discussion (Tool 3). Expert judgment (Tool 5).
7. Creating future scenarios to identify future vulnerabilities to climate and non-climate change.	(i) Future risks and impacts from climate change and development pressures identified; (ii) Future scenarios for climate change.	Expert judgment (Tool 5). Scenario Analysis. (Tool 4). Modeling Tools (Tool 4.2).
8. Assessing exposure, sensitivity, and adaptive capacity.	(i) Risk and Vulnerability Ranking.	FGD (Tool 3). Expert judgment (Tool 5).
9. Summarizing the information and creating vulnerability matrix.	(i) Vulnerability matrix.	FGD (Tool 3). Expert judgment (Tool 5).

Checklist of Key Activities for Stage 1:

- Ensure adaptation objectives are consistent with and contribute to national or sub-national development goals;
- Identify and consult with key stakeholders;
- Consult available information on climate change and its likely impact assessments, climate change scenarios, and relevant policies related to the selected site;
- Identify vulnerable groups or sectors in the study area after discussing with key stakeholders and focus groups;
- Identify a core team for vulnerability assessment and the design of EbA initiative;
- Identify and map major ecosystem services and ecosystem areas;
- Assess key linkages between the socio-economic sectors and ecosystem services;
- Identify impacts of climate change and other major drivers for each vulnerable group/sector or area;
- Assess the level of dependence of vulnerable groups/sectors/areas on ecosystem services;
- Assess the level of current and future vulnerability for each vulnerable group, sector or area and associated changes in ecosystem services for different climate change and development scenarios.

Suggested tools and methods for Stage 1:

Tool 1: secondary research and analysis

Description: Before starting work in the field/site, it is important to collect the secondary data available at both national and sub-national level. Any secondary data available on scientific information on climate change, types of ecosystems in the study area (such as forest type, information on topography, geography. etc.) would be useful. Similarly demographic and socioeconomic data of communities such as male/female ratio, major sources of livelihoods in the area, or other information can be collected beforehand.

Application scale: National/sub-national/provincial.

Tool 2: stakeholder consultation including community representatives

Description: The stakeholder consultation process for EbA includes identifying and engaging key people and organizations that can either impact, or are impacted by, any part of EbA assessment. It is necessary to do a preliminary stakeholder assessment to identify key stakeholders that can help in initiating the discussion about the adaptation objective. At a sub-national level it may involve:

- National and sub-national governmental agencies, such as the ministry of natural resources and their provincial and district level offices, the ministry of planning and investment and their sub-national offices, sectoral ministries such as agriculture, forestry, water, land-use and their sub-national offices;
- Technical experts in climate change and different sectors;
- Non governmental agencies that are engaged in climate change and adaptation related activities; and
- Community representatives.

Application scale: National/sub-national/provincial.

Tool 3: Focus group discussion

Description: Focus group discussion (FGD) is one of the most commonly used participatory methods to understand concerns and perceptions of the communities. A focus group is a small group of six to ten people led through an open discussion by a moderator. The moderator/researcher should establish a focus group based on some shared characteristics, so that the group is more or less homogenous, everyone feels equal, and no member feels inhibited to speak. Focus groups can be formed based on gender, livelihood groups, or other similarietes to facilitate the discussion on common and individual concerns and perceptions.

Prepare a predetermined questionnaire to conduct a focus group discussion, but the discussion should be open-ended and semi-structured. The questionnaires should not be too long and the FGD should ideally be under two hours. To make analysis easier, the same questionnaire should be used with different focus groups where possible. Other PRA tools such as seasonal calendar, historical timeline, community mapping can also be included as a part of FGD.

Application scale: Provincial/district/commune.

Tool 3.1: Seasonal Calendar

Description: The purpose of generating a seasonal calendar is to identify the seasonality of the (i) weather patterns, i.e. summer months, rainy season, winter etc.; (ii) the community's livelihood activities, which are often connected to resource use and resource abundance; and (iii) seasonality of hazards. Communities identify different activities (agriculture, aquaculture, seasonal migration) that occur throughout a year and the guided discussion will seek to identify how the climate change will affect overall activities and whether it will alter the seasonality of community's livelihood activities. The discussion will also seek to provide understanding of historical changes in seasonality that the community has already experienced, and the social mechanisms that the community has employed to mitigate their effects.

Applicable Scale: Provincial/district/commune.

Table 2. Example of seasonal calendar in Thanh Phu coastal district, Ben Tre province

ThanhPhu district		1	2	3	4	5	6	7	8	9	10	11	12
Weather & climate	Dry season												
	Rainy season												
	Storm; tropical cyclones												
	High tides												
	Dry season												
	Drought												
Sea fishing & Aquaculture	Clams, oysters farming												
	Clams, fish, shrimp, snails, squid, crab farming												
	Intensive shrimp farming												
	Extensive shrimp farming												
	Offshore fishing												
Agriculture	Watermelon												
	Cassava												
	Benut												
	Mango												
	Corn												
	Rice												
	Vegetable												

Tool 3.2: Historic Climate Trend analysis

Description: Understanding the history of past extreme events and a community's reaction to these events can serve as very important information for an adaptation plan. The historical trend analysis will give insight into past climate hazards, their trends, intensity, and impacts to ecosystem services and communities. The trend analysis can be done either just through discussion or by drawing a line to mark the passage of time (10-20-30 years based on the available data).

Applicable Scale: Provincial/district/commune.

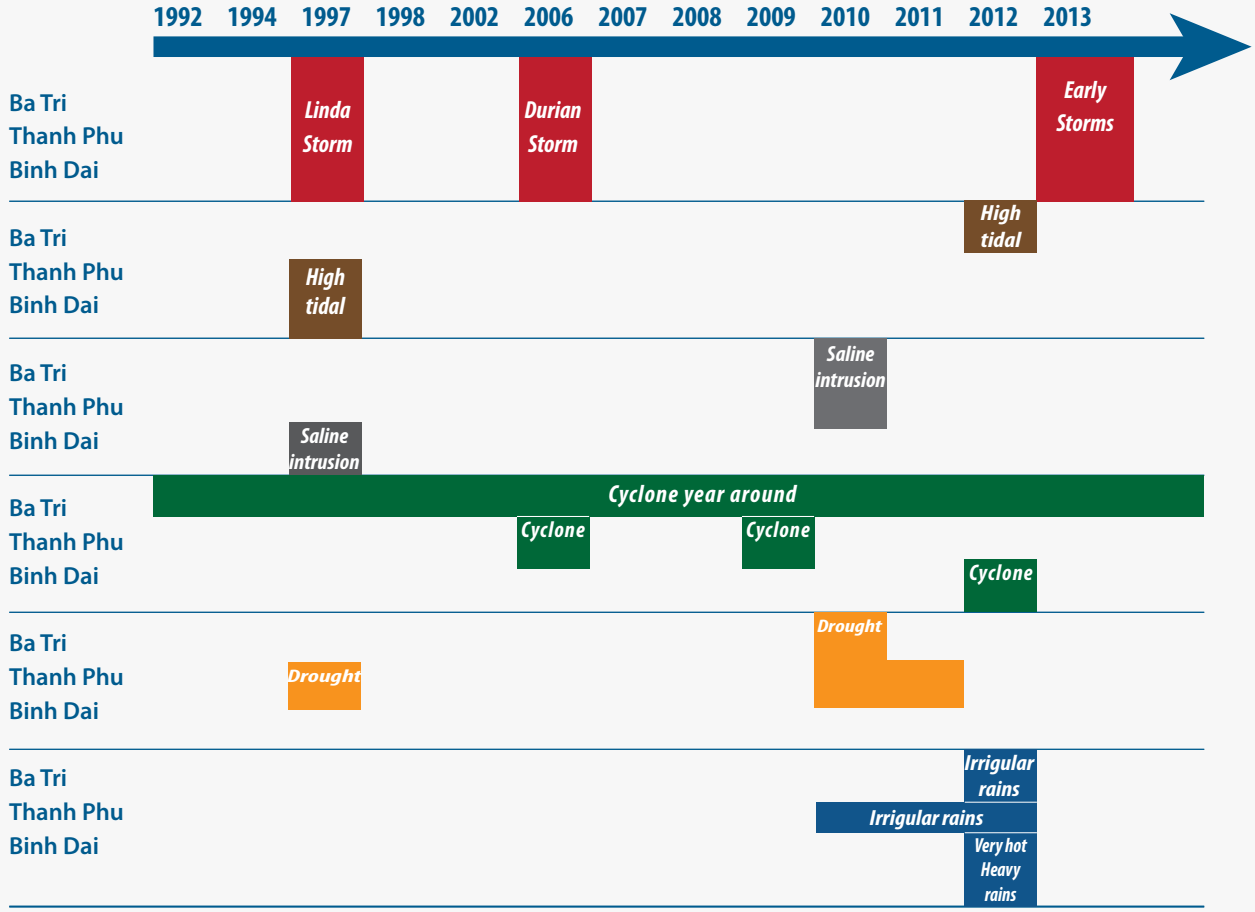

Figure 2: Example of Natural hazard map of three coastal districts in Ben Tre (Ba Tri, Binh Dai and Thanh Phu districts)

Table 3. Summary of significant natural disasters in Thanh Phu district, Ben Tre province

Time of event	Type of event	Intensity
November 1997	Linda storm	Very serious
December 2006	Durian storm	Strong winds, heavy rain, and caused severe damages
May 2007	Typhoon	Damages to houses
2010	Sea level rise	Heavy impact to aquaculture and vegetable plantation
2009 – 2010	Unidentified	Massive death of clam and blood cockle

Tool 3.3: Participatory mapping

Description: Participatory mapping can be done either on a piece of paper, through actual maps of the study area, or as direct inputs in digital maps depending on the context. Participatory mapping can help in EbA by identifying: (i) key ecosystems, ecosystem services and their location in the study area; (ii) climate hazards showing the locations more prone to hazards; and (iii) locations of population groups, identification of which are most vulnerable if applicable, or populations with different livelihoods.

Applicable scale: Provincial/district/commune.

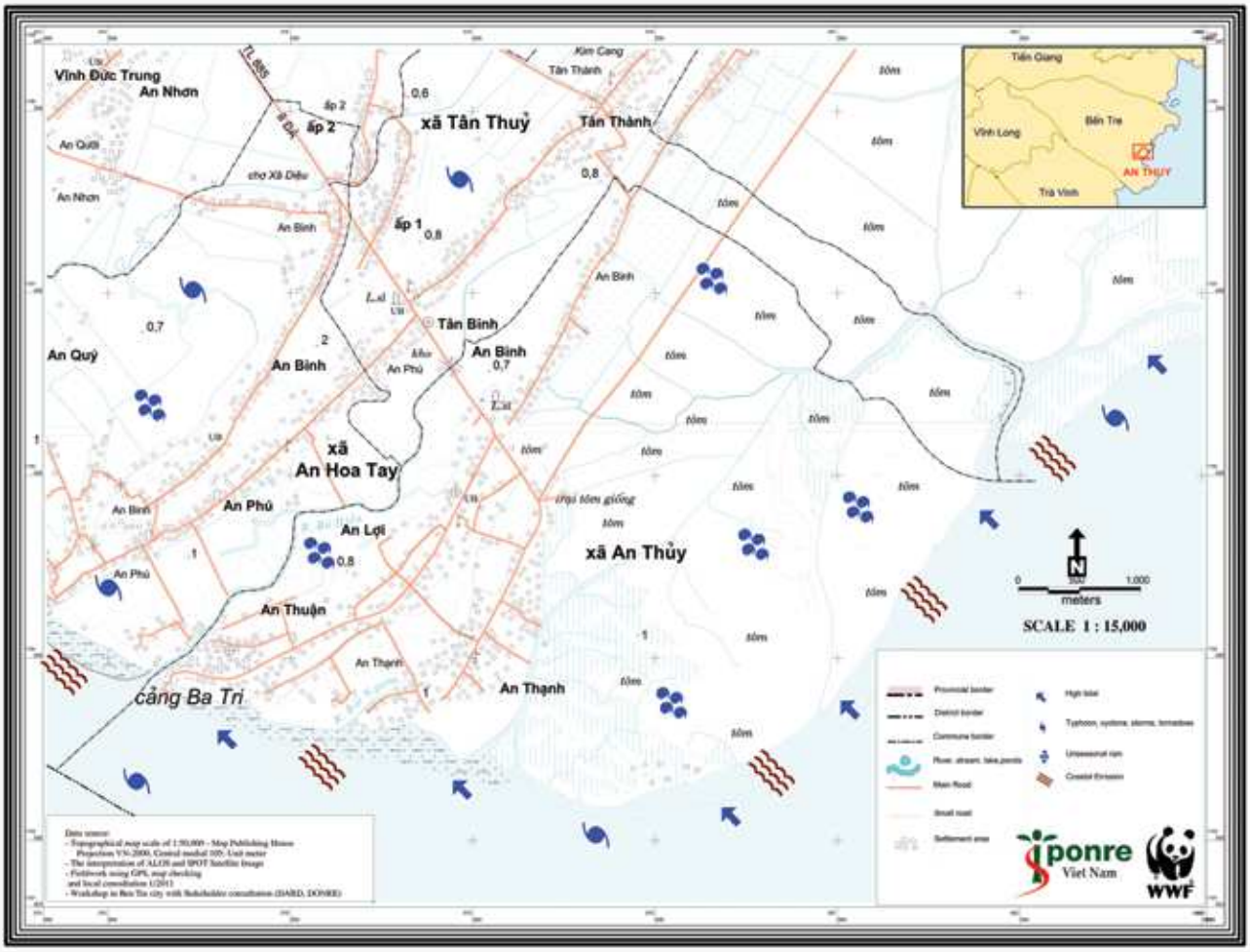

Figure 3. Example of a hazard map in An Thuy commune, Ba Tri district, Ben Tre province

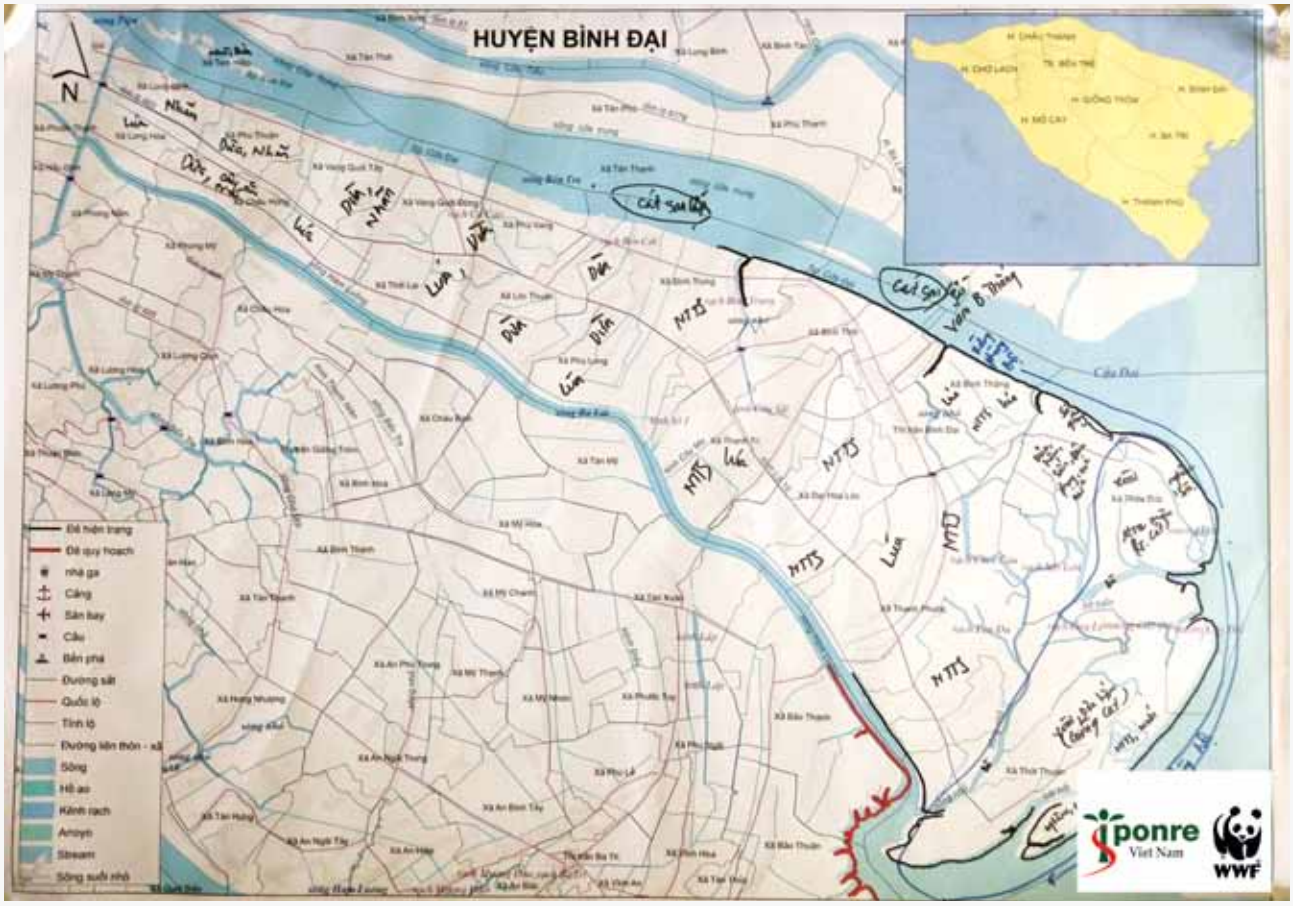

Figure 4. Example of a participatory map for hazards and available resources in Binh Dai district

Tool 4: scenario analysis

Tool 4.1. Future Scenarios Development

Description: A scenario analysis is a process of analyzing possible future events by considering alternative possible outcomes or alternate future developments. For EbA and/or other adaptation planning, the scenario analysis can provide useful insight on the future risks and vulnerability to both societies and ecosystems. Scenarios are developed based on certain criteria or assumptions about the future, for example, the level of infrastructure development, or looking at changes with or without climate change pressures, among others. These criteria can either be collectively agreed upon or taken from existing and future development plans/ policies. A Scenario Analysis can be done with or without using any modeling in a stakeholder consultation.

Applicable scale: Provincial/sector level.

Example of future scenario development process for Ben Tre province, Viet Nam.

- Layout current status of land use/land cover on a map;
- Define drivers of change;
- Describe how the futures look like (if… then….);
- Draw expected futures under different assumptions on maps.

Scenario 1: Normal development/Business as usual

Assumptions: the socio-economic development in the province at the same growing rate in the previous 10 years period, provincial land-use plan is fully implemented, rising sea level scenarios in 2020.

Scenario 2: Rapid development

Assumptions: Agriculture and aquaculture are expanded and intensified as agriculture sector proposed, industry and infrastructure are developed as industrial sector proposed, rising sea level scenarios in 2020.

Scenarios 3: Conservation

Assumptions: New protected areas are established, mangrove covers increased up to 100 percent in planned forestry areas, natural hydrological regime is maintained, rising sea level scenarios in 2020.

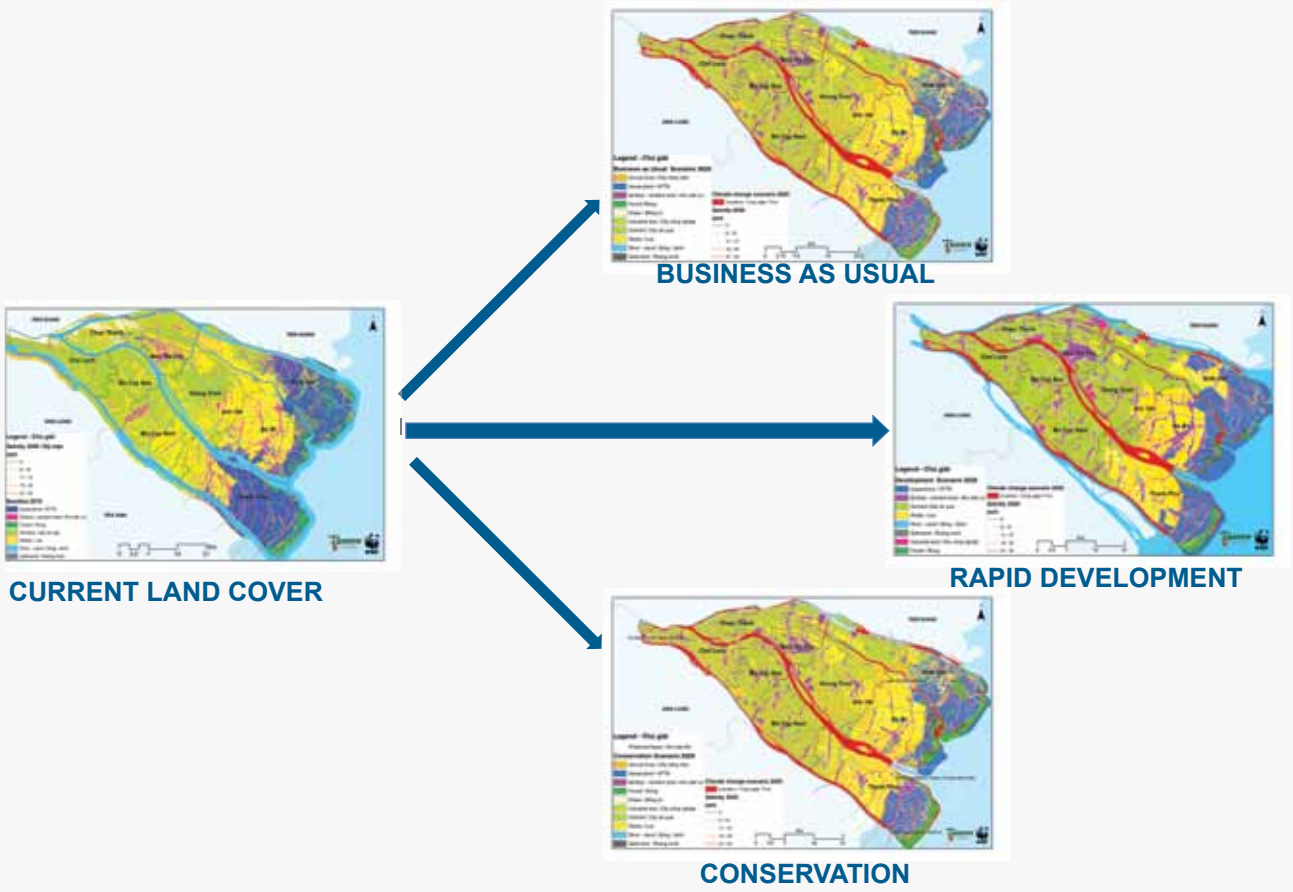

Figure 5: Example of different future scenarios development in Ben Tre province

Tool 4.2: Scenario analysis involving modeling tools for future vulnerability assessment.

Description: The assessment of the impact of climate change on the ecosystem services can be done through scenario analysis using tools such as InVEST, Land Change Modeler, or hydrological models. Data layers that reflect climate change scenarios (e.g. sea level rise, change in precipitation) will be used as input parameters in the models. WWF uses InVEST, mostly in large-scale assessments for valuation of ecosystem services.

InVEST is designed to inform decisions about natural resource management. Decision makers, from governments to non-profits to corporations, often manage lands and waters for multiple uses and inevitably must evaluate trade-offs among these uses; InVEST's multi-service, modular design provides an effective tool for evaluating these trade-offs.

The InVEST toolset includes models for quantifying, mapping, and valuing the benefits provided by terrestrial, freshwater and marine systems. Specifically it includes models for:

- Wave Energy;
- Coastal Vulnerability;
- Coastal Protection;
- Marine Fish Aquaculture;
- Marine Aesthetic Quality;
- Marine Overlap Analysis Model: Fisheries and Recreation;
- Marine Habitat Risk Assessment;
- Terrestrial Biodiversity: Habitat Quality and Rarity;
- Carbon Storage and Sequestration;
- Reservoir Hydropower Production;
- Water Purification: Nutrient Retention;
- Sediment Retention Model: Avoided Dredging and Water Quality Regulation;
- Manage Timber Production;
- Crop Pollination.

Applicable scale: Provincial/sector/district

Example of the use of the InVEST tool to quantify ecosystem services changes under different scenarios in Ben Tre.

1. Coastal Vulnerability

In general, coastal vulnerability scenarios show that the coastal areas in Binh Dai district (with a less and thinner mangrove belt) are more vulnerable to storm surges and sea-level rise than Ba Tri and Thanh Phu district (with a more and thicker mangrove belt). The river mouths that have mangroves and sea/river dike (Ba Tri river mouth) are more resilient than the areas that do not have either mangroves or sea/river dikes. The coastal areas are more affected by northeast monsoons, especially the areas faced to the northeast, even in the Thanh Phu mangrove reserve.

The coastal communities in the Development Scenario are more vulnerable to weather extreme events than the Business as Usual and Conservation scenario in term of lost and damaged community property and crops because of high population concentration and investment in farming.

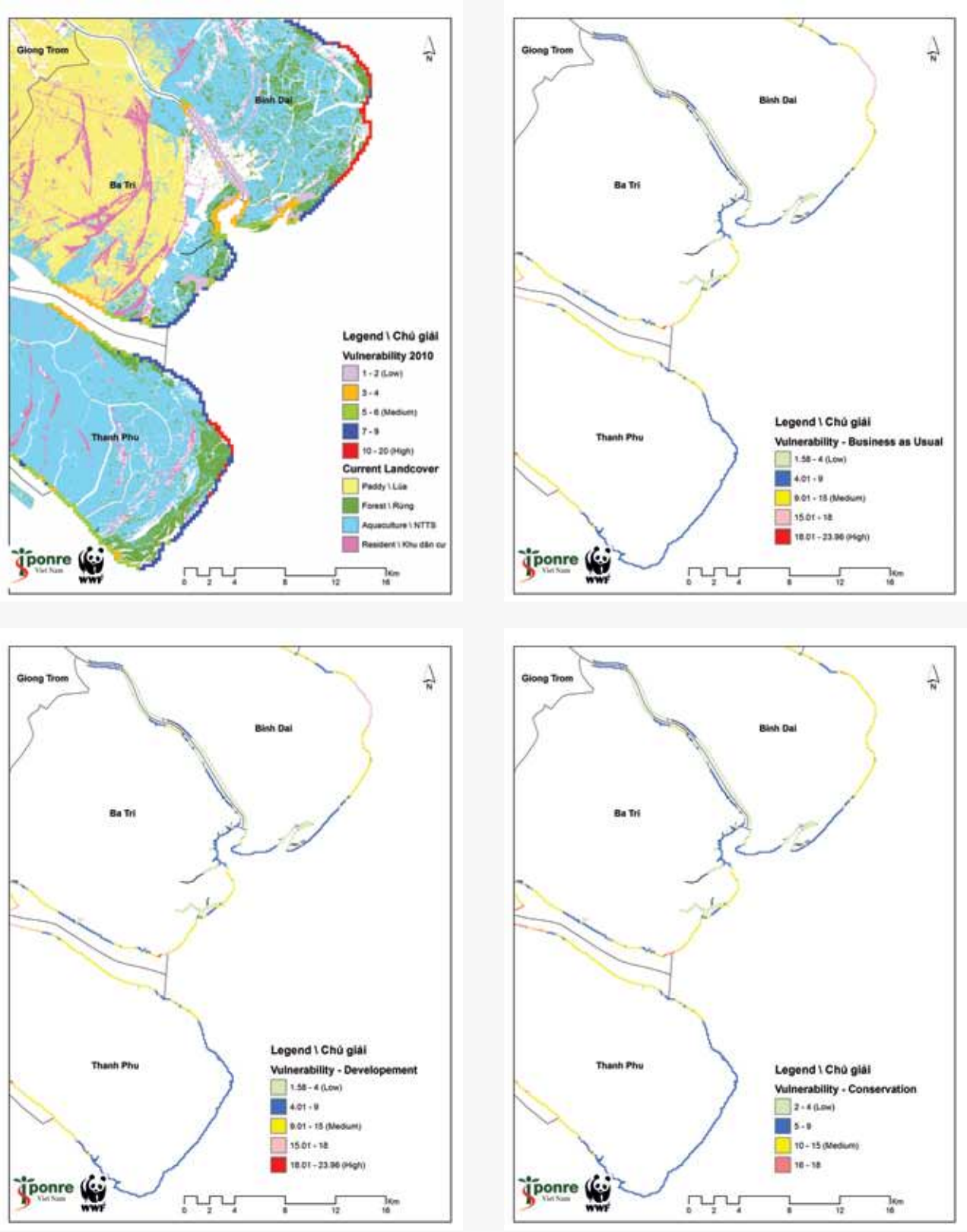

Figure 6: Coastal vulnerability of the coastal area under different scenarios in Ben Tre

2. Coastal protection

The chart below is the simulated results from InVEST model at land point 4. The red line (no-habitat) means that if there are no mangroves and sand dunes the wave will surge further to 300 – 400m to inland. The current mangrove belt and sand dunes have reduced the wave height from 0.4m to 0.1 m when it reached 100m inland. In the Business as Usual and Development scenario, the wave height reduced from 0.6m to 0.1m at 100m from the coastline to the sea. In the conservation scenario, the wave height reduced from 0.7 m to 0.1 m at 300m from the coastline thanks to mangroves expansion and plantation of the dunes.

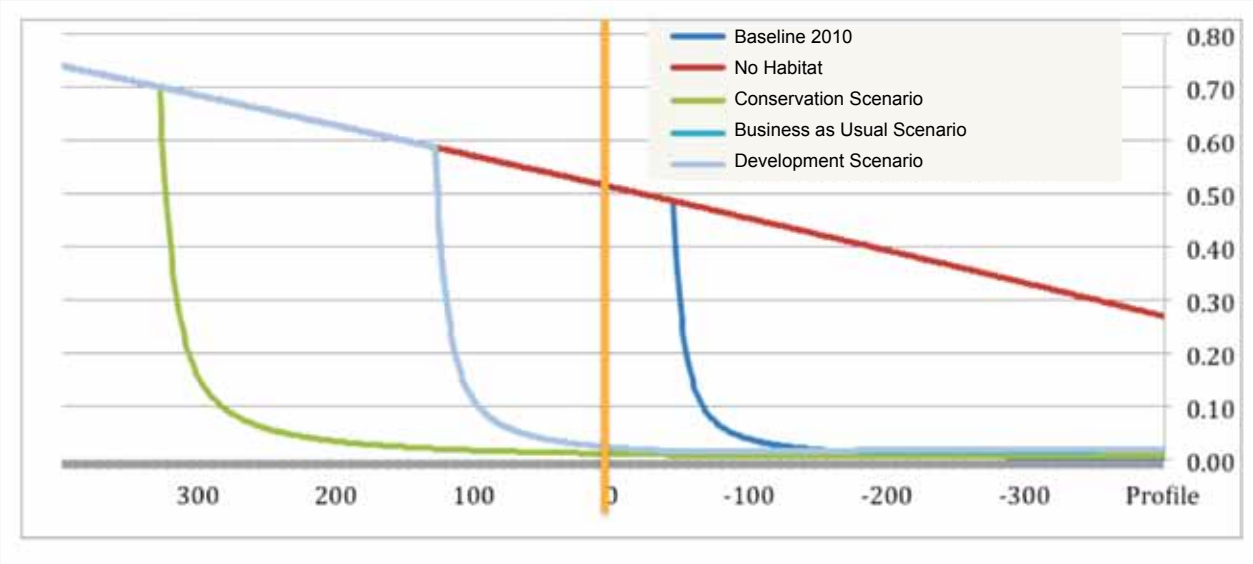

Figure 7. Wave height reduction ability of coastal ecosystems at Land Points 4 under different scenarios in Ben Tre

The wave energy is also reduced by 80 percent to 95 percent in different scenarios at seven observation land points. In most observation land points, wave energy under the Conservation scenario is reduced by 92 to 95 percent. In the Development scenario, the wave energy reduction ranges from 80 to 95 percent.

3. Carbon storage and sequestration

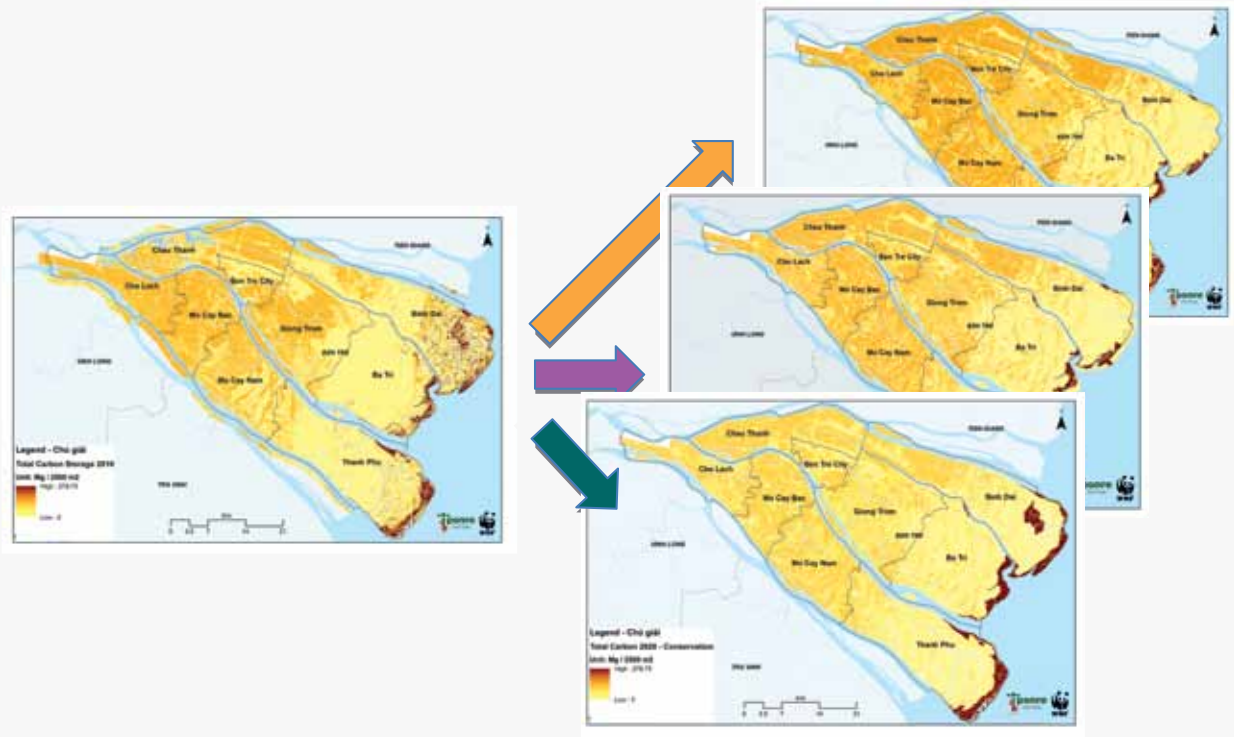

Figure 8. Carbon storage under different scenarios in Ben Tre

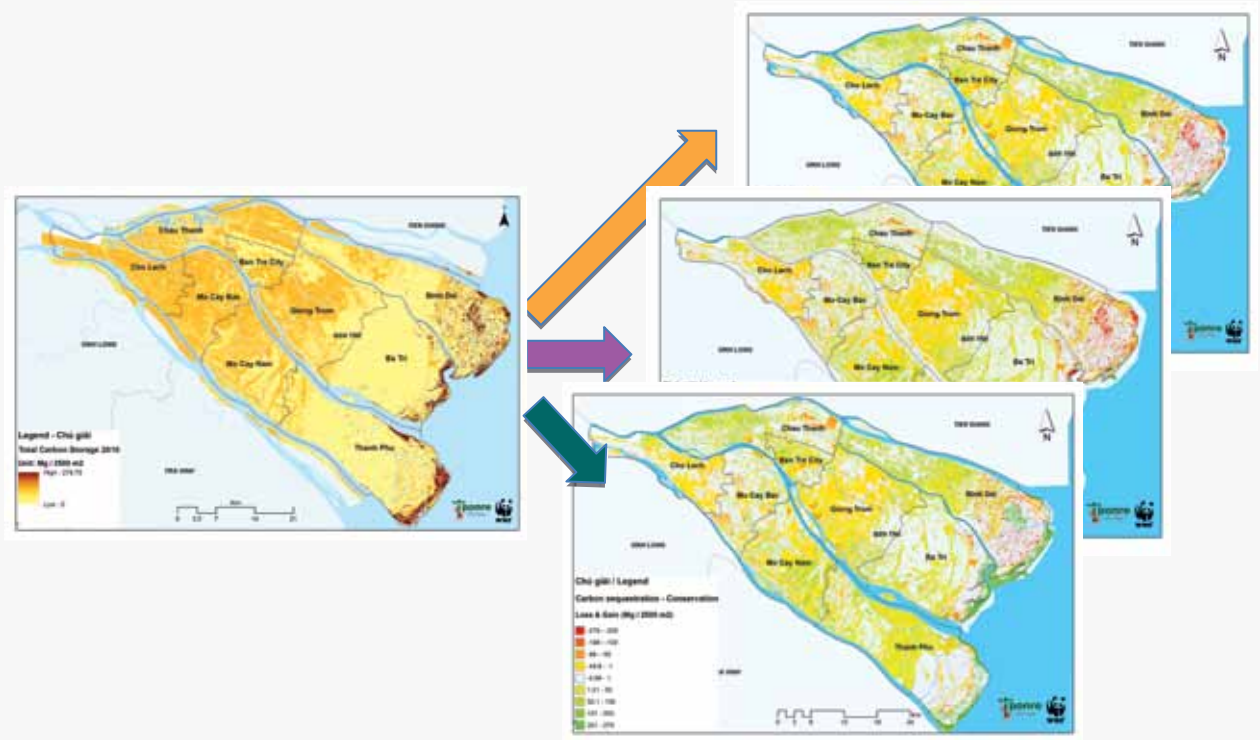

Figure 9. Carbon sequestration under different scenarios in Ben Tre

Carbon storage in the conservation scenario is much higher than other scenarios throughout the province. In other scenarios, the carbon storage is also slightly increased in most of the province, except Cho Lach district due to the increased build-up areas for industry and settlement, which caused the reduction in fruit garden areas.

Tool 5: expert judgment

Description: Expert judgment is an approach for soliciting inputs from individuals with particular expertise on concepts related to EbA. Considering the complexity involved in EbA especially with regards to uncertainties and the impact of climate change on ecosystems, expert judgment can be used for rapid assessment and analysis of different aspects of vulnerability, and prioritization of adaptation options. Expert judgment can be used in a variety of ways including a panel format for aggregating opinions, meetings, and workshops. It is important to realize that specific expertise may be necessary at different phases. Expert consultation may be needed in designing the project, deciding the data to be included, and for analyzing the data rigorously to come to scientific and experience-based conclusions.

The experts needed may include: climate change and adaptation specialists, hydrologists, ecologists (foresters, marine biologists, etc.), species specialists for particular species, sociologists/socio economic specialists, economists, and others that may be identified.

Applicable scale: National/Sectoral/Provincial level.

Tool 6: vulnerability matrix

Description: Creating a vulnerability matrix is one way of presenting the vulnerability analysis. The ultimate objective of the user should be to understand current and future risks and impacts from climate and non-climate risks in order to come up with effective adaptation strategies.

It is good to keep in mind that the "vulnerability of a system" is best understood by looking not only at individual pressures and impacts but also the altered interactions within the system - in this case, interactions between ecosystem and communities.

Applicable scale: Provincial/Sectoral level

Table 4. Ranking of risks to key livelihoods in three coastal communes in Ben Tre

Livelihoods	Related ecosystems			Accommulated risks
	Ecosystems	Prediction of riskes under high emission scenario	Risk ranking of livelihoods	
Intensive and Extensive shrimp	Mangrove and estuary	Medium-High	Medium-High	Medium-High
Clam	Sand bars and dunes	Medium-High	Medium-High	Medium-High
Coastal capture fisheries	Estuary	High	Low-Medium	Medium
Vegetables	Sand dunes	Medium	High	Medium-High

Table 5. Summary adaptive capacity of 3 coastal communes in Ben Tre

Ecosystems | Dependent livelihoods	Adaptative capacity	
	Communities	Institutional
Mud flat/sand bars		Low
Mangroves		Low
Sand dunes		Low
Estuary		Low
Clam and Cockle growing	Medium	
Intensive and extensive shrimp farming	Low-Medium	
Vegetables growing	High	
Coastal capture fisheries	Low	

Table 6. Vulnerability matrix

		Community importance	Current hazards	Future potential climate and development hazards	Risk rating	Adaptive capacity	Vulnerability
Ecosystem	Coastal mangroves	Med – High	Dramatic loss of mangrove habitats, due to expanding areas of shrimp farming aquaculture; Deforestation and weak forest management; Trans-boundary impacts (hydropower, water pathway, irrigation projects in the upstream countries such as China, Laos, Thailand and Cambodia); reduction of sediment and nutrient loading.	Permanent-regular inundation from sea level rise with little migration options for many species; Increased erosion from increased storm activity and monsoonal winds; Uncertain change to the alluvial dynamic of the mudflats and sandbars due to increased flow and increased sedimentation from upstream catchments. SLR and spring tide inundation; Dike construction – flow, sediment and habitat alteration; Continued (unsustainable) investment and development of shrimp farming under the provincial SEDP; Port and wholesale market development will increase the demand for shrimp.	Moderate/ High	Low	High
Key EDLA [7]	Shrimp farming	Med – High		Continued (unsustainable) investment and development of shrimp farming under the provincial SEDP (boom and bust); SLR increasing salt concentration; Increased temperatures causing disease and sudden changes in salt concentration; Increased erosion and mangrove destruction leading to a loss of natural habitat and food.	Moderate/ High	Low/ Moderate	Moderate/ High
Ecosystem	Intertidal alluvial mud flats and sandbars	Med – High	Over-exploitation of aquaculture mudflat and sandbar resources; Increased erosion; Trans-boundary reductions of sediment and nutrient flows; Polluted water from storms, run-off, sewage, and industrial contaminates from the port and from shrimp farms	Permanent inundation from SLR with little migration options for many species; Uncertain change to the alluvial dynamic of the mudflats and sandbars due to increased flow and increased sedimentation from upstream catchments; Changes to sediment dynamics and suspension from increased annual flood discharge through the estuary; Dike construction – flow, sediment and habitat alteration; Port, bridge, industrial zone and associated infastructure expansion and development reducing and degrading the area of intertidal ecosystems;	Moderate	Low	Moderate -High
Key EDLA	Clam and blood cockle farming	Low – Med		Increased annual maximum temperature could cause increase in mass, simultaneous death of clams; Increased recurrence of SLR and saline intrusion will be likely cause death of clams; Increase in insect disease (mosquito fly) due to an increase in the amount of wet season rainfall.	Moderate -High	Moderate	Moderate

		Community importance	Current hazards	Future potential climate and development hazards	Risk rating	Adaptive capacity	Vulnerability
Ecosystem	Open water estuarine	Med – High	Polluted water from storm water run-off, sewerage, industrial contaminates from the port and from shrimp farms Water infrastructure on river such as dams & harbours including transboundary impacts (hydropower and irrigation projects in upstream countries) that reduces sediment and flow.	Increased coastal erosion, due to increased storm activity, monsoonal winds and SLR; Increase in annual flow, flood pulse and flooding, due to the increase in precipitation in the upper Mekong Basin; Uncertain change in the alluvial dynamic of the mudflats and sandbars due to increased flow and increased sedimentation from upstream catchments; SLR and spring tide inundation; Increased estuarine/marine aquatic habitats due to increased upstream flow and SLR; Dike construction – flow, sediment and habitat alteration; Increased temperature impacting the shrimp farms and ecology.	Moderate/ High	Low	High
Key EDLA	Capture fisheries	Low – Med		Continued (unsustainable) investment and development of shrimp farming under the provincial SEDP – boom and bust; SLR causing increase in salt concentration; Increased temperature causing disease and sudden changes in salt concentration; Increased erosion and mangrove destruction leading to a loss of natural habitat and food.	Moderate/ High	Low/ Moderate	Low/ Moderate
Ecosystem	Sand dunes	Low – Med	Population growth coupled with increasing agricultural and industrial demand; Increasingly polluted water and soil due to a new harbor and other land constructions, as well as sewage from water transportations; Residents simultaneously exploit, destroy and adjust and recover natural resources; Increased road/ infrastructure construction and infrastructure cut the connectivity of dune ecosystems.	Continued (unsustainable) investment and development of shrimp farming under the provincial SEDP – boom and bust; SLR causing increase in salt concentration; Increased temperature causing disease and sudden changes in salt concentration; Increased erosion and mangrove destruction leading to a loss of natural habitat and food.	Moderate	High	Low/ Moderate
Key EDLA				Unseasonal rainfall may have serious negative impact on watermelon crops. Increased duration and intensity of rainfall events may cause poisonous levels of alum concentration. Delay in the start of the wet season will change the shrimp crop calendar.	Moderate/ High	High	Moderate

[7] Ecosystem's dependent livelihood activities

2.3.2. Stage 2: Identifying and Prioritizing Adaptation Strategies

The purpose of Stage 2 is to identify a broad range of potential alternatives, including hard and soft adaptation measures, in discussion with the communities and relevant experts. For each hazard, a range of adaptation options should be identified, including ecosystem-based approaches. These approaches are then evaluated based on different criteria to select the optimum adaptation strategies. Under this framework, methodology for both cost effectiveness analysis and multi-criteria analysis (MCA) will be provided to select and prioritize EbA options.

Table 7. Expected outputs and suggested tools and methods for stage 2

Stage 2 and steps	Outputs	Tools and Methods
10. Development of adaptation strategies	(i) A list of coping strategies. (ii) Long-list of adaptation strategies.	FGD. Key informants' interviews (Tool 3).
11. Multi-criteria analysis including cost effectiveness analysis.	(i) A criteria for screening adaptation strategies. (ii) Costs, effective measure, benefits identified.	Participatory Stakeholder Consultations. Land change modeler, InVEST. Marxan with Zones. Field survey's data, data analysis.

Checklist of key activities for Stage 2:

- Identify coping strategies of different vulnerable groups and sectors in consultation with the stakeholders;
- Consult experts and impacted groups to formulate appropriate adaptation strategies for communities and ecosystems;
- Identify what could be the preferred future with adaptation strategies including EbA strategies;
- Develop multiple criteria for prioritization of adaptation strategies;
- Conduct cost effectiveness analysis or social, economic and environmental effectiveness to compare adaptation strategies;
- Prioritize and short-list adaptation strategies.

Suggested tools and methods for Stage 2:

Tool 7: multi-criteria analysis

Description: Multi-criteria Analysis (MCA) is a decision-making tool for complex problems where multiple criteria are involved. Since many social, economic, environmental criteria are important considerations in selecting the final adaptation measure, MCA can be used to compare and make a decision on the best possible adaptation measure. The multi-criteria decision support system will help in structuring the available information in a clear and concise way so as to support the identification of the most suitable alternative; with this approach the choices made will be participatory, explicit, and justified. Multi-criteria analysis can be done with or without the use of any software/computer based tools. In both cases, stakeholder participation is extremely important to define the criteria used in analysis.

Process:

1. Collectively agree on the main categories of effects of the adaptation strategies to be considered: environmental, social, economical, etc.;
2. Identify the criteria/indicators to be used to measure those effects (decrease in the amount of some ecosystem services, loss of natural habitats, decrease in agricultural areas, opportunity costs, capacity

requirements etc.);

3. Assign a scoring weight to different criteria in consultation with the stakeholders; and
4. Based on the collectively agreed criteria, rank the identified adaptation options.

Applicable scale: National/Regional/Sectoral/Provincial level

Example of multiple criteria:

Economic Considerations: i) Effectiveness: Are adaptation measures cost effective over a time period? (ii) Efficiency: Are achieved outputs optimal to the resource allocated? (iii)Is the farmer income increased? (iv) Do we get the highest productivity?

Social Considerations: (i) Equity: does the adaptation measure benefit vulnerable groups and communities? (ii) Local relevance– does the adaptation measure build on the existing capacities of the vulnerable communities? (iii) Is the poverty rate decreased? Are there any newly created jobs?

Environmental Considerations (i) Provision of services: Does the adaptation measure ensure that the provision of ecosystem services continue to the vulnerable communities? (ii) Positive impact: Do adaptation options show overall positive impacts on the environment?

Technical Considerations: (i) Robustness: Are adaptation measures robust under future CC projections? (ii) Flexibility: Is the option flexible, and will it allow for adjustments and incremental implementation and reiteration depending on the level and degree of climate change?

Political Considerations: (i) Legitimacy: Is the option politically, culturally, and socially acceptable? (ii) Synergy/Coherence with other strategic objectives: Does the option offer co-benefits (for example, improving agricultural land management practices could lead to reduced erosion/siltation and carbon sequestration)?

Tool 8: Methodology for cost effectiveness

Description: Cost-effectiveness analysis (CEA) is an economic decision-making tool. It is used to compare two or more options for achieving the same (or similar) outcome, the benefits of which are not easily measured in monetary terms.

A classic CEA starts by stating a specific goal, such as reducing the incidence of a disease in a town by 50 percent in four years, presents data on the expected cost of two or more methods of achieving this goal and then selects the least-cost alternative (World Bank 2010).

An important aspect of CEA is that the main benefits of projects and interventions are not evaluated in monetary terms. These benefits are presented in non-monetary measures of effectiveness, such as numbers of lives saved or years without major flooding. By comparing the ratio of costs to the measure of effectiveness, options for interventions can be ranked. Avoiding having to estimate a monetary value for an aspect of project benefit is a key attraction of CEA.

Application scale: Provincial/ Sectoral/District level.

Example of CEA analysis in the coastal area of Ben Tre province

For the Ben Tre province, the cost effectiveness of building sea dikes (hard adaptation option) in Ba Tri, Binh Dai, and Thanh Phu district was compared with the cost effectiveness of planting mangroves (EbA solution). The effectiveness was determined as the number of people protected from coastal flood. CEA was done under two scenario-low risk and high risk. With the low climate change risk scenario, the cost effectiveness ratios were computed for a short-term/low risk period of 10 years (upto 2020), while 30 years (upto 2050) was used for the high climate change risk scenario. See Tables 8 and 9.

Table 8. Cost effectiveness analysis for low climate change risk with short-term adaptation options (low risk scenario)

District	Adaptation options	Effectiveness measure	Financial costs	Financial cost effective-ness ratio (Mill VND) / person)	Other economic net benefits/ costs	Total costs	Total economic cost effective-ness ratio (Mill VND) / person)
Thanh Phu	Sea dike	14,806	2390.5	161.5		2390.5	161.5
	EbA with mangroves	14,806	21.3	1.4	62.7	-41.4	-2.8
Ba Tri	Sea dike	10,070	190.3	18.9		190.3	18.9
	EbA with mangroves	10,070	10.5	1.0	57.8	-47.3	-4.7
Binh Dai	Sea dike	4,714	1526.6	323.8		1,526.6	323.8
	EbA with mangroves	4,714	19.0	4.0	121.5	-102.5	-21.8
Ben Tre province	Sea dike	29,590	4107.3	138.8		4,107.3	138.8
	EbA with mangroves	29,590	50.8	1.7	242.0	-191.2	-6.5

Source: Based on field testing the framework (WWF, 2013)

Table 9 : Cost effectiveness analysis for high climate change risk with long-term adaptation options (high risk scenario)

District	Adaptation options	Effectiveness measure (number of affected residents protected)	Financial costs (mill VND)	Financial cost effectiveness ratio (mill VND / person)	Other economic net benefits/costs (mill VND)	Total costs (mill VND)	Total economic cost effectiveness ratio (Mill VND / person)
Thanh Phu	Sea dike	15,011	2,469.8	164.5		2,469.8	164.5
	Combined Sea dike with mangroves	15,011	2,500.6	166.6	278.2	2,222.3	148.0
Ba Tri	Sea dike	12,046	192.1	15.9		192.1	15.9
	Combined Sea dike with mangroves	12,046	206.4	17.1	253.9	-47.5	-3.9
Binh Dai	Sea dike	6,050	1,528.4	252.6		1,528.4	252.6
	Combined Sea dike with mangroves	6,050	1,552.2	256.6	566.6	985.6	162.9
Ben Tre province	Sea dike	33,107	4,190.2	126.6		4,190.2	126.6
	Combined Sea dike with mangroves	33,107	4,259.2	128.6	1,098.7	3,160.5	95.5

2.3.3. Stage 3: Guidance for implementation of ecosystem based adaptation responses

Once the adaptation options have been identified and shortlisted, and a particular strategy is selected, the next step is implementation. Implementation consists of several steps including project design, operationalization the strategy, and monitoring and evaluation (M&E). The iterative feedback process is of particular importance so that actions can be adjusted as new information is obtained.

Recommended summary of processes for implementation of EbA responses are as follows:

i. Based on the findings from the vulnerability analysis, make any adjustments necessary to the adaptation outcome/s identified in Step 1;

ii. Formulate the anticipated "impacts" from the outcomes. The overarching impact from the outcomes may be much broader, longer-term, and in line with the national and sub-national priorities to which the action may contribute. The outcomes must be within the scope of your initiative;

iii. For EbA actions, the principal outcome should be reduced vulnerability of the targeted community (or other socioeconomic system) and interim or related outcomes should include maintenance or improved condition of key ecosystem service(s) that contribute for example to the adaptive capacity of communities.

iv. Specify the key assumptions made in relation to the implementation of EbA options and the intended results. Assumptions may be process related or related to human behaviors. If there is an assumption that climate change will impact socio-economic systems and ecosystems in certain ways, these need to be clearly articulated. Once the outcomes have been identified, it is also important to identify critical barriers;

v. Develop a work plan including a plan for participatory M&E. The impacts of EbA strategies are only apparent in the long term. Therefore, it is necessary to develop M&E systems that can outline project timeframes and include indicators that can be measured by communities and/or local institutions. The M&E plan should also include criteria for assessing sustainability against climate change, replicability and cost effectiveness in addition to measuring progress against the established baselines and targets. The M&E plan should be designed as a 5-10-20 year lifetime depending on overal objectives and the scope and scale of each EbA strategy.

Checklist of key activities for Stage 3:

- Identify risks and assumptions for each outcome/output;
- Identify the cost of selected outcomes and outputs;
- Establish a funding plan and corresponding budget;
- Engage stakeholders in the EbA initiative and assess the their specific attitudes and priorities;
- Assess sustainability of outcomes and outputs;
- Identify and budget M&E requirements and establish a reporting line for M&E;
- Document reflection, evaluation of the project, adaptive learning and adjustments made to different aspects of the initiative along the way.

3. MAINSTREAMING OF EbA STRATEGIES IN POLICIES AND PLANS

The development of EbA measures requires a bottom-up/top-down approach. To facilitate successful implementation of EbA it will need the commitment at the national level, sub-national level, and local level. On one hand active development and consideration of EbA measures should take place at the sub-national and local levels. However, the outputs of the analysis of implementation throughout Viet Nam, could also feed into and significantly improve the climate change and development policy and planning process. This would include the introduction of concepts in general policy and planning, but could also include the introduction of identified actions in action plans.

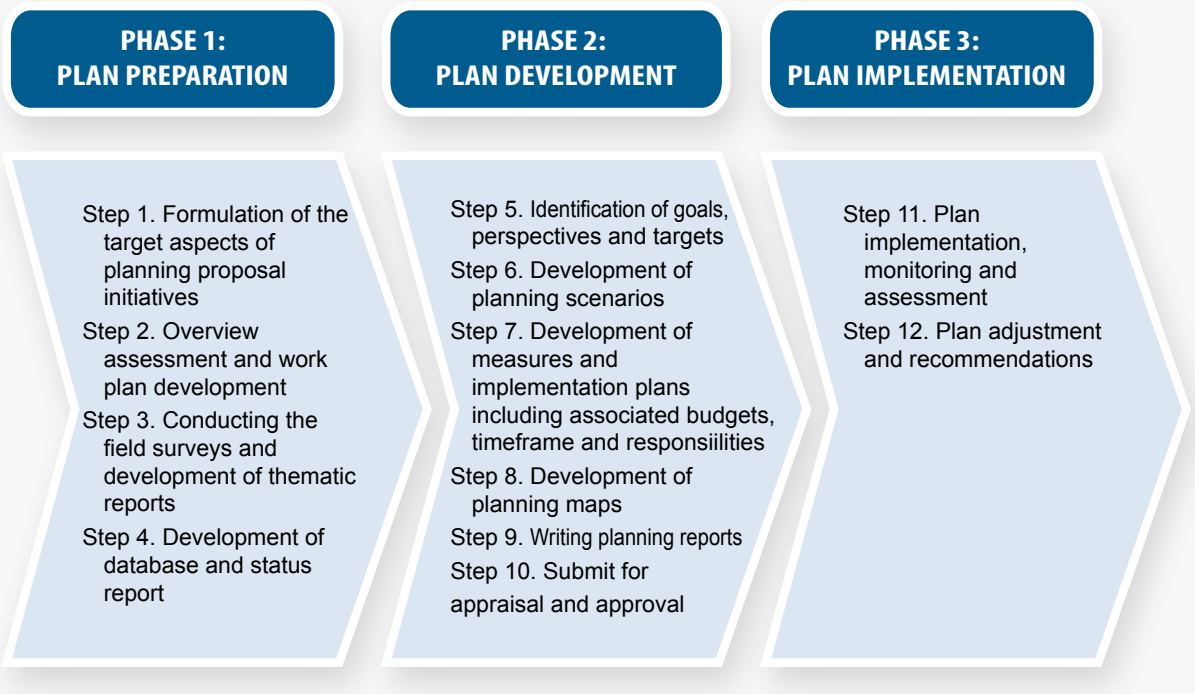

Figure 10. A common planning process in Viet Nam (Source: Compiled by WWF 2013).

In Viet Nam, the most common planning cycle is 5-10 years. Most of the existing plans in Viet Nam including the National Target Program for Climate Change, Socioeconomic Development Plans and sectoral plans will come to a conclusion in 2015. The processes to formulate new plans will start in 2014. In addition, as noted in Section 1 of this framework, Viet Nam is already taking significant steps to mainstream climate change and introduce climate specific plans. Combined, the upcoming planning process and the existing commitment to mainstream climate change provides a tremendous opportunity to ensure that EbA approaches are imbedded in the planning processes and in development plans.

3.1. Mainstreaming in the Planning Process

The common planning process is divided into 3 stages (preparation, development, and implementation) and 12 steps. The operational guidance of EbA can inform this planning process. Table 10 below provides a detailed analysis of when and how different steps of the framework can be used to inform different steps in the planning process.

Table 10: Integrating EbA and operational guidance for EbA in the planning process in Viet Nam

The EbA operational guidance	The planning cycle	Content/activities required to deliver in the planning cycle
Stage 1: Defining the objective, Vulnerability and Impact Analysis Step 1: Set the ecosystem based objective for climate change adaptation. Step 2: Understanding the context of communities, their demographic, socioeconomic conditions, key sources of livelihood and how it is supported by the ecosystem services. Step 3: Understanding and mapping ecosystem and ecosystem services in the study area. Step 4: Understanding current threats or risks from climate change to the communities. Step 5: Understanding threats from non-climate risks and different socio economic dynamics including potential development plans to the communities. Step 6: Understanding threats from current climate and non-climate risks to the Ecosystems and Ecosystem services (ES). Step 7: Creating Future Scenarios to identify future vulnerabilities to climate and non climate change. Step 8: Assessing exposure, sensitivity and adaptive capacity. Step 9: Summarizing the information and creating vulnerability matrix.	**Phase 1:Plan preparation** Step 1. Formulation of the target aspects of planning proposal initiatives. Step 2. Overview assessment and work plan development. Step 3. Conducting the field surveys and development of thematic reports. Step 4. Development of database and status report.	i) Mitigating adverse climate change impacts is among the objectives of the identified plan. ii) The roles and linkages between ecosystems, their services to the selected sector/target group(s) for study have to be identified and planned for further analyses.

The EbA operational guidance	The planning cycle	Content/activities required to deliver in the planning cycle
Stage 2: Identifying and prioritizing EbA Strategies Step 10: Identifying existing coping strategies and strategies for adaptation. Step 11: Multi-criteria analysis including cost-effectiveness analysis for EbA measure prioritization.	**Phase 2: Plan development** Step 5. Identification of goals, perspectives and targets. Step 6. Development of planning scenarios. Step 7. Development of measures and implementation approaches. Step 8. Development of planning scenarios. Step 9. Write planning reports. Step 10. Submit for appraisal and approval.	i) EbA objective is considered one among planning objectives. ii) The climate change scenarios and their projected impacts to the selected sector(s)/target group(s) must be analyzed and assessed and the results need to be incorporated into the planning scenarios development. iii) The identified vulnerable groups (as identified in the vulnerability assessment) should be considered the beneficiaries of proposed measures of the plan. iv) The proposed measures should include EbA measures.
Stage 3: Implementation, monitoring and evaluation	**Phase 3: Plan implementation** Step 11. Plan implementation, monitoring and assessment. Step 12. Plan adjustment and recommendations.	Criteria on monitoring and evaluation of EbA strategies should be included.

3.2. Potential Entry Points for EbA Mainstreaming into sub-national policies

Because of its multisectoral nature and its direct link to the level of human wellbeing through management of resources, EbA can be integrated with several existing strategies. Table 11 gives select examples of the most appropriate plans for mainstreaming EbA at the provincial level and the possible entry points for EbA within these plans and the responsible agencies.

3.2.1. Provincial socio-economic development plan (SEDP) and land-use plan

Potential for EbA integration: The provincial SEDP and the land-use plan are the two most important policies acting as the legal basis and guidance for all other provincial plans to follow in development of their own plans. Given their importance, providing suggestions for EbA integration into these policies will later on increase the possibilities for the EbA adoption in other plans.

3.2.2. Provincial climate change action plan (CCAP)

Potential for EbA integration: The provincial CCAP is the most relevant and suitable for EbA integration because of its direct mandates on developing, coordinating, and implementing climate change adaptation and mitigation projects at the province level. Coordinating with other particular sectors for developing sector climate change action plans provides yet another opportunity for EbA integration.

3.2.3. Provincial agriculture sector development plan (AFAP)

Potential for EbA integration: The AFAP includes agriculture, aquaculture, and forestry, which particularly follow the SEDP and land use plan to formulate sectoral targets. There is good potential for EbA integration into these plans as there is already the National Action Plan Framework for Adaptation and Mitigation of Climate Change in the Agriculture and Rural Development Sector Period 2008-2020, which encourages the provinces to follow it for developing their own provincial climate change action plan for agriculture sector. Moreover, agriculture is among the top sectors that directly experience climate change impacts and is strongly dependent on natural resources for agriculture production.

3.2.4. Provincial biodiversity conservation plan (BCP)

Potential for EbA integration: Currently, there are approximately 20 provinces in Viet Nam that have completed the provincial BCP development. There are more than 30 provinces that still need to complete this. Currently, the Viet Nam Environment Administration has finalized the national guideline for mainstreaming an ecosystem-based approach to climate change into BCP in Viet Nam—this unique document will encourage the adoption of Ecosystem-based Adaptation into BCP and provide sufficient detailed guidance on how to do it. This EbA framework for Viet Nam will be an additional legal complementary document.

Table 11. Entry Points for EbA Integration in Relevant Policies

Relevant Sectors	Relevant Policies	Responsible Agencies	Examples of EbA measures
Natural resources and environment management	Provincial Climate change Action Plan	Department of Natural resources and Environment (DONRE)	• Wise use of wetlands; • Community-based natural resources management; • Environmental protection.
Biodiversity Conservation	Provincial Biodiversity Conservation planning	DONRE	• Establish new protected areas; • Create green corridors; • Strengthen law enforcement.
Land Use	Provincial Land use plan	DONRE	• Reallocate settlements and public works to safer/less vulnerable areas.
Planning and Investment	Provincial Socioeconomic Development Plan	Department of Planning and Investment (DPI)	• Green growth; • Investment in natural capital.
Agriculture	Climate change action plan for agriculture sector	Department of Agriculture and Rural Development (DARD)	• Climate-smart farming practices.
	Aquaculture and fishery development plan		• Rehabilitate aquatic resources; • Community-based fisheries management; • Promote sustainable and responsible aquaculture and capture fisheries.
	Forestry development plan		• Restore coastal mangroves; • Improve forest protection.
	Irrigation development plan		• Water saving, collecting and storing system.

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ANNEXES

ANNEX 1: RESOURCES TO HELP VALUATE AND DETERMINE EbA RESPONSES

Climate risk screening tools	Description	Available at
Adaptation Wizard	Provides a 5-step process to assess vulnerability to climate change and identify and options to address key climate risks. The "getting started section" is helpful for Step1: Designing Adaptation Outcomes (UK Climate Impacts Program).	www.ukcip.org.uk/
Assessment and Design for Adaptation to climate change – A Prototype Tool (ADAPT)	Carries out risk analysis at the planning and design stage, through a five level flag classification and proposes options to minimize risks and guides project designers to appropriate resources. The focus thus far is on agriculture, irrigation and bio-diversity (World Bank).	http://sdwebx.worldbank.org/climateportal/
Climate change adaptation through integrated risk assessment (CCAIRR)	The approach constitutes of five main components: Capacity assessment and strengthening, review of knowledge data and tools, Rapid Risk Assessment, mainstreaming, and monitoring and evaluation (Asian Development Bank).	http://www.adb.org/Documents/Reports/Climate-Proofing/chap8.pdf
The Community-based Risk Screening tool- Adaptation and Livelihoods (CRiSTAL)	User-friendly conceptual framework aimed at raising awareness on climate change adaptation and facilitates the identification and organization of an adaptation strategy (IUCN, SEI-US, IISD, Inter-cooperation).	http://www.cristaltool.org/
Climate Vulnerability and Capacity Analysis (CVCA)	The methodology provides a framework for analyzing vulnerability and capacity to adapt to climate change at the community level (CARE).	www.careclimatechange.org/cvca/CARE_CVCAHandbook.pdf
Climate change and Environmental Degradation Risk and Assessment (CEDRA)	The tool assists in prioritizing which environmental hazards may pose a risk in existing locations and support the decision to adapt existing projects or start a new one (Tearfund).	http://tilz.tearfund.org/Topics/Environ-mental+Sustainability/CEDRA.htm
Designing Climate Change Adaptation Initiatives: A Toolkit for Practitioners	The toolkit aims to provide support for developing countries to move to low emission climate resilience growth paths while mobilizing financial resources to scale-up good practices with sufficient speed and where most needed (UNDP).	http://www.undp-adaptation.org/projects/websites/docs/KM/PublicationsResMaterials/UNDP_Adaptation_Toolkit_FINAL_5-28-2010.pdf
Disaster Risk Reduction Tools	ProVention Consortium.	http://www.proventionconsortium.org/?pageid=32&projectid

Climate risk screening tools	Description	Available at
NAPAssess	NAPAssess is an interactive decision-support tool designed to facilitate a transparent and participatory NAPA formulation process in Sudan. The use of multi-criteria analysis is also relevant in the context of climate screening.	http://www.sei-us.org/napassess/
Opportunities and Risks from Climate Change and Disasters (ORCHID)	Basic framework including a four-step generic approach to portfolio screening for climate risks. Institute of Development Studies (IDS) and Department for International Development (DFID).	http://www.ids.ac.uk/go/research-teams/vulnerability-team/research-themes/climate-change/projects/orchid
Screening Matrix	Simple climate change screening matrix or checklist to establish sector program support sensitivity. Testing on sector programs in 17 countries and some results are available (DANIDA).	http://www.danidadevforum.um.dk/en/menu/ Topics/ClimateChange/ClimateAndDevelopment/ToolsAndReferences/ClimateChangeScreening
Temporal and Spatial Analogues	Involves the construction of temporal or spatial analogues using historic climate data. The data used as temporal and spatial analogues is either from the past or from another location.	http://content.undp. org/go/cms- service/download/publication/?version=live&id=3259633

(According Traerup và Lewoff, 2011)

RESOURCES TO ASSESS IMPACTS ON ECOSYSTEMS AND IDENTIFYING ECOSYSTEM-BASED ADAPTATION OPTIONS

Resources	Description	Link
Step-by-Step Guide for Considering Potential Climate Change Effects on Coastal and Estuarine Land Conservation Projects.	This draft step-by-step guide was developed to assist in the consideration of how climate change may affect proposed conservation projects. The guide is based on the assumption that it is prudent to evaluate how the targets of conservation projects might be affected by changing climate conditions. These evaluations may help to determine how the resilience of a project may be increased and/or how a project may contribute to the wider system's (e.g., watershed, coastal ecosystem) resilience (Office of Coastal and Ocean Resource Management and NOAA, 2011).	http://coastalmanagement.noaa.gov/land/media/celphowtoapp.pdf
Ecosystem Services Review for Impact Assessment	The Ecosystem Services Review for Impact Assessment (ESR for IA) provides practical instructions on how to incorporate ecosystem services throughout environmental and social impact assessment (WRI, 2011).	http://www.wri.org/publication/ecosystem-services-review- for-impact- assessment

Resources	Description	Link
An introductory guide to valuing ecosystem services	This guide looks at how the framework for the valuation of the natural environment could be improved by offering an approach that ensures that ecosystems and the services they provide are taken into account. It builds on traditional valuation approaches. In particular, Chapter 3 provides an overview of the steps to be taken in valuing the impacts on ecosystem services which includes identifying policy options and the current baseline; assessing the impact of policy options on the provision of ecosystem services, and valuing the changes in ecosystem services (DEFRA, 2007).	http://archive.defra.gov.uk/environment/policy/natural- environ/documents/ eco-valuing.pdf
Biodiversity In Impact Assessment; Voluntary Guidelines on Biodiversity-Inclusive Impact Assessment.	Provides an overview of the minimum knowledge required to address biodiversity in impact assessment and presents guidelines for biodiversity including impact assessment. (CBD, 2006).	http://www.cbd.int/d oc/publications/cbd- ts-26-en.pdf
Biodiversity in Impact Assessment.	Outlines principles to promote “biodiversity-inclusive” impact assessment (IA), including Environmental Impact Assessment (EIA) for projects, and strategic environmental assessment (SEA) for policies, plans and programs. Guiding principles and operating principles are presented. The operating principles provide high-level guidance on how to incorporate biodiversity in impact assessments (IAIA, 2005).	http://www.iaia.org/publicdocuments/special-publications/SP3
Ecosystem-based Adaptation Tools	An online database for tools and projects for innovative interdisciplinary coastal-marine spatial planning and ecosystem-based management.	
Ecosystem-based approaches to climate change adaptation and mitigation in Europe	Study to address current knowledge gaps regarding the uptake and implementation of ecosystem-based approaches and thereby gain a better understanding of their role and potential in climate change adaptation and mitigation in Europe.	http://ec.europa.eu/environment/nature/climatechange/pdf/EbA_EBM_CC_FinalReport.pdf

RESOURCES FOR MAPPING AND VALUATION OF ECOSYSTEM SERVICES

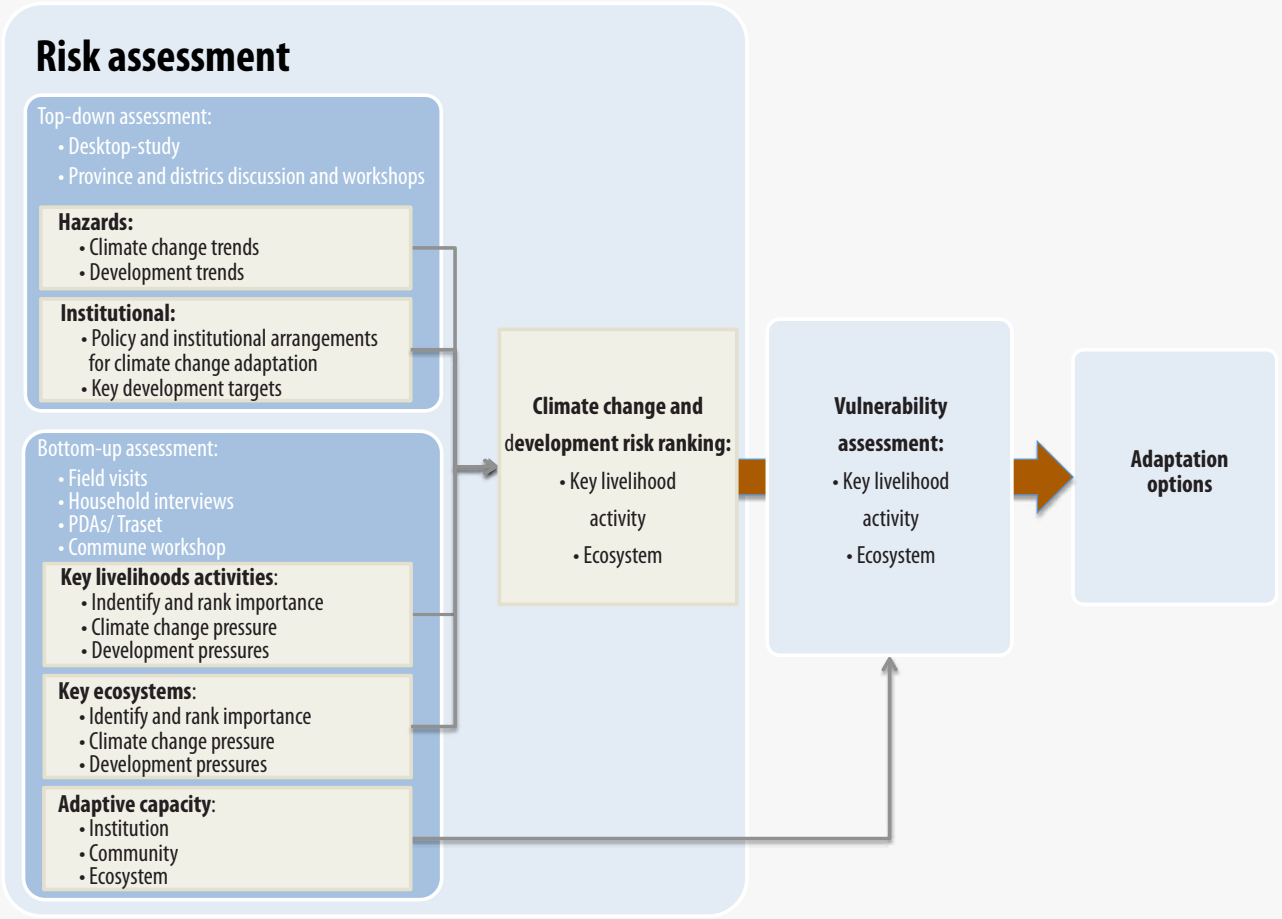
Resources	Description	Link
Ecosystem Services Evaluation using InVEST	Information about the Natural Capital Project, the InVEST tools and its applications. Many links to publications about ecosystem services valuation can be found here.	http://www.naturalcapitalproject.org/
Heart of Borneo: Investing in Nature for a Green Economy	Case study in Borneo where InVEST and the Land Change Modeling tool have been used to valuate the natural capital and to develop different scenarios for the future.	http://www.hobgreeneconomy.org/en/home
A Green Vision for Sumatra: Using ecosystem services information to make recommendations for sustainable land use planning at the province and district level.	Publication describing the outcomes from a study conducted in Sumatra by WWF Indonesia, in which InVEST has been used for the assessment of the ecosystem services.	http://www.naturalcapitalproject.org/indonesia.html
Integrating ecosystem-service tradeoffs into land-use decisions. Proceedings of the National Academy of Sciences of the United States of America	InVEST has been used to evaluate the environmental and financial implication of seven planning scenarios encompassing contrasting land use combinations in the North Shore of O`ahu (Hawaii).	http://www.naturalcapitalproject.org/pubs/tradeoffs-2012.pdf
Modeling benefits from nature: using ecosystem services to inform coastal and marine spatial planning. International Journal of Biodiversity Science, Ecosystem Services & Management.	Description of the InVEST marine models and the results from an application to the West Coast of Vancouver Island, British Columbia (Canada).	http://www.princeton.edu/~pinsky/Home_files/Guerry%20et%20al%202012%20IJBSESM.pdf
Mapping and Valuing Ecosystem Services as an Approach for Conservation and Natural-Resource Management.	Key features of the InVEST models are discussed in this paper including the ability to visualize relationships among multiple ecosystem services and biodiversity.	
Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. Front Ecol Environ, 7(1): 4-11.	This paper demonstrates how InVEST can quantify ecosystem services in a spatially explicit matter and analyzes tradeoffs between them in order to make natural resource decisions more effective, efficient and defensible.	https://groups.nceas.ucsb.edu/sustainability-science/weekly-sessions/session-5-2013-10.11.2010-the-environmental-services-that-flow-from-natural-capital/supplemental-readings-from-univ-of-minnesota-students/Nelson%20et%20al%202009.pdf/view

RESOURCES FOR ANALYSIS OF ADAPTATION OPTIONS

Resources	Year	Description	Link
USAID Adapting to Climate Variability and Change: A Guidance Manual for Development Planning	2007	This adaptation guidance manual is designed to assist planers and stakeholders in the identification and analysis of adaptation opinion through a stepwise approach drawing on relevant case studies.	http://pdf.usaid.gov/pdf_docs/PNADJ990.pdf
Georgetown Climate Center Adaptation Tool Kit: Sea-Level Raise and Coastal Land Use	2011	This adaptation tool kit provides a concise overview of range of planning, regularory and spending tools to assist adaptation decision-making.	http://georgetownclimate.org/sites/default/files/Adaptation_tool_kit_SLR.pdf
GIZ Climate proofing for development	2010	This document presents a methodology for climate proofing in development planning. Of particular relevance is Step 3 "Options for Action" which provide a methodology for evaluating and prioritizing adaptation action.	www.undp.org.cu/crmi/docs/gtz-climateproofing-td-2010-en.pdf
World bank Climate impact on energy systems: Chapter 4 Emerging Adaptation Practices	2011	This chapter describes the different considerations in delivering adaptation actions in energy sector.	http://elibrary.worldbank.org/doi/abs/10.1596/978-0-8213-8697
USAID Adapting to Coastal Climate Change: A Guidebook for Development Planers	2009	This guidebook provides detail treatments for climate concerns in coastal area. The user is guided through the stages of adaptation planning, implementation and integration.	http://pdf.usaid.gov/pdf_docs/PNADO614.pdf
UNFCCC Assessing the Costs and Benefits of Adaptation Options: An Overview of Approaches	2011	This publication provides an introduction to a range of different assessment approaches and methodologies to assessing the costs and benefits of climate change adaptation options and shares best practices and lessons learned.	http://unfccc.int/resource/docs/publications/pub_nwp_costs_benefits_adaptation.pdf.
World Bank Economics of Coastal Adaptation to Climate Change	2010	This report provides global level overview of the cost of adaptation to sea level-rise required from 2010 to 2050.	http://climatechange.world-bank.org/sites/default/files/documents/DCCDP_10_CoastalZoneAdaptation.pdf.
The Adaptation Prioritization Tool (APRT)	2013	Monitoring and Technical Adaptation Prioritization Tool (APRT) is a tool to support mainstreaming adaptation to climate change through prioritization in the SEDP process at the local, sectoral, and national levels—overall public action, without regard to source of funding.	

(Adopted from UNEP, 2012)

ANNEX 2: CONCEPTUAL GUIDANCE FOR VULNERABILITY ANALYSIS



1. **Top-down assessment of development targets & climate change projections**: a literature review was undertaken to review and assess: (i) the current institutional and policy arrangements for climate change adaptation; (ii) the future climate trends for selected site and (iii) the key potential development targets at three selected communes in the selected site.
2. **Bottom-up assessment of climate and non-climate pressures on key ecosystems and their livelihood-dependent activities**, workshops, meetings and interviews are undertaken to: (i) identify key ecosystems and their environmental and socio-economic services; (ii) discuss and rate the dependence of communities' livelihoods on these ecosystems; and (iii) identify the current climate and non-climate pressures on the ecosystems and their ecosystem-dependent livelihood activities.
3. **Risk Rating: Synthesis of the bottom-up and top-down assessments**: a combination of potential climate and development related impacts (top-down) with the hazard assessment of the ecosystems and their livelihood-dependent services (bottom-up).
4. **Assessment of the adaptive capacity of the dependent selected communes:** an assessment of: i) the ecological ability to adapt to climate and development threats; i) the communities' adaptive capacity—local communities' current coping mechanisms and how they're positioned to continue to adapt to climate change; and iii) institutional adaptive capacity—the current strengths and weaknesses of provincial and district government institutions to adapt to climate change.
5. **Vulnerability assessment**: based on a comparison of the risk assessment and the institutional and commune adaptive capacity.
6. **Adaptation options**: outlines, describes and prioritizes the key adaptation strategies at the ecosystem and community level. In addition, the potential adaptation linkages to relevant policies.

ANNEX 3: EXAMPLES OF EbA RESPONSES

1. Adjustment of land use planning

- Reallocation/setback of construction planning of public works, coastal neighborhoods from high risk areas to climate change

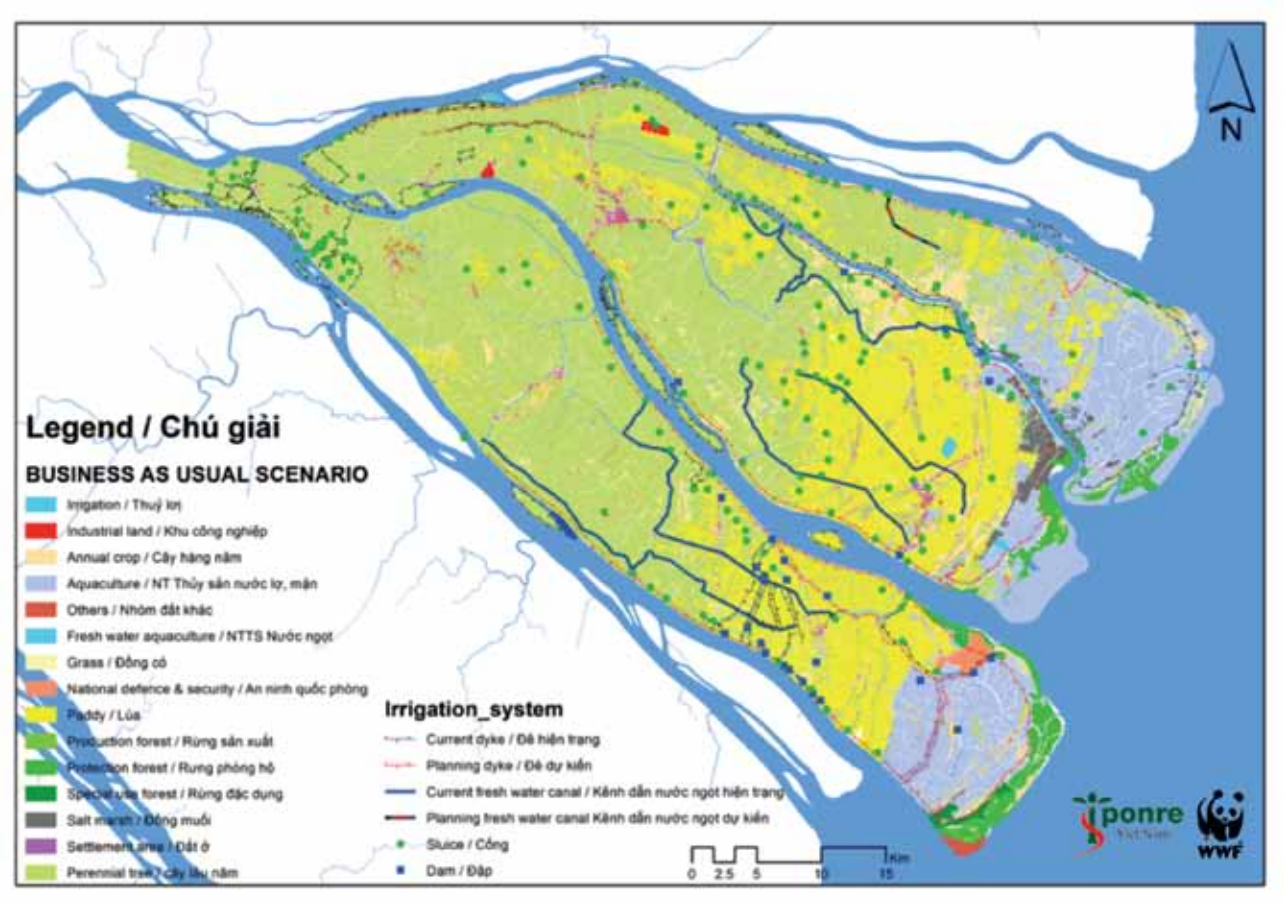


Figure 10: Integrating climate change issues into provincial strategies and development planning

2. Integrating climate change issues into provincial strategies and development planning including

- The provincial Action Program to respond to climate change;
- Biodiversity Conservation Planning;
- Planning of socio-economic development of the province (SEDP); and
- Communication Programs.

3. Wise use and management of freshwater resources

- Analysis of hydrological systems in the province, mapping of surface water and groundwater;
- Protection and restoration of wetlands to maintain and protect freshwater resources;
- Collecting and storing rainwater; and
- Coordinate with upstream areas to ensure fresh water for use by ecosystems downstream.

4. Conservation and restoration of natural habitats

- Management and protection of riparian vegetation, coastal mangroves;
- Plant more mangroves in the coastal areas;
- Restore natural hydrological regime in rivers; and
- The establishment of the fisheries management (restoration of aquatic resources).

5. More investment for biodiversity conservation for climate change adaptation

- Management and strict protection of existing protected areas;
- Propose and upgrade new protected areas;
- Strengthening capacity of conservation areas; and
- Communication, increase awareness for local people.

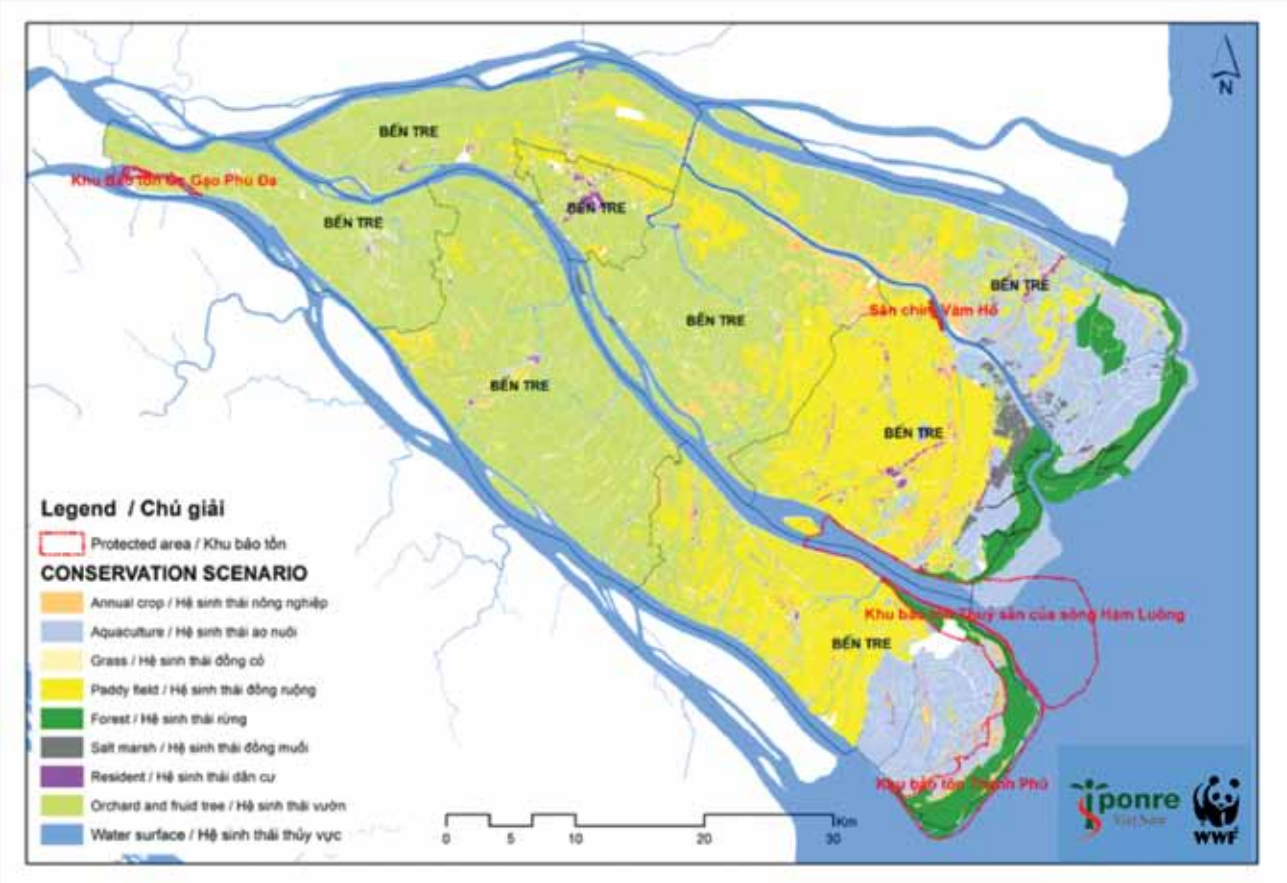


Figure 11: Example of scenario development for immediate adjustments in land-use planning in Ben Tre province

6. Climate resilient farming

Vegetables growing: Lack of water, environmental pollution, high cost of fertilizers, wind-brought salt vapor

- Planting windbreak trees, absorb vapor salt, prevent surges
- Rainwater harvesting, water-saving irrigation (drip irrigation)
- Composting of organic waste

Aquaculture farming: Extensive aquaculture, low forest cover, disease-prone, less effective, affected by weather

- Improved farming practices (pond preparation, seed, animal calendar, harvest care)
- Forest restoration in coastal
- Poly culture (shrimp - crab - fish – oysters)

Rice farming: Field salinity, drought, poor soil, or low yield

- Rotation shrimp - rice / fish - rice
- Research / tame the salt-tolerant rice varieties, drought
- Increase / improve connectivity to the river to collect water and sediment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