



Vulnerability Assessments

A Review of Approaches

Charlotte L. Morgan



BUILDING RESILIENCE TO CLIMATE CHANGE IMPACTS – COASTAL SOUTHEAST ASIA





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Foreword

“Building Resilience to Climate Change Impacts – Coastal Southeast Asia (BCR)” is a four year project supported by the EU and implemented by IUCN with partners VASI, SDF and GIZ, and operating in 8 provinces of Thailand, Cambodia and Vietnam, along the stretch of the South China Sea Coast between Bangkok and Ho Chi Minh City. The project has developed an integrated community based and ecosystem based approach which it is applying on the ground in project sites. As part of this overall approach there is a need to conduct vulnerability assessments in the project target areas to gain a more in-depth understanding of local vulnerabilities to climate change, and to start the process of identifying priority adaptation options.

In recent years, a number of international organizations have published documents relating to approaches and methodologies for implementing vulnerability assessments. Before deciding which approach and methods would be used in the BCR project, it was considered wise to review a range of documented existing approaches. This desk review considers a number of existing approaches and methods and provides clear recommendations for the BCR project to move forward. As such it provides an important contribution to identifying and selecting appropriate approaches and methods that will be used in implementation of the vulnerability assessments in each province by the BCR project.

Robert Mather, Bangkok.

Executive summary

This review assessed the suitability of various frameworks, approaches and tools for conducting vulnerability assessments, for use in the EU funded IUCN project “Building Resilience to Climate Change in Coastal Southeast Asia”. In particular their suitability for use at the provincial, community, and household/individual levels of analysis was emphasised. The majority of Vulnerability Assessments (VAs) treat vulnerability as a measure of exposure, sensitivity and adaptive capacity of the system or system component in question; setting guidelines to measure each attribute. This review considers the suitability of IUCN’s own coastal-context vulnerability assessment framework, CARE’s Climate Vulnerability and Capacity Analysis (CVCA), the World Bank risk-based Vulnerability Analysis for Freshwater Ecosystems, Community-based Risk Screening Tool Adaptation and Livelihoods (CRiSTAL) and Dynamic Interactive Vulnerability Analysis (DIVA). Of those reviewed, the most suitable VAs for the BCR project are the CARE CVCA and to a lesser extent the IUCN framework. The CARE CVCA provides clear guidance on how to measure vulnerability to climate change at multiple levels. However while recognizing the goods and services provided to local communities by species and habitats as “natural assets” that contribute to livelihoods, it does not integrate consideration of the climate change vulnerability of these natural assets themselves, into the human vulnerability assessment. The IUCN framework provides a similar methodology but less guidance. Another approach to Vulnerability and Capacity Assessment (VCA) is also being developed by the Sustainable Development Foundation (SDF), a partner in the BCR project. This will potentially address the gaps and weaknesses in both the CARE and IUCN approaches available so far. Unfortunately documentation of this methodology was not fully developed enough at the time of this review to be included. The recommended way forward at this point is to adopt elements of the CVCA approach as the core, supplementing it with additional elements from the IUCN framework and elsewhere where required. If the new SDF methodology indeed achieves this, then it can be adopted as the main starting point for the BCR project methodology. CRiSTAL can be used as an ancillary support tool to the main vulnerability assessment if deemed necessary.



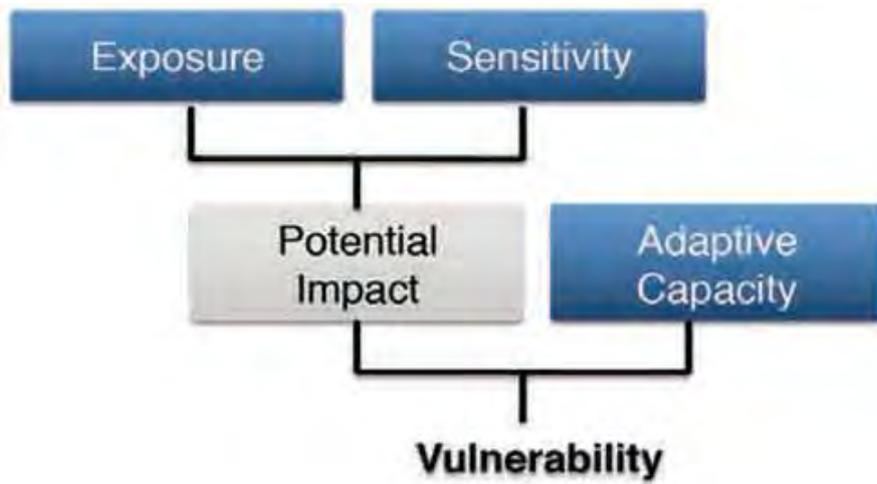
The nature of vulnerability and how it is measured

Vulnerability of people, or ecosystems, to change has most recently become an important subject as the importance of climate change has come to light. Climate change is a serious, ongoing threat to development and will add burdens to those already poor and vulnerable (Yamin et al., 2005; IPCC, 2001). It also represents a classic multi-scale global change problem in that it is characterized by infinitely diverse actors, multiple stressors and multiple time scales (Adger, 2006). The impacts of climate variability, manifested in floods, droughts, unseasonal rains and extreme events, create enormous developmental challenges for developing countries and the poorest communities due to their dependence on climate sensitive economic sectors, such as rain-fed and irrigated agriculture, and their limited economic, technological and human capacities (IPCC, 2001).

In the South East Asian context, previous Vulnerability Assessments (VAs) have highlighted that sea level rise and climate change will affect agriculture, water and forest resources, populations and infrastructure of mega-cities (Goh, 2009). The coastal zone in particular, presents multiple challenges for coastal communities and managers, as it combines a dynamic environment (erosion processes, marine flooding) and highly concentrated and valued assets (cities, tourism development, environmental values and natural resources (Romieu et al., 2010).

The IPCC Third Assessment Report describes vulnerability to climate change as “a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity” (p995). Figure 1 shows this relationship visually:

Figure 1: the components of vulnerability (from Marshall et al., 2009)



The object of this review is to compare and contrast existing vulnerability assessments, frameworks and toolkits that are suitable for use in the Building Coastal Resilience (BCR) project. The report will then examine the process by which the most suitable tools are implemented at provincial, community and household levels, as is required by the BCR project. It will culminate with recommendations.



Introduction to vulnerability assessment methods

[IUCN framework for assessing vulnerability to climate change](#)

These guidelines are set out in the publication by Marshall et al. (2009) and they are written for the context of coastal communities. The framework is one of the few that specifically approach vulnerability according to the IPCC-identified components of exposure, sensitivity, and adaptive capacity, and despite the slight difference in interpretation of these concepts and how to put them into practice, it is in the realm of adaptive capacity that the IUCN framework is particularly useful (Yates, 2010). The framework focuses mainly on adaptive capacity assessment of a coastal Socio-Ecological System, rather than identifying specific risks within the system (for example natural disasters etc) as other VAs do. The assessment itself determines the magnitude of exposure, sensitivity, and adaptive capacity using context specific indicators which are aimed to be worked into a project design.

The indicators explore the context within which communities plan, make decisions, and implement decisions for effective adaptation, and indicators such as these are essential for an adaptive capacity assessment capable of uncovering the structural causes of vulnerability (Yates, 2010). The framework can be implemented at both provincial and community levels, however the majority of detailed analysis is at community level. The focus within the framework is on adaptive capacity, as well as implementing resilience-building activities. In this respect the IUCN framework has value beyond the scope of the BCR project, as it is not just a vulnerability assessment but more an integrated climate change adaptation framework.

[CARE Climate Vulnerability and Capacity Analysis \(CVCA\)](#)

CARE has a specific approach that analyses vulnerability and capacity to adapt to climate change at the community level. It aims to gather, organise and analyse information on the vulnerability and adaptive capacity of communities, households and individuals, whilst also providing guidance and tools for participatory research, analysis and learning (CARE, 2009). It also aims to take into account the

role of local and national institutions and policies in facilitating adaptation (CARE, 2009), and as such is geared towards a multiple level implementation and analysis.

CARE's CVCA approach integrates good practices from their previous Household and Livelihood Security (HLS) approach, and from other approaches which focus on DDR (Disaster Risk Reduction) and hazard identification- such as IFRC's VCA methodology. The framework of the CVCA facilitates analysis of the information gained from both types of assessments from a climate change perspective; it examines both hazards and conditions, and analyses the interactions between the two (CARE, 2009). In this respect it takes aspects of other VAs and concentrates them in a community, climate change related focus, which is highly relevant to the BCR project.

The CVCA approach adopts the definition of vulnerability proposed by the IPCC (as well as defining exposure, sensitivity and adaptive capacity accordingly), identifying livelihood assets as the fundamental factor in determining adaptive capacity (Yates, 2010). It does not set-out any specific indicators for exposure or sensitivity, but does identify it, similar to the IUCN framework. Access to and control over the livelihood assets is said to build adaptive capacity, and subsequently lead to community resilience, particularly to climate-induced hazards (thereby indicating the influence of DRR on the framework [Yates, 2010]). The framework is social in context, as 'systems' are referred to as communities (CARE, 2009 p5).

World Bank framework for risk-based decision making for water investments

The World Bank VA methodology was developed in the freshwater ecosystem context; however it can be applied in other contexts, and is scalable both temporally and geographically. The approach was developed based on existing analyses in the literature, in particular approaches set out in recent World Bank reviews (World Bank, 2009). The same process can be used to identify risk in a matter of days at the small sub-basin level, using expert opinion, or it can form the basis for a regional investigation using years of research (Le Quesne et al., 2010).

This approach is a risk based methodology which involves definition of the objectives and identification of the components of interest/concern, establishment of the impact and likelihood of events that could compromise those objectives, and identification of the options that reduce the risk of those identified events (Le Quesne et al., 2010). Lastly is the assessment of adaptation options to determine suitability and timing of intervention. The risk assessment step comprises a top down analysis of narrative scenarios and possible futures; a bottom-up analysis of exposure, sensitivity, and adaptive capacity and the final risk assessment, which brings these two analyses together (Le Quesne et al., 2010).

Implementing this method includes the following stages:

- Stage 1: preparatory background analysis
- Stage 2: identify problem, objectives, performance criteria and rules for decision making
- Stage 3: Assess risks; and
- Stage 4: Identify and evaluate options to manage risk

(Adapted from Le Quesne et al., 2010):

Within the World Bank/WWF report (Le Quesne et al., 2010) there is a detailed implementation explanation in the hydrological/freshwater context, using the approach to specifically measure vulnerability within a basin. Since this particular tool is mostly focused on freshwater ecosystems, it will not be included in further analyses of suitability.

Community-based Risk Screening Tool Adaptation and Livelihoods (CRiSTAL)

CRiSTAL was developed by IUCN, the International Institute for Sustainable Development (IISD), the Stockholm Environment Institute (SEI-US) and Intercooperation, to help project designers and managers integrate risk reduction and climate change adaptation into community-level projects (Marshall et al., 2009). It can be used by local communities, project planners and project managers, and is intended to promote the development of adaptation strategies based on local conditions, strengths and needs (UNFCCC, 2008). It helps project users understand the links between livelihoods and climate in their project areas, assess a project's impact on

community-level climate change vulnerability, and make project adjustments to improve the project's impact on community resilience to climate change (Marshall et al., 2009). CRiSTAL has been structured around four framing questions divided into two modules, one for synthesizing information on climate and livelihoods, and one for planning and managing projects for adaptation.

Essentially the key output is a list of project activities that protect/enhance acc work for understanding the links among climate, livelihoods and project activities (UNFCCC, 2008).

Dynamic Interactive Vulnerability Assessment (DIVA):

DIVA is a tool for integrated assessment of coastal zones produced by the EU-funded DINAS Coast consortium in 2004 (UNFCCC, 2008). It was inspired by the Global Vulnerability Assessment as discussed by Hoozemans et al. (1993) and is specifically designed to explore the vulnerability of coastal areas to sea-level rise (UNFCCC, 2008). It comprises a global database of natural system and socio-economic factors, relevant scenarios, a set of impact-adaptation algorithms and a customised graphical-user interface with erosion, flooding salinisation and wetland loss being the specific factors considered (UNFCCC, 2008).

It is a scenario based model, with application at national, regional and global scale with the analysis considering broad adaptation issues. DIVA covers all 180+ coastal nations in 12,148 coastal segments at the aforementioned scales (UNFCCC, 2008). It is included in this review as sea level rise presents a particular hazard for many of the communities in the project study sites in Thailand, Cambodia and Vietnam.



Provincial level analyses

During the provincial analysis phase of the project, a method to assess vulnerability within specific livelihood and economic sectors is required. These sectors are tourism, agriculture, aquaculture, and fisheries. When assessing vulnerability in these sectors, the three indicators of vulnerability (which are omnipresent in all VAs reviewed) need to be considered as a starting point in designing or tailoring a Vulnerability Assessment to this project. These indicators are exposure, sensitivity and adaptive capacity. It should be noted that whilst parts of VAs are discussed here that are relevant to the scale of the analysis in question (i.e. provincial or community-level analysis), tools should be viewed as complete analyses that operate on multiple levels.

IUCN framework

The IUCN framework recognizes the need for differential scales when measuring exposure, sensitivity and adaptive capacity. The majority of the specific vulnerability analyses are carried out at community level; however they could be adapted for use in a provincial-level overview, before proceeding to the more specific community level analysis.

The first step in understanding exposure under this framework is to analyse the magnitude and rate of climate variation to which coastal communities and marine based industries are expected to be exposed (Marshall et al., 2009). For example, direct climate impacts such as temperature, storm severity ocean pH or indirect climate impacts such as reduced coral cover, increased shoreline erosion, and decreased primary production which can affect the system of interest (Marshall et al., 2009).

The next step in applying the IUCN framework at the provincial level is determining the sensitivity of broad sectors to climate change. The third step in the framework is assessing adaptive capacity, as whilst exposure and sensitivity determine the potential impact of a climate-induced change, adaptive capacity can be a major influence on what impact actually eventuates (Marshall et al., 2009).

Table 1: indicators of adaptive capacity, methods by which they are assessed and their scale (Adapted from Marshall et al., 2009).

Indicator	Method	Scale
The capacity to experiment and learn	Assess secondary data sources, interview leaders. Community measures of education, connections between resource use and resource condition	Community
The capacity to re-organise	Assess secondary data sources, interview leaders. Count number of community organisations, population and migration after extreme events; analyse how community decision-making is made	Community and provincial
Community assets (natural, economic, social, physical and human capitals)	Community based workshops; census information; accessing a range of govnt reports; numbers of satellite dishes on roofs etc	Community and provincial
Flexibility (social, cultural, political, economic, environmental)	Assess secondary data sources, interview leaders; assess livelihood diversity, past response to a recent climate event and/or current resource regulations. This could be used as a filter to see whether provincial development plan has covered these aspects(– i.e. climate proofing in 5-10 year development plans)	Mainly provincial but some community level as required for site analysis
Gender relations (bias etc)	Interview community leaders. Measure proportion of women in decision-making roles; the breadth of opportunities available to women to become decision makers	Community and provincial
Environmental institutions and social norms (effectiveness)	Identify perceptions of industry leaders and members. Measure the nature and number of recent institutional changes and responses to them.	Provincial/National
Culture of corruption (extent)	Interview industry members and community members.	Community and provincial
Flexibility of Markets	Access secondary data; interview industry leaders. Measure diversity in market products, placing and pricing.	Provincial

These indicators illustrate the scale of assessing adaptive capacity according to the IUCN framework. The IUCN framework also offers information on how to qualitatively rank resilience-building opportunities for prioritisation purposes. Table 2 shows that the criteria of need, benefit, feasibility and costs can help to prioritise adaptation/resilience-building actions. These criteria can be applied at a variety of different planning levels, from local to national. A simple rating (e.g. high, medium, low) or semi-qualitative score (e.g. 1-5) can be used to assess each criteria and generate an overall score for each resilience-building opportunity.

Table 2: criteria used to rank resilience-building efforts (from ICUN- Marshall et al. 2009)

Criteria for resilience building	Description	Action
Need	Individuals, communities and sectors will vary in the extent and immediacy of their vulnerability to climate change	Managers should rank candidates for adaptation using transparent methods for equitable resource allocation. Should establish clear criteria for evaluating need and recognising urgency in adaptation.
Benefit	Benefits of adaptation actions will vary considerably between actors – can assist with decisions between sectors/regions in which to invest in adaptation action.	Prioritising groups/regions should be done with the development of clear criteria for evaluating benefit- through comparative assessments of economic/social/ environmental value
Feasibility	Some adaptation options can be infeasible in practice. Reducing vulnerabilities might be economically/ technically/politically challenging.	Feasibility analysis will help identify strategies which are more practicable. In instances where this is difficult to evaluate- risk-based approach can help with decision making in the face of uncertainty
Costs	Adaptation options vary greatly in cost – inexpensive options may deliver major benefits with great certainty.	Weighing up costs against feasibility and likely benefits. Decision makers should consider the nature of the vulnerability, the type of adaptation strategy and the institutional context of the adaptation initiative

CARE CVCA framework:

Even though the CVCA framework is essentially a community-level based VA, with the aim of enabling Community-Based Adaptation (CBA), it offers a set of guiding questions for analysis of information at national, local and household/individual level, which makes it suitable to help design both provincial-level and community-level VAs for the BCR project. The CARE handbook (2009) also outlines the information which is required by the project team before undertaking the VA at national level. Table 3 outlines the information required, which may be useful for discussion at national/provincial project meetings.

Table 3: information required by project team before undertaking full vulnerability analysis at National level

Information group required	Examples where appropriate
Population demographics	Age, gender, linguistic, culture
Socio-economic factors as related to population	Income, livelihoods, dependence on aid/social security
Health factors or related issues	-
Cultural diversity and groupings	Cultural issues affecting response or recovery
Municipal social planning factors or issues	-
Environmental analyses	Ecosystems/Ecosystem-services
Key facilities	Fire, police, emergency medical service stations, hospitals, long-term care facilities, key public facilities and shopping malls

Guiding questions and analytical tools at national level:

The CVCA uses guiding questions addressing resilient livelihoods, DRR, capacity development and underlying causes of vulnerability. For example the following are the guiding questions from the CARE CVCA guidebook (2009):

- Is the government monitoring and analysing current and future climate information related to livelihoods?
- If so, is this information being disseminated? How? To whom?
- What are the observed and predicted impacts of climate change for the country?
- What livelihood groups or economic sectors are most vulnerable to climate change?
- Is climate change integrated into relevant sectoral policies?
- Is climate change integrated into poverty reduction strategy and/or other development policies and programs?

Guiding questions can be adapted for use at a provincial level of analysis. A set of analytical tools are then outlined in the CVCA process to help facilitate the answering of the guiding questions , such as secondary data tools, mapping, key stakeholder interviews and policy analysis.

Writing the overall CVCA report:

The CARE handbook provides guidance on producing a comprehensive CVCA report, and lists the recommended contents- which acts as a framework detailing the sorts of information required for the overall VA at various scales. It is a useful starting point for provincial managers to analyse, to determine what can be expected of this process, and what sorts of results they will ultimately be using and how. Headings include (from CARE, 2009):

- CVCA process
- Climate context
- Livelihoods (climate linkages)
- Changing disaster risks
- Institutional Context Related to Climate Change
- Underlying causes of Vulnerability

Creating an enabling environment:

The CVCA handbook goes into detail towards the end of the publication about how to create an enabling environment at both National and Local levels, which would prove useful in the BCR project for the project team to refer to when discussing project outputs and next steps. More information can be found in the CARE handbook (2009).

CRiSTAL

One of the important characteristics of CRiSTAL is that it promotes climate change adaptation based in local strengths and needs, and as such can be adapted based on local contexts. The tool is primarily based at the community level and its practical implementation in the BCR project shall be discussed in the 'community level analysis' section of this report.

DIVA

DIVA can be applied both globally and at a national scale, however for site-specific applications the model would have to be modified to incorporate local variables (Kay et al., 2008). If DIVA was to be used at the Thai, Cambodian and Vietnamese National scales in the BCR project context, its outputs would be helpful in exploring broad coastal adaptation strategies.

The tool contains data and a user interface for running climate and socio-economic scenarios. The DIVA database offers an opportunity to;

- explore the effects of climate change on coastal environments and societies;
- explore the costs and benefits of coastal adaptation options;
- explore a range of coastal impact and adaptation indicators; and
- explore user-selected climate and socio-economic scenarios and coastal adaptation options;

These functions could be used to support provincial level VA's but do not in themselves provide a framework for assessing vulnerability, sensitivity and adaptive capacity. There is also a potential for overlap with the SEA-START climate model downscaling project currently underway.

At the time of writing, the model and its most recent accompanying literature is no-longer available, and therefore specific operational information on what specific data the model requires is scarce. The original guidelines for the tool do say that the DIVA tool is comprised of a computer model program, where the user creates an individual 'case' which is composed of the SRES Land Use/ Population and Economic scenario, derived SRES Sea Level Rise scenario, input parameters and initial values.

If the BCR team wish to use DIVA then its creators would need to be contacted to ascertain the status of the software, whether it can be obtained, and what level of expertise is required to effectively use the tool.



Community-level analyses

IUCN framework: community level

The IUCN framework concentrates primarily on assessing vulnerability to climate change on the community or individual scale. The first step in the framework is to assess exposure to climate change. The second step of assessing sensitivity at community or individual levels, which involves ascertaining the numbers of people directly and indirectly dependent on marine resources and determining the weightings that individuals place on their marine activities relative to other income (and food) sources (as pointed out by Hoegh-Guldberg et al. 2009). Weightings that individuals place on their marine activities relative to other income sources will have to be carried out through structured interviews or surveys.

IUCN framework: individual or house hold level

The capacity of individuals to cope and adapt will be determined in part by their characteristics, circumstances and their capacity to take advantage of other opportunities (Marshall and Marshall, 2007). The framework measures individual adaptive capacity to climate change within the community context by using a comprehensive set of indicators for individual household surveys and interviews, in coordination with the provincial project teams and their partners. Three examples of the 17 provided indicators are in Table 4.

Table 4: Individual indicators of adaptive capacity to climate change (from IUCN framework- Marshall et al., 2009)

Indicator	Explanation
Perception of risk	How an individual perceives the risks associated with change is fundamental in determining their ability to cope and adapt. How risk is managed reflects individual and cultural differences in experiences, knowledge, beliefs, values, attitudes and judgements as well as differences in abilities to plan and execute plans (Ritchie et al., 2004; Taylor 2003).
Ability to cope with change	In social systems, the ability to cope is a measure of the proximity to emotional (and usually financial) thresholds (Marshall, 2008a). By assessing perceptions about stress within a climate change context resource managers and adaptation planners can qualitatively assess the proximity to the thresholds of coping (e.g. Milbrath, 1995; Saegert and Winkel, 1990; Rickson et al.,1990; Biscoe, 2002).
Level of interest in change	This dimension of adaptive capacity corresponds with the degree to which the system is capable of 'self-organisation'. Individuals that have a higher level of interest in adapting to the requirements of the future usually have a higher financial, social and/or emotional flexibility. The level of interest in climate change adaptation can also be influenced by climate education and access to climate technology, expertise and information (Steinfeld, 2001). An interest in adapting is necessary for individuals to identify the consequences, impacts and possible responses ("adaptation options") to climate change (Howden et al., 2007)

CARE CVCA framework: Local government/community level analyses:

The CARE CVCA tool offers multiple-scale guidelines on assessing vulnerability to climate change. As with the IUCN guidelines, the CVCA focus is on the community-level assessment, as there is an emphasis on community-level adaptation, and thus context-specific, in situ assessments. As per national/provincial level assessment the CVCA provides a different set of guiding questions for the community-level analyses, and a set of analytical tools to be used at this scale (secondary research, policy analysis, institutional mapping, key informant interviews). More detail can be found in the CARE handbook (2009).

As well as the guiding questions for the VA, the CVCA provides a list of tools that can be used within the community-level analysis which may be useful for provincial managers to examine when deciding the specifics of the community-level VAs:

1. **Facilitation tips:** To guide planning and preparation for community visits and to provide general guidance on effective facilitation
2. **Hazard Mapping:** To become familiar with the community, and to see how the place is perceived by different groups within the community. To identify important livelihoods resources in the community, and who has access and control over them. To identify areas and resources at risk from climate hazards and to analyse changes in hazards and planning for risk reduction.
3. **Seasonal Calendars:** To identify periods of stress, hazards, diseases, hunger, debt, vulnerability, etc. To understand livelihoods and coping strategies. To analyse changes in seasonal activities. To evaluate use of climate information for planning
4. **Historical timeline:** To get an insight into past hazards, changes in their nature, intensity and behaviour. To make people aware of trends and changes over time and to evaluate extent of risk analysis, planning and investment for the future.
5. **Vulnerability matrix:** To determine the hazards that have the most serious impact on important livelihood resources. To determine which livelihoods resources are most vulnerable and to identify coping strategies currently used to address the hazards identified
6. **Venn diagram:** to understand which institutions are most important to communities. To analyse engagement of different groups in local planning processes and to evaluate access to services and availability of social safety nets

Hazard/Vulnerability mapping:

During the planning process as to which community sites will be subject to specific VA, the CVCA provides guidance for the production of vulnerability map. The map can be used to identify realistic expectations regarding the capacity of each identified group as well as estimate likely emergency needs of the most vulnerable. It can also help prioritise segments of a given community for action, and provides a visual aid in designing adaptation strategies for whole communities or regions.

The mapping process involves gathering the relevant data and mapping the general population, high-density areas, dividing the map into municipal (operational) sectors and mapping the 'high risk' areas. Examples of potential high risk areas within specific communities may include banks of a river (flood), heavily forested areas (fire), heavily used transportation routes (risk of accidents) and processing plants (fires, bomb threats, industrial accidents and chemical leaks). By then selecting applicable categories for 'most vulnerable', the map can be divided into sections detailing the scale of human vulnerability within the area. Examples include the elderly, livestock owners, tourists, fishers and people with disabilities (CARE, 2009). More information regarding the methodological steps of this process can be found in the CARE CVCA handbook (2009). An example of a hazard map from Northern Ghana from the CARE CVCA handbook (2009) is shown in figure 2.

Figure 2: A Hazard Map for Bansi Village in Northern Ghana showing the key resources in the village and the hazards affecting them, from CARE, 2009



CARE CVCA Household/individual level analyses

Guiding questions for the local and individual level CVCA analysis are provided by CARE to help guide and shape a context-specific VA. These questions and the associated analytical tools provided by CARE will prove useful in guiding a community level analysis for the BCR project team if the CVCA analysis route is chosen. More information can be found in the CARE handbook (2009).

CRiSTAL: Community-level analysis implementation:

One of the important characteristics of CRiSTAL is that it promotes climate change adaptation based in local strengths and needs, and as such can be adapted based on local contexts. CRiSTAL comprises two modules which are essentially gathering the same information as both ICUN VA and CARE CVCA. The first module of CRiSTAL can be considered the vulnerability analysis itself (exposure and sensitivity to climate change) and the second can be considered the adaptation actions needed to address those vulnerabilities (adaptive capacity).

Module 1:

Within the first module, Users gather information for this module through participatory workshops, consultations, site visits, document review, Internet research, and interviews (Marshall et al., 2009). The CRiSTAL publication itself only provides a conceptual framework and key concepts for identifying, analysing and assessing the links between community-level climate risks, livelihoods and development projects, but does not describe in detail the steps and tools required for actually carrying out a community-level assessment, and as such a more comprehensive review of the tool's field testing will be required if the BCR project team wish to adapt this methodology to the project's context. A Sri Lankan field test in 2006 is used here to highlight the steps involved in the method, and the expected outcomes of various stages of the project.

Table 5: conceptual overview of the CRiSTAL tool, with BCR context considerations (conceptual steps taken from Marshall et al. 2009).

Overarching question	Sub-questions
1. What is the climate context (module 1)	<ul style="list-style-type: none"> • What are the anticipated impacts of climate change in the project area? • What climate hazards are currently affecting the project area? • What are the impacts of these hazards? • What are the coping strategies used to deal with these impacts?
2. What is the livelihood context (module 1)	<ul style="list-style-type: none"> • What resources are important to local livelihoods in the project area? • How are these resources affected by current climate hazards? • How important are these resources to coping strategies?
3. What are the impacts of current or planned development projects on livelihood resources that...(module 2)	<ul style="list-style-type: none"> • Are vulnerable to current climate hazards? • Are important to local coping strategies?
4. How can current or planned development projects be adjusted to reduce vulnerability and enhance adaptive capacity? (module 2)	<ul style="list-style-type: none"> • How feasible is it to implement these changes in terms of...? <ul style="list-style-type: none"> - Local priorities/needs - Project finances - Institutional capacity - A supportive policy framework - Risks associated with future climate change

Assessing existing development projects for module 2:

Since one of the aims of CRiSTAL is to help project designers and managers integrate risk reduction and climate change adaptation into community-level projects, there must first be an inventory of existing and planned community-level projects in the BCR project region (as outlined in table 6). Once this data has been gathered, CRiSTAL can then aid the project team to understand how these development projects influence climate-related vulnerability and adaptive capacity.

The Sri Lankan field test was based on the existing IUCN project entitled 'Conservation of Biodiversity through Integrated Collaborative Management in the Rekawa, Usangoda and Kalametiya Coastal Ecosystems, Sri Lanka' (IUCN et al., 2006). In this example, the project ran for the four years immediately before the CRiSTAL test- however the project team was able to visit sites and communities that had been target beneficiaries of the project (IUCN, 2006). Whilst there, the CRiSTAL analysis was implemented by representatives of IUCN and other organisations, which involved community stakeholder consultations determining the climate change context of their livelihoods (IUCN et al., 2006). The two primary consultation groups were sand beach fishers, and women- who were the recipients of small grants as a result of the original development project (IUCN et al., 2006). Figure 3 shows the results of the session with the sand beach fishery representatives, and shows their perceptions of the ways in which the climate negatively affects their livelihoods.

Figure 3. An example of the results of a livelihood context analysis conducted as part of a CRiSTAL project in Sri Lanka. It is showing the extent to which climate hazards negatively affect livelihood resources- this data was collected from a community group consultation session where local stakeholders, representative of the fishing industry in the region, were present. From IUCN et al. (2006)

Resource	Drought						Flood						Changing sea conditions					
	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
Natural Resources																		
Freshwater						X						X					X	
Soil					X							X					X	
Marine products (fish, shells, coral)		X						X										X
Physical Resources																		
Irrigation infrastructure						X						X				X		
Fishing equipment (harbour, boats, nets)	X									X								X
Financial Resources																		
Village fund (requested for future)	X						X						X					
Revolving loans					X						X						X	
Liquid assets (pawning jewellery)						X					X						X	
Human Resources																		
Biodiversity knowledge	X						X						X					
Awareness of legal frameworks for NR use	X						X						X					
Skills				X					X								X	
Social Resources																		
Biodiversity Task Force	X						X						X					
Federation of 17 community organisations	X						X						X					
Death society	X						X						X					

The CRiSTAL project in Sri Lanka then determined the livelihood resources important to the coping process, and in the case of the fishers represented in figure 2, freshwater, soil, fishing equipment, revolving loans and skills were identified (IUCN et al., 2006). Lessons learned from the Sri Lanka test of the tool demonstrated that overall, CRiSTAL is a good tool for project design and helps to mainstream vulnerability and adaptation aspects into project design, which can then in turn help set baselines for monitoring. Hammill et al. (2007) state in their short evaluation of CRiSTAL that ideally it should be a follow on tool for the CVCA process; that it should act as a framework into which CVCA generated information can be fed for the purposes of informing project design/implementation.

In the BCR project context, the tool would be most effectively implemented at community level, as a decision-support tool to existing or planned development projects in the BCR regions. The participatory elements of CRiSTAL make it ideal for community implementation in the BCR regions, and given the successful field testing in Sri Lanka with similar conditions to the BCR regions (for example the concentration on subsistence fishing groups) make it a suitable tool to implement.

Comparative matrix

In order to facilitate a clear comparison of the approaches detailed in this report, a comparative matrix is presented in table 7:

Table 7: a comparative matrix of Vulnerability Analysis tools and frameworks discussed in this report in relation to suitability for use in the BCR project

Tool/ framework	scale	Measures exposure	Measures sensitivity	Measures adaptive capacity	Suitability for BCR project	Coastal and marine climate context specific	Additional information
IUCN framework	multiple	Yes through climate scenarios- but left up to the user	Yes- through assessing how many people are dependent on climate sensitive resources	Yes- through series of indicators designed to be implemented at community level	HIGH	Yes- through the use of indicators at multiple levels	Focus on adaptive capacity and implementing resilience-building policies/ projects in communities
CARE CVCA	multiple	Yes	No specific indicators, but can be modified	yes	HIGH	no	Focus on creating an 'enabling' environment within institutional frameworks for adaptation activities. Integrates concepts from livelihoods approach and disaster risk reduction. Provides more practical guidelines for implementation than IUCN framework

World Bank VA	multiple	yes	yes	Yes- via a 'bottom-up' approach- complementing a 'top-down' approach involving narrative scenarios and possible futures. These two analyses are brought together in the final risk assessment	LOW	No- designed for freshwater ecosystems/ catchment management	Risk based approach which involves assessing risk and developing adaptive responses. Ecosystem focus- original example based on dividing focus area into tributaries and carrying out analysis based on identifying thresholds of concern in each unit. Suggested in accompanying literature that these units can be socio-economic in nature, although does not provide any specific guidance.
CRiSTAL	community	Yes	?	yes	MEDIUM	no	Ancillary support tool- to be used to measure how effective developmental projects at community level are at addressing climate change vulnerabilities and facilitating adaptive capacity. Strengths lie in providing a platform for community engagement concerning climate adaptation. Not a stand-alone tool- should be used in conjunction with another framework/tool if required.
DIVA	National and/or regional	yes	No but can be used to determine sensitivity	No but can be used to determine adaptive capacity	MEDIUM	yes	Ancillary support tool- designed to provide national/regional sea level rise predictions and consequences

Summary and recommendations

Summary

The above analysis shows that different advantages and disadvantages exist for each method of VA. The IUCN VA framework and CARE CVCA appear the most suitable and comprehensive for application to the BCR project. Both address vulnerability, sensitivity and adaptive capacity of vulnerable communities at multiple scales. Both VA frameworks are similar however the CVCA is more explicit offering more guidance, especially at a community and household/individual level. The CRiSTAL tool shows significant potential as a decision support tool and implementation tool for community based projects identified as an output of provincial and community scale vulnerability assessments. The World Bank VA is focused specifically on freshwater ecosystems therefore less applicable to the BCR project. DIVA could hold significant value during vulnerability assessment but may be impractical for use by the BCR project at this time. Further recommendations regarding the three most appropriate approaches for use in the BCR project (IUCN, CVCA, CRiSTAL) are presented below.

IUCN

The IUCN approach is a climate change specific framework and is inherently set in the coastal context. It is an integrated 'system wide' approach, taking ecological vulnerabilities into consideration, which is necessary for resource dependent communities. The framework is adaptable in so much as it can be implemented at the sectoral scale or at community scale. For assessing sensitivity to exposure to climate change the IUCN framework is non-specific, stating only that the way to assess social sensitivity in this context is to ascertain the numbers of people directly dependent on resources. The approach provides a set of indicators for measuring adaptive capacity (at both community and household/ individual levels) and the overall vulnerabilities of specific sectors and communities can be determined.

The framework also identifies the importance of a dynamic livelihoods analysis and therefore of recognising the relationships between communities and planning for the future. It also offers a helpful ranking system for resilience-building activities, which the BCR project team can consider using when identifying appropriate pilot activities for implementation in each province.

CARE CVCA

The CARE CVCA method also has a specific climate change focus but does not use as comprehensive a 'system wide' approach as the IUCN framework. Instead it focuses on four areas: climate-resilient livelihoods; disaster risk reduction; capacity development and addressing the underlying causes of vulnerability (CARE, 2009; Yates, 2010). A particular strength of the framework is the recognition that building an enabling environment for community-based adaptation is a crucial component, and the framework addresses this at three scales: household, community/local government, and national, which will be highly applicable for the BCR project

The CVCA offers sets of guiding questions to help form context-specific VAs at both national and community/individual level. The CVCA also offers more explicit guidance on the ways in which the guiding questions can be administered as a VA; through the use of analytical tools. These tools are tailored to each level of the VA, from national down to individual. The community-level analysis is particularly detailed, which is in keeping with CARE's focus on CBA (Community-Based Adaptation). The community-specific tools such as hazard mapping (see fig 1) and historical timelines, would be appropriate for use in the BCR community VA. The seasonal calendar would be a particularly useful tool when analysing agricultural/fisheries sectors as it identifies periods of stress and change, and the extent to which climate influences resource use.

Helpfully, the CVCA literature provides a template for the writing of the final report, which is successful in giving an indication of what should be included, and addresses all facets of a complete VA. Overall the CVCA is more specific, and therefore offers more guidance, when designing a context-specific VA. It offers a clearer project design plan than the IUCN guidelines, with practical information provided to help the data collection process (e.g. the field guides provided in the handbook). It focuses on livelihood analyses, measuring exposure to shock, coping responses and institutional reactions and vulnerability at multiple scales. It places emphasis on

creating an 'enabling environment' for climate change adaptation measures, at all three scales mentioned, and is therefore similar, but more explicit, than the IUCN guidelines.

However while recognizing the goods and services provided to local communities by species and habitats as "natural assets" that contribute to livelihoods, it does not integrate consideration of the climate change vulnerability of these natural assets themselves, into the human vulnerability assessment. The CVCA therefore needs to be supplemented by an assessment of likely climate change impacts on the species and habitats that are important to each community. If communities are to rely to a greater or lesser extent on their local resource base to help them adapt to a future climate, they also need to know what will be happening to that resource base.

CRiSTAL

CRiSTAL is a decision tool used to understand the links between livelihoods and climate change, whilst also developing adaptation methods with local strengths and needs in mind. With CRiSTAL, the focus is laid heavily on hazards (with no account of seasonal or projected changes), coping strategies rather than adaptation, and the impact on existing projects (rather than communities). The first module of CRiSTAL seeks to determine the same information as both IUCN and CVCA; identifying climate hazards and linking these to livelihoods and coping strategies. The second module is concerned with determining whether existing or planned development projects are reducing vulnerability of communities etc to climate hazards and determining how flexible they are to accommodate climate change adaptation options. W Field testing in Sri Lanka on fishing communities, (IUCN et al., 2006) showed that the tool is effective as a decision support tool for project design, as well as in engaging communities in the climate change/livelihood context.

In the BCR project, CRiSTAL can be used as an accompanying/follow on tool from the CVCA process, at both the provincial and community-levels.

Recommendations

The suggested step by step approach for the BCR project to conduct vulnerability assessments and start to identify resilience-building actions is therefore as follows:

Overall: the BCR project should adopt elements of the CVCA as the main starting point and core of the approach, but address its omissions and weaknesses by bringing in additional elements from the IUCN Framework, CRiSTAL, and elsewhere, as follows:

- 1) Start with the CVCA guiding questions for understanding the overall context – compiling and synthesising information from BCR project stakeholders. This synthesis will then help inform the detailed design and selection of appropriate tools for the subsequent detailed Vulnerability Assessments. In the BCR project this process needs to be carried out within specific sectors important at the provincial level (i.e. fisheries and aquaculture, agriculture, and tourism) as well as on a community level (i.e. specific target communities identified in each province)
- 2) Develop downscaled climate scenarios for each province, and identify elements of possible future climate of particular importance for the key sectors in the province
- 3) Adapt the CVCA guiding questions (and add in additional guiding questions as necessary) for use in provincial level Vulnerability Assessments, using key informant interviews and focal group discussions as the main techniques to answer the questions. The downscaled provincial climate scenario and its main implications should be presented and discussed in provincial level meetings. The rapid assessment of climate change impacts on habitats and species important in the fisheries, aquaculture, agriculture and tourism sectors in the province, should also be presented and discussed in provincial level meetings.
- 4) Review Provincial development plans from a climate change perspective, and if major projects are planned in the coastal zone of the province (roads, sea-walls, dykes, water gates, irrigation, dredging, etc) the CRiSTAL

tool could be applied to understand the implications of the project(s) from the perspective of climate change vulnerability

- 5) Identified pilot communities in each province on the basis of agreed criteria, and conduct community-level vulnerability assessments using the CVCA guiding questions and tools including hazard mapping, seasonal calendars, timelines, transect walks, Venn diagrams, etc described in the CVCA handbook, but also bringing in additional approaches such as identification of climate-hazard trends used by SDF and SEA-START. In addition the information from the downscaled climate scenarios and the rapid assessment of climate change impacts on species and habitats that are relevant to each community should be discussed in village meetings.
- 6) Overall Vulnerability Assessment reports should be compiled for each community, in the local language and presented back to the community in a formal meeting for the community to verify the accuracy and appropriateness of the report
- 7) Each community should then be supported to identify initial pilot adaptation activities. The ranking of resilience-building activities in the IUCN Framework can be used to help prioritise proposed actions – and CRiSTAL can be used to assess their feasibility.

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About IUCN

IUCN is the world's oldest and largest global environmental organization, with more than 1,000 government and NGO members and almost 11,000 volunteer experts in some 160 countries. IUCN's work is supported by over 1,000 staff in 60 offices and hundreds of partners in public, NGO and private sectors around the world.

IUCN helps the world find solutions to our most pressing environment and development challenges. We support scientific research, we manage field projects all over the world and we bring governments, NGOs, the UN, international conventions and companies together to develop policy, laws and best practice.

About Building Resilience to Impacts of Climate Change– Coastal Southeast Asia (BCR)

Climate change is a global challenge but a lot can be done at the local level to minimize impacts and capture opportunities. IUCN's Building Resilience to Climate Change Impacts–Coastal Southeast Asia Project, funded by European Union, aims to increase adaptive capacity of people and the ecosystems on which they depend to cope with the anticipated impacts of climate change and plan for DRR, through sound governance and planning.

The project will strengthen the ability of local government and local people to plan for, and adapt to, future climate risks in eight coastal provinces between Ho Chi Minh City and Bangkok: Can Gio, Ben Tre, Soc Trang, and Kien Giang in Vietnam; Kampot and Koh Kong in Cambodia; and Trat and Chanthaburi in Thailand.



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