



Mekong River Commission

Review of climate change adaptation methods and tools

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Meeting the Needs, Keeping the Balance



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Table of contents

Summary	vii
1 Introduction	1
2 Methodology and definitions	3
2.1 Objectives	3
2.2 Key definitions.....	6
2.3 Literature review.....	8
2.4 Analytical focus	10
2.5 Review methodology	11
2.6 Challenges, limitations and information gaps	12
3 Trends in thought on adaptation planning	14
3.1 Moving from single to multiple drivers of change: the scholarly journey	16
3.2 The practice of adaptation planning: applying methods and tools	18
4 Review of projects, actions and initiatives	23
4.1 Overview of adaptation in LMB countries	23
4.2 Policy and institutional responses to climate change in LMB countries	26
4.3 Overview of projects, actions and initiatives.....	26
4.4 Networks, partnerships and activities	30
4.5 Institutions	32
5 Methods and tools	36
5.1 Methods and tools in LMB countries	36
5.2 Overview of methods and tools for adaptation planning.....	38
5.3 Scoping	44
5.4 Vulnerability assessment	45
5.5 Identification, development and implementation of adaptation options.....	46
5.6 Gender.....	47
6 Analysis of methods and tools	50
6.1 Evaluation of methods and tools.....	51
6.2 Selection criteria	54
6.3 Using methods and tools for adaptation planning in LMB countries.....	56
7 Conclusions	61
8 References	62
Annex I. Additional definitions	66
Annex II. Details of projects	68
Annex III. List of climate adaptation actions	74

List of tables and figures

Table 1. Definitions of approach, method and tool	3
Table 2. Adaptation definitions.	7
Table 3. Relevant best practice criteria.	11
Table 4. Key words.....	12
Table 5. WRI's National Adaptive Capacity Framework.....	21
Table 6. Geographical scope of networks, partnerships and activities for Asia and the Pacific.	30
Table 7. Institutions: scope of climate adaptation work.....	35
Table 8. Experiences with methods and tools in the LMB countries' national communications.....	36
Table 9. Overview of Methods and Tools.	38
Table 10. SWOT analysis of methods and tools.	53
Table 11. Assessment criteria for adaptation planning methods and tools.	55
Figure 1. MRC CCAI Adaptation Planning Framework.	5
Figure 2. Summary of reviewed adaptation projects in Asia.	27
Figure 3. Summary of the reviewed adaptation planning projects in the Mekong region.....	28
Figure 4. Summary of reviewed climate adaptation capacity building projects in Asia.....	28
Figure 5. Summary of actions.....	29
Figure 6. Overview of distribution of methods and tools	43

List of acronyms

ADB	Asian Development Bank
CCAI	Climate Change and Adaptation Initiative (of the MRC)
CDM	Clean Development Mechanism
GEF	Global Environment Facility
GTZ	German Technical Development Assistance Agency
IPCC	Intergovernmental Panel on Climate Change
LMB	Lower Mekong Basin
MARD	Ministry of Agriculture and Rural Development, Viet Nam
MOE	Ministry of Environment, Cambodia
MRC	Mekong River Commission
NAPA	National Adaptation Programme of Action (Reports by the least developed countries to the UNFCCC)
NGO	Non-governmental organisation
NWP	Nairobi Work Programme on impacts, vulnerability and adaptation to climate change (under the UNFCCC)
SEI	Stockholm Environment Institute
SENSA	Swedish Environment Secretariat for Asia
Sida	Swedish International Development Cooperation Agency
SWOT	Strengths, Weaknesses, Opportunities, and Threats Analysis method
UNDP	UN Development Programme
UNFCCC	UN Framework Convention on Climate Change
USAID	United States Agency for International Development
WEAP	Water Evaluation and Planning System
WRI	World Resources Institute

Summary

Climate change is an unavoidable challenge that society will have to deal with over coming decades. For developing countries, the task is particularly daunting. The process of adapting to new conditions, stresses and natural hazards that result from climate change will require additional interventions. Although most communities have some ability to respond to changes and extreme climatic events, the expected impacts of climate change will exceed this capacity almost in all cases. For this reason, it will be necessary to explicitly plan how to adjust to climate change. Adaptation planning begins with an assessment of current and future impacts and vulnerability to climate change. Such assessments are in themselves full of uncertainty, relying on good data that often may not be available. The steps between baseline analysis through to identifying possible adaptation actions are complex, and consequently, approaches to support the planning process have been developed. This report reviews many of the methods and tools that are available for planning adaptation.

The purpose of this review is twofold: it provides an introduction to the theoretical landscape of planning adaptation to climate change, offering an overview of many of its key concepts and approaches; and it draws out key issues that are especially relevant to countries in the Lower Mekong Basin (LMB) in the selection of approaches for adaptation planning.

Methods and tools for adaptation refer to the various guidelines, models, toolkits and frameworks that have been developed to support the process of planning adaptation. These range from complex models to assess climate change impacts to guidelines of the steps to take from identifying, designing, implementing and evaluating adaptation measures. These approaches are being developed by government agencies, non-governmental and community-based organisations, universities and think-tanks. A growing demand for such approaches means that they will need to be refined to suit different situations and so field testing to understand the capacities and limitations of the methods and tools is vital.

The process of adaptation planning involves many components, but each of the identified methods and tools generally only cover one or two of the steps.

There are seven main conclusions from the analysis of the reviewed methods and tools:

1. Access and availability of methods and tools for adaptation is not a limitation.
2. There is limited guidance available on how to select the most appropriate approaches for a given location.¹

¹ There are a number of overview documents listing the approaches, but few if any of these actually describe or contain information about experiences with applying the tools and methods.

3. Because considerable knowledge gaps still exist about what adaptation is, training or other ways of sensitisation may need to be the first step before jumping into adaptation planning.
4. Most of the methods and tools are not ‘plug-and-play’; their use requires training, skilful facilitators, significant data collection and/or large resources.
5. No one single approach is sufficient to successfully support adaptation planning, each contributes a small piece of the puzzle.
6. Monitoring progress would be an important component of adaptation planning and implementation because this is where the real lessons are drawn for application elsewhere.
7. Expert judgment is still one of the most important ingredients for success and cannot be replaced by any of the available methods and tools.

An outcome of the review is a list of criteria to help in selecting methods and tools. Emerging from this list is a recommendation for more in-depth assessments of existing methods and tools. This would assess the approaches for quality, ease of use, resources needed and proven success. Such assessment could be based on the criteria developed in this review and would need to include a user perspective, interviewing users of different approaches and an outcome perspective evaluating of the outputs of the applied methods and tools.

1 Introduction

The science is clear, climate change is here and is a challenge that people need to deal with over coming decades. Human activities have already caused some irreversible changes to ecosystems and further damage is likely. It is necessary to think how we will adjust not only to these specific changes but to the new uncertainty about our future climate. This is particularly relevant for developing countries, where it will be necessary to address many institutional and capacity issues in order to ensure sustainable adaptation to climate change.

Adaptation is the process of adjusting to new conditions, stresses and natural hazards that result from climate change. Adaptation to climate change takes place in response to impacts experienced already, as well as in anticipation of expected impacts. In this sense, adaptation can be a spontaneous, autonomous process that takes place depending on existing capacity (so-called ‘*adaptive capacity*’) and it can also be planned. Planned adaptation can take many forms and be driven by decision makers from a distance and by policies on a macro scale as well as locally by those involved. Both autonomous and planned adaptation may require additional outside support in terms of financing, knowledge and technology, including, in particular, guidance on how to assess who and what needs to adapt and how to do it. For this reason, there are a raft of adaptation policies, plans and projects, which are supposed to facilitate the move towards adaptation at all levels — from local to national. Adaptation planning involves the full spectrum of activities from identifying and assessing to implementing adaptation measures, and is informed by the assessment of impacts and vulnerability.

Methods and tools for adaptation are the various guidelines, models and frameworks that have been developed to support the process of planning adaptation. These range from complex models to assess climate change impacts to guidelines on the steps to take for identifying, designing, implementing and evaluating adaptation measures (see Table 1 for a definition of what is covered). These approaches are being developed by government agencies, NGOs, community-based organisations, universities and think-tanks. More academic approaches are often accompanied by conceptual frameworks describing how adaptation relates to development, and analytical frameworks, which provide guidance on how to understand the application of adaptation measures. Neither type of framework is necessary when applying most of the approaches reviewed in this report, but an understanding of what adaptation means and why it is necessary as a prerequisite.

Many governments regard methods and tools as integral elements in adaptation planning; and indeed they are. But, why are there so many approaches? Is it because of a high demand – so many different circumstances requiring different approaches, or is it because what has been developed so far is inadequate? The answer is probably a little of both. Experience with adaptation learning and capacity building activities in the Asian region, as well as elsewhere,

has shown that despite the existence of many of these tools, decision-makers still struggle with adaptation. Clearly, this has implications for how the approaches are applied. As has been shown in the case of the Thai Second National Communication to the UN Framework Convention on Climate Change (UNFCCC) (Box 5), expert judgment remains one of the most important aspects of impact and vulnerability assessment, as well as for adaptation planning.

This review of adaptation methods and tools examines approaches that have been developed and applied around the world, with a particular emphasis on Asia. The scope of the work focuses on reviewing academic as well as literature such as manuals and project documents to identify what has been developed and applied so far to adaptation planning. The review is supported by stocktaking of actions, projects and initiatives on adaptation relevant to planning and to the LMB countries and other locations, focusing on trans-boundary waters. This report describes the approaches that have been identified and evaluates their validity for use in the LMB countries.

The purpose of this review is twofold: firstly, it provides an introduction to the theoretical landscape of planning adaptation to climate change, offering an overview of many of the key concepts and approaches; and secondly, it draws out key issues that are relevant to countries in the LMB by highlighting approaches that are particularly user-friendly, discussing experiences and activities in the region, and providing recommendations on the approaches that are best suited for the LMB.

The report is structured as follows. Section 2 describes the methodology and scope of the work, including some key definitions. Section 3 provides an overview of the trends in thinking about adaptation planning and the use of guidelines, methods and tools to support this planning. Actions, projects and initiatives are described in Section 4. Section 5 lists the methods and tools collected and reviewed in this report and Section 6 discusses these methods and tools. Finally, Section 7 provides an overview of how these methods and tools could be applied in the LMB countries.

2 Methodology and definitions

2.1 Objectives

The objective of this study was (1) to conduct a review of existing methods and tools for climate change impact assessment, vulnerability assessment and adaptation planning at national, regional and international levels; to explore past experiences and best practices and to provide recommendations on the approaches, methods and tools best suited for the LMB; and (2) to identify methods and tools for adaptation planning, and to assess their appropriateness for the LMB countries.

The aim of the literature review is to ensure that the approaches for adaptation planning and the development of methods and tools will be based on relevant past experiences (national, regional, international) on climate change adaptation.

The examination of methods and tools for adaptation planning includes also methods and tools for carrying out climate change impact and vulnerability assessments. Explanations of what ‘approach’ ‘method’ and ‘tool’ mean here are provided in Table 1. The geographical scope of the review is global but methods and tools applicable to the Mekong countries are the ultimate focus. Consequently, analysing the suitability for the Mekong countries of approaches, methods and tools developed elsewhere is the second step of the review. This was based on experiences with the approaches in other locations, coupled with an assessment of the feasibility and applicability of the approaches to Cambodia, Lao PDR, Thailand and Vietnam. To help assess the methods and tools and experiences in implementing them, a broader picture of adaptation methods and tools was gained by identifying actions, projects and initiatives on adaptation relevant to planning, with particular focus on the Mekong countries.

Table 1. *Definitions of approach, method and tool*

Approach	A complete framework that prescribes an entire process for the assessment of vulnerability and adaptation and offers a broad strategic approach. An approach may be built on the application of certain methods and tools. Example: The UNDP Adaptation Policy Framework (2004), which provides an overview of how adaptation should be approached, rather than a specific set of ‘instructions’.
Method	A set or sequence of steps that should be followed in order to accomplish a specific task within a larger framework. Methods can be implemented through using a number of tools. Example: Vulnerability and capacity assessment is a method for which a number of tools can be used.
Tool	A means or instrument by which a specific task is accomplished. Examples include: impact models, decision tools (cost-benefit analysis), stakeholder tools (vulnerability indexes).

Source: Adapted from UNFCCC (2008a).

The **MRC Climate Change and Adaptation Initiative (CCAI)** is a collaborative regional initiative of MRC Member Countries which aims to support the countries in adapting to the new challenges posed by climate change. Its objective is to guide climate change adaptation planning and implementation through improved strategies and plans at various levels and in priority locations throughout the LMB. The CCAI started on 1 August 2009 following a formulation process with national and regional consultations.

The CCAI has four main outcomes:

- Outcome 1: Climate Change Adaptation Planning and Implementation
- Outcome 2: Improved Capacity to Manage and Adapt to Climate Change
- Outcome 3: Strategies and Plans for Climate Change Adaptation
- Outcome 4: Regional Exchange, Collaboration And Learning

This review is an activity contributing to achieve Outcome 1 and emphasises the following aspects of climate change adaptation planning:

- different approaches to the planning process
- models of stakeholder engagement
- approaches to gender responsiveness and mainstreaming adaptation.

These are considered key aspects of the CCAI. The methods and tools included in the review cover a broad spectrum of activities related to adaptation planning, including: climate change risk analysis; climate change impact assessment; vulnerability assessment; and identification and assessment of adaptation options and strategies.

In this review, the definition of adaptation is specific: it refers to the process of adjusting to climate change. However, the approach recognises the importance of the broader set of issues and activities related to adaptation planning, including impact and vulnerability assessments and risk analysis. It also recognises that there can be methods and tools applicable to planning for change and uncertainty in the context of development for specific sectors, such as water resources management, that may not specifically refer to *climate change* or *adaptation*. These tools and methods may also be of interest, so while the understanding of adaptation is narrow, the scope of the search is broad. At the same time, methods and tools that only focus on disaster recovery and response are not considered in this review, because they do not address the ideas of thinking ahead and forward planning. For this reason, the choice of key words is important (Table 3), as well as the definition of best practices and the criteria used for selecting such practices (Table 2). The key words and the overall approach, as well as the conceptual understanding of adaptation in relation to development, have focused the review in order to ensure that it is broad enough to encompass approaches that are relevant, but narrow enough to be focused on adaptation. This is also guided by expert judgment.

The work emphasises developing countries, but does not exclude methods and tools developed for adaptation planning in developed countries, which may be both relevant and suitable. It is likely that methods and tools applied in developed countries will have been tested more widely, and thus that more documentation on their strengths and weaknesses will be available. Despite this, while adaptation to climate change is considered a ‘new’ field, the last few years have seen an upsurge in the number of projects, initiatives and activities on adaptation around the world. Consequently, whenever necessary, this review brings the focus down from the global level to Asia, Southeast Asia, and, when possible, to the Mekong countries. Limited information is location specific and, therefore, it was decided that it was less relevant to use a geographically specific category in this review, although the ultimate goal was to identify approaches that would be useful for the LMB.

The review revolves around the MRC CCAI Adaptation Planning Framework (Fig. 1). This framework places vulnerability assessment at the heart of adaptation planning, leading to the identification of adaptation options and their eventual implementation. Stakeholder engagement, capacity building, as well as monitoring and evaluation takes place throughout

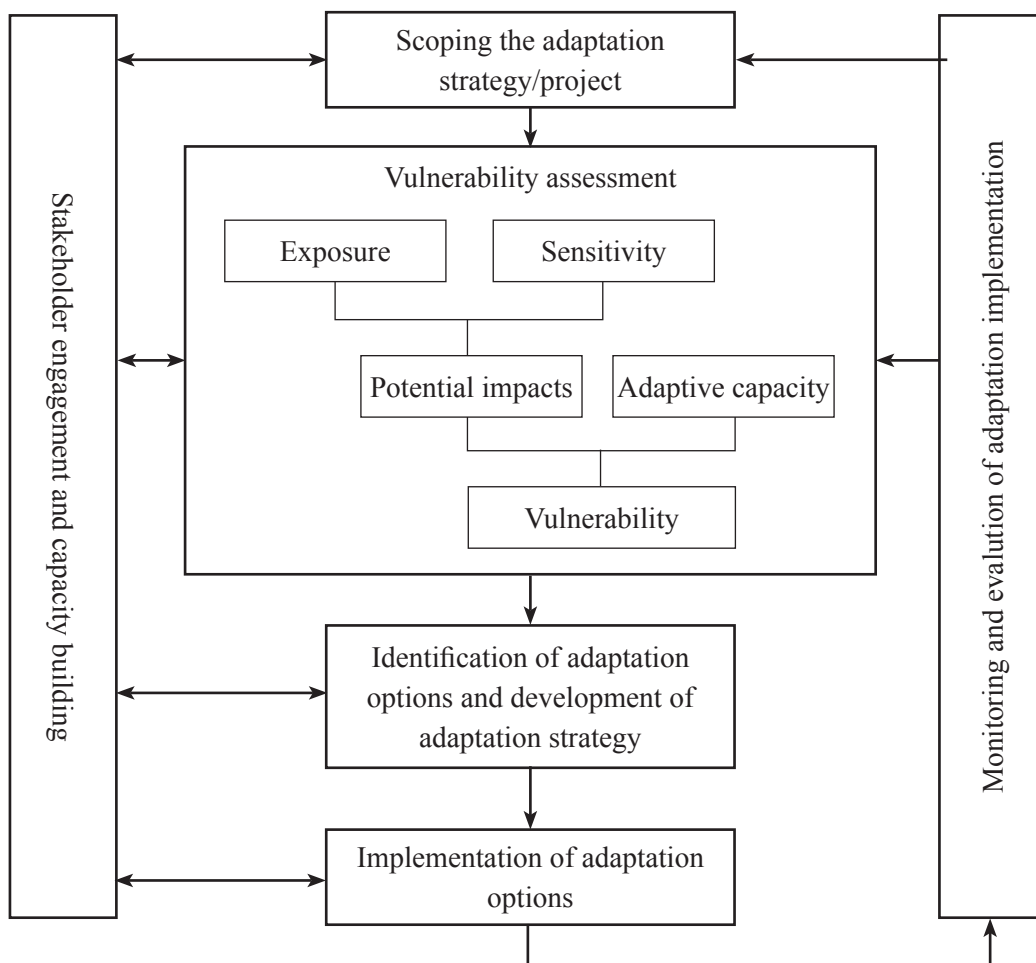


Figure 1. MRC CCAI Adaptation Planning Framework.

the process. The MRC CCAI Adaptation Planning Framework helps guide the final stages of the review, namely the identification of the most suitable approaches for the LMB countries.

2.2 Key definitions

This section includes some definitions of the key concepts used in this review. The definitions guide what has been included and excluded of the review, and guide the reader on the findings. Annex I contains a longer list of additional definitions.

Adaptation – In the specific context of climate change, adapting means adjusting to a new set of climatic attributes, either new and unfamiliar from those already existing or changed parameters of existing attributes. This adjustment can be imposed on the basis of premeditated planning or it can take place without specific policy frameworks or tools to implement it (i.e. autonomous adaptation). The emphasis has shifted from the latter to the former, since the 1970s, as awareness of detrimental human impact on the environment leading to risks for humans has replaced the idea that humans are at the mercy of the environment. In this process, the idea of adaptation as something done by plants and animals in evolution has changed to one where adaptation is now promoted as a concept for guiding policy to ensure sustainable development, reduce vulnerability and minimise risk to humans from climate change. Although many researchers have identified different types of adaptation and presented a number of concepts and frameworks to describe them, most of the literature on adaptation focuses on providing policy and practical guidance. Table 4 summarises a number of other definitions that have been proposed since the early 1990s.

Coping – Sometimes used as a synonym for adaptation, but coping measures are generally short-term actions to ward off immediate risk, rather than to adjust to continuous or permanent threats or changes (Corbett 1988; Frankenberger and Goldstein 1990; Davies 1996). In some cases, coping strategies deplete assets, leading to a higher risk from recurring hazards. Coping strategies can thereby undermine the possibility of long-term sustainable adaptation and so it is important to distinguish between coping and adapting.

Maladaptation – Any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that increases vulnerability to climate change instead of reducing it. Maladaptation can take place when the development context is not considered explicitly in designing and implementing adaptation measures. Maladaptation is also described as actions that have positive impacts on a target group or generation but, as a consequence, have adverse impacts on another group or generation (Barnett and O'Neill 2010).

Table 2. *Adaptation definitions.*

Source	Definition
IPCC 2007	Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects.
Smit and Wandel 2006	A process, action or outcome in a system (household, community, group, sector, region, country) in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity.
Füssel and Klein 2002	All changes in a system, compared to a reference case, that reduce the adverse effects of climate change.
Burton 1992	The process through which people reduce the adverse effects of climate on their health and well-being and take advantage of the opportunities that their climatic environment provides.
Pielke 1998	Adjustments in individual, group and institutional behaviour in order to reduce society's vulnerabilities to climate change.
Burton <i>et al.</i> 1998	All those responses to climate change that may be used to reduce vulnerability.
Smit 1993	Adjustments to enhance the viability of social and economic activities and to reduce their vulnerability to climate, including its current variability and extreme events as well as longer-term climate change.
Scheraga and Grambsch 1998	Those responses or actions taken to enhance resilience of vulnerable systems, thereby reducing damages to human and natural systems from climate change and variability.
Rennie and Singh 1996	Ways in which local individuals, households and communities have changed their mix of productive activities, and modified their community rules and institutions in response to vulnerabilities, in order to meet their livelihood needs.

Resilience – Has its roots in ecology, with two different applications for ecological systems, which are now also widely used to refer to social systems (Holling 1973; Adger 2000; Peterson 2000). Resilience may refer either to the extent to which a system is able to absorb adverse effects of a hazard or to the recovery time for returning after a disturbance. In this sense, highly resilient systems are characterised either by their ability to endure despite high stress or their ability to bounce back quickly. From this perspective, resilience can be described as a buffer or shock absorber, allowing individuals or systems an opportunity to cope during an event and not depleting all resources or options for recovery after an event. It is therefore seen to have links with the adaptive capacity and vulnerability of a system. Increasing resilience is the goal of an adaptation process.

Vulnerability – Describes how sensitive an individual or system is to a specific hazard, and is sometimes described as sensitivity and exposure (Bohle *et al.* 1994; Cannon 1994, 2000; Adger 1996; Cutter 1996; Handmer *et al.* 1999; Kelly and Adger 2000; Wisner *et al.* 2004). Numerous factors determine vulnerability, including geographical location, gender, age, political affiliation, livelihood, access to resources and wealth (entitlements), etc. The most useful element is the notion that a hazard does not translate directly into risk but that it is

qualified by the degree of vulnerability of the individual or system in question to that hazard. The underlying factors causing vulnerability are therefore what determines risk. For this reason, poverty is often considered one of the main drivers of risk but there are a number of other significant factors that should not be overlooked, including belief systems and influence on decision makers, which also drive vulnerability.

Vulnerability assessment – the practice of identifying the factors causing vulnerability, sometimes to quantify it for comparative purposes. Sometimes vulnerability is assessed in order to identify capacity – when vulnerability is seen as the opposite of capacity. Numerous approaches, methods and tools are available to assess vulnerability. For climate change, an assessment of existing vulnerability (baseline) will be mapped against possible future vulnerability scenarios. According to Downing and Patwardhan (2004), outputs of a vulnerability assessment include:

- A description and analysis of present vulnerability, including representative vulnerable groups (for instance specific livelihoods at risk of climatic hazards)
- Descriptions of potential vulnerabilities in the future, including an analysis of pathways that relate the present to the future
- Comparison of vulnerability under different socio-economic conditions, climatic changes and adaptive responses.

Impact assessment – The practice of identifying the effects of climate change at a given location. Impact assessments require a reference baseline and a projected climate change scenario (Rivero Vega 2008). With this, sophisticated impact tools and methodologies are applied to current and projected climate and socioeconomic scenarios. Results obtained with the same impact tools in both situations (actual and projected) are compared to each other in order to obtain an assessment of the expected climate change impact on basic parameters which characterise the sector as a whole or a part of it. Once the impact of climate change has been assessed, possible adaptation measures and strategies are analysed and their expected results are estimated using the same tools that were used to derive the original impacts.

2.3 Literature review

The literature review covers aspects on climate change and adaptation related to water and related resources relevant to the Mekong River Basin, considering integrated water resources management (IWRM), poverty reduction, food security and achievement of the Millennium Development Goals.

The main emphasis of the review is to identify methods and tools that have been designed for adaptation planning. Adaptation planning includes impact and vulnerability assessments, identification of adaptation options and prioritisation/selection among those options through to their implementation. Related to these processes is risk analysis, which is used generally to address hazards, but here the focus is specifically on climate change.

The literature review covers English language literature (scientific journals, reports and other publications) in the four MRC Member Countries, the Southeast Asia region and globally.

The literature review covers the following aspects of climate change adaptation:

Scales: The review looks across all scales, from the local to the global, and also examines national and regional linkages. Trans-boundary methods and tools are of particular interest for the Mekong region.

Disaster risk reduction: Disaster risk reduction and adaptation to climate change have many similarities, as well as some differences. Because of the similarities, disaster risk reduction methods and tools are included in the review, although in some cases they are not appropriate for adaptation or climate change.

Integrated water management, including agriculture, fisheries, hydropower, flood and drought management: Agriculture, including fisheries and livestock, continues to be important to many of the Mekong countries. Managing agriculture with climate change is an important topic, which will be relevant to the region. Water management – whether through integrated water resources management or other approaches – is a mechanism to cope with variability in water, including floods and droughts. This review covers methods and tools in agriculture, including water management, which help deal with climate variability and change.

Ecosystem services, ecosystem-based adaptation and conservation agriculture: Ecosystem-based adaptation is based on the idea that social adaptation depends on a healthy and vibrant ecosystem. Also, ecosystems will be affected by climate change, and the impacts on ecosystem services are likely to have significant implications for society. Ecosystem-relevant methods and tools may not be labelled ‘adaptation’ but have been included when possible in this review.

Gender issues: Gender issues are relevant because men and women are likely to perceive and experience climate change differently, meaning that they have different adaptation needs. The emphasis here was to identify any methods and tools which specifically focus on how men and women experience and respond to climate stress, hazards and extremes in different ways.

Governance and institutions: This includes, among other things, how adaptation planning processes incorporate and prioritise stakeholder engagement and participation, transparency, trans-boundary collaboration and political feasibility. It also includes issues of cross-scalar institutions (i.e. those that span from regional to local) and policy making and how these relate to planning methods and tools.

Sustainability and cost: The social, environmental and economic consequences of selected strategies will determine how sustainable a chosen approach will be over time. The review

sought for tools and methods to assess these consequences, including indicators. Approaches to cost-benefit analysis for selected options are also part of this.

A ‘stocktake’ was carried out to identify the major discourses and trends in thinking about adaptation planning. It focused on actions, projects and initiatives. The meaning of each of these is described below. In all cases, information that has been included is limited to what is easily accessible on the internet or already available on hand at Stockholm Environment Institute (SEI) and MRC.

Actions – refers to relevant internationally recognised actions on adaptation. In particular, actions under the UN Framework Convention on Climate Change (UNFCCC) and its Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change (NWP), as well as all other similar processes. This component includes an inventory of relevant workshops and meetings, as well as other ongoing efforts and initiatives on adaptation in developing countries.

Projects – refers to completed, ongoing and planned projects being implemented by governments, local and international NGOs, civil society organisations and research institutes, with a focus on adaptation planning. Due to the vast number of projects underway, only a selection has been included in the report, all focused on Asia.

Initiatives – refers to networks, research groups, centres of excellence and other non-project activities that focus on adaptation to climate change. For this component, the emphasis is on those who are developing, sharing, and using methods and tools for adaptation.

2.4 Analytical focus

The analysis of the methods and tools, and especially their suitability for the Mekong countries, is based on an analysis of the various approaches, how they have been applied in Asia, and to what extent their scope is applicable to the situation in the Mekong countries. A broad understanding of the trends in thought on methods and tools for adaptation planning was considered a necessary foundation for this analysis. This understanding emerged from examining scholarly discussions on the subject as well as discussions from workshops and projects. The analysis was also guided by a set of criteria that determine whether an approach to adaptation planning can be considered ‘best practice’. The set of criteria includes, but is not limited to the description in Table 3.

Table 3. *Relevant best practice criteria.*

Categories of activities	Criteria
Methods and tools for impact & vulnerability assessment	<ul style="list-style-type: none"> • Is it simple to use or does it require training or other inputs? • Is there evidence of application? • Is it considered ‘state of the art’?
Methods and tools for adaptation planning	<ul style="list-style-type: none"> • Is it relevant to the needs and concerns in the Mekong countries? • Is it holistic in considering all sectors, even if the main focus is on one sector? • Does it acknowledge an IWRM approach? • Is it simple to use or require training or other inputs? • Is it accessible?
Identifying and evaluating adaptation options	<ul style="list-style-type: none"> • Does it promote integration with development planning and management? • Does it consider relevant social, environmental and economic issues and impact analysis? • Does it consider issues related to gender and minority groups? • Does it consider cost-benefits and cost-efficiency?
Institutional issues	<ul style="list-style-type: none"> • Is it transparent? • Does it involve stakeholder participation? • Is it politically feasible in the Mekong region? • Is it gender responsive?

2.5 Review methodology

A basic literature search with the key words ‘adaptation methods and tools’ already yields many results. Table 4 contains a number of other key words and terms used in the literature search.

Much of what is done in terms of adaptation planning comes from governments and development organisations that implement projects. For this reason, ‘grey literature’ is likely to contain as much – if not more – information about adaptation methods and tools as academic literature.

Grey Literature – One of the first sources of information was an internet search. This led both to project documents (reports, proposals and plans), as well as to online toolkits, compendia and databases. Grey literature here is considered to include: toolkits, project documents, reports, and other publications; working papers, theses and online papers from academic institutions; legal texts, including agreements, treaties and policy documents; and promotional material from NGOs and other organisations.

Academic literature – The main source of information for academic abstracts is the Web of Knowledge (WoK), which is the database for all Thomson Scientific products (<http://wok.mimas.ac.uk>).

Table 4. *Key words.*

Vulnerability assessment	Impact assessment	Adaptation planning	Adaptation method	Adaptation tool
Vulnerability method	Impact method	Risk analysis	Adaptation toolkit	Disaster management method
Vulnerability tool	Impact tool	Disaster planning	Disaster risk reduction method	Disaster management tool
Water management planning	Water management toolkit	Disaster management toolkit	Disaster risk reduction toolkit	Integrated water resources management
Cost-benefit analysis	Trans-boundary water management	Stakeholder engagement	Cost-effectiveness	River basin management
Climate change	Climate variability	Flood	Mekong	Thailand
Vietnam	Cambodia	Lao, Laos	Southeast Asia	Riparian Asia
Cyclone	Disaster	Drought	Sea-level rise	Typhoon

Papers were included or excluded based on the judgement of the review team, whose members have many years experience working on adaptation, and are well aware of key authors, organisations and adaptation initiatives. The decision was made based on how closely the papers address methods and tools specifically for adaptation. The next level of criteria was matching the papers with the key aspects (i.e different approaches to the planning process; models of stakeholder engagement; and approaches to gender responsiveness and mainstreaming adaptation).

2.6 Challenges, limitations and information gaps

This review has identified a large number of methods and tools for adaptation to climate change. Defining the scope of the study was important in order to ensure that the work could be undertaken in the given timeframe and provide the most relevant information. Consequently, what has been reviewed here reflects a large majority of existing methods and tools, but not all of them.

Two categories of approaches have been identified: those that have been an outcome of a specific project and those that have been designed for generic application. Both approaches, however, have limitations. When approaches result from a planning project in a specific location, they have been tested but may not be generally applicable. Similarly, when approaches have been developed for more generic application, there is often no real-world experience to support this process, meaning that they can be too idealistic, abstract or

ineffective and may require considerable work to adapt before application. Finally, because many of the approaches may not have been field-tested, there is no assurance of quality or guarantee of success, especially with many of the newer approaches.

In some cases it was difficult to distinguish whether an approach had been tested or not, as information on experience with its application was not available. This is often the case when toolkits and methods have been designed by one organisation and then applied by another. Evidence of experience of application is not provided on the website or document that describes the development of the approach. However, one of the limitations to this study is that many of the tools and methods that have been designed have not been tested adequately in the field (or at all). This conclusion may have been incorrectly drawn in some cases, when no evidence of application was found. Finally, some of the methods and tools may have been applied but may have been found to have been inadequate, or – as a result of newer development – outdated. This is also difficult to identify through a web-based review.

Another limitation is that many of the tools reviewed here have been designed for, or applied in, developed country contexts only. This implies that they require skills, resources and institutional arrangements that are weaker or not present in developing countries. Many developing country governments have not begun thinking about adaptation. As noted already, use of the approaches described here may need to be adjusted to the specific circumstances of a location. In some cases, and for some approaches, this will be a small amount of effort and for others it may be a lot.

An additional limitation in using this review is that many of the tools and methods cannot be easily compared. They target different users (e.g donors versus city governments), different levels of governance (e.g national versus local level), different institutions (NGOs versus community leaders) and are based on different conceptual approaches to adaptation. This relates to the distinction between an ‘impacts approach’, whereby adaptation is based on understanding how climate change will affect a system or group, versus a ‘vulnerability approach’, whereby the development deficit that is causing people to be vulnerable to climate change is the focus. Although a shift has been evident, as described in Section 3, the impacts approach continues to dominate many discussions. This diversity makes it difficult to have an overview of the methods and tools available (Olhoff and Schaer 2009). Indeed, the most comprehensive assessments of the tools are those that have focused on mainstreaming tools specifically targeted at donors (including Olhoff and Schaer 2009; Klein *et al.* 2007; Kropp and Scholze 2009).

3 Trends in thought on adaptation planning

Due to an increasing acknowledgement of climate change as a key driver of how our environment and societies will look in the future, how to adapt to the expected changes is one of the much discussed issues for planners and decision makers worldwide. Because of the widespread confusion about how to plan and implement adaptation, tools, methods and approaches have gained considerable interest. Some recent approaches focus on adaptation planning in the context of uncertainty and recognise many social, economic and environmental changes besides climate change. By contrast, the early publications and tools emerging in the 1990s emphasised assessment of the risks associated with climate change as the first step and the main source of information on which to base decisions on adaptation. This resonated with the contemporary view that adaptation implied relatively simple actions that would ‘cancel out’ the difference between business-as-usual and the scenarios of climate change impacts. In other words, adaptation measures would be applied when climate change impacts affected society so that the impact would not disrupt business-as-usual. This approach is now recognised as far too simplistic. Identifying impacts and the adjustments necessary to address them is very complex and must be embedded in larger societal change. In fact, it has now been recognised as so complex that tools specifically directed at particular groups have been designed, e.g. see the section on *Gender and Adaptation* below.

As scientific understanding of climate change has improved, many questions have been answered and many new ones have also emerged. Uncertainty about the dynamics of climate change persists, although there is greater certainty about the overall phenomenon. At the same time, it has become clear that adaptation is about adjusting development trajectories not only to deal with climate change, but also to cope with fluctuations in the many other, non-climatic factors that influence human well-being. If these multiple layers of change are not reflected in planning, outcomes may be ineffective at best and exacerbate the situation at worst. Furthermore, the large deficits in social development worldwide, evident by the difficulty in achieving the Millennium Development Goals, must be resolved in order for any actions taken specifically to adjust to climate change to matter. The risks associated with unsustainable development and lack of equity cannot be eliminated through actions that only consider climate change impacts. For this reason, the general approach to adaptation planning has moved away from impact and vulnerability assessments only, towards embedding a forward-thinking approach into sectoral and cross-sectoral development planning (so-called ‘mainstreaming’). This is reflected by the trends in the tools, methods and approaches that have been developed and applied over this time. A look at the guidebooks since 1985 provides a good example of this shift.

The UNFCCC-led practice of adaptation planning

One of the documents to be developed on impact assessment was the *SCOPE Report on Impact Assessments* (Kates et al. 1985). Guidance documents that followed this, also emphasising impact assessment, include: the *IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations* (Carter et al. 1994); the US Country Studies Program's *Vulnerability and Adaptation Assessments: An International Guidebook* (Benioff et al., 1996) and the *Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies* (Feenstra et al. 1998). The latter was primarily for assessing impacts by sector based on which adaptation strategies would be designed for each sector. The later *Compendium of Decision Tools to Evaluate Strategies for Adaptation to Climate Change* (UNFCCC 1999) focuses on decision-making, again taking a sectoral approach and looking at making decisions based on assessments of impacts. Later publications reflect an understanding that there is more to adaptation than impacts and vulnerability assessments. The guide *Climate Adaptation: Risk, Uncertainty and Decision-making* (Willows and Connell 2003) emphasises decision-making with uncertainty and the *Adaptation Policy Framework* (UNDP 2004), offers an approach to formulating and implementing adaptation strategies, policies and measures on a project basis, which is interwoven with theoretical discussion on adaptation. The UN Framework Convention on Climate Change (UNFCCC) also released an updated version of its 1999 compendium, entitled *Compendium of Methods and Tools to Evaluate Impacts of, and Vulnerability and Adaptation to, Climate Change* (UNFCCC 2004). This moves away from focusing solely on impacts to recognising the centrality of vulnerability.

Importantly, these documents came at a time when adaptation theory had moved far faster than either policy or practice and, in many ways, they continued to contribute to the theory more than to the practice of adaptation, simply because there was still limited experience of trying to implement adaptation measures. During the 2000s, the types of actors involved in adaptation research, practice and policy expanded significantly, with wider involvement from development practitioners and a wider range of line ministries (i.e. no longer just the environment ministries). This meant less academic theory around adaptation and more case studies on vulnerability from real world. It became obvious also that the UNFCCC and its related activities, previously seen as the main guiding process on adaptation, could not adequately address information gaps at national levels about how to actually get moving on adaptation. More practical and specific guidance was sought for local-level decision-making bodies, who fall outside the immediate scope of the UNFCCC.

Emerging from a more practical perspective are guides such as *Preparing for Climate Change: A Guidebook for Local, Regional and State Governments* (ICLEI et al. 2007), *Climate Change Adaptation by Design* (Shaw et al. 2007), and similar documents for particular cities (e.g Cape Town's *Framework for Adaptation*, Toronto's *Ahead of the Storm*) targeted at local governments. Sector-specific guides have also been developed, such as the *Adapting to Coastal Climate Change: A Guidebook for Development Planners* (USAID

2009). These guides are more comprehensive in their approach to adaptation planning, including awareness of the complexity of vulnerability and its reduction, suggesting a more sophisticated understanding of what is necessary for adaptation planning. These guides also embrace the concept of mainstreaming adaptation, which essentially means integrating awareness of climate change into all stages in decision-making, especially in key sectors that may be more sensitive to climate change. Other guides, which emphasise mainstreaming include the *Mainstreaming Disaster Risk Reduction: A tool for development organizations* (Tearfund 2005), *Mainstreaming Climate Change Adaptation: A Practitioner's Handbook* (CARE International in Vietnam 2009) and the *Screening Tools and Guidelines to Support the Mainstreaming of Climate Change Adaptation into Development Assistance – A Stocktaking Report*, prepared for UNDP by Olhoff and Schaer (2009), which target development organisations, practitioners and development agencies, respectively. These guides move from assessing vulnerability through identifying adaptive capacity, designing and implementing adaptation measures to monitoring the success and effectiveness of implementation.

While tools and methods, including approaches such as impact assessments, have been used throughout the last 15 years, they must be applied in a way that is consistent with current thinking about adaptation planning in order to be robust enough to withstand all the changes that are occurring. Various collections of methods and tools, such as the updated *Compendium on Methods and Tools to Evaluate Impacts of, and Vulnerability and Adaptation to, Climate Change* (UNFCCC 2008a), serve as comprehensive reference documents on adaptation methods and tools. But, most of this information does not explain how these approaches should be implemented. This still remains a challenge for stakeholders and, therefore, additional steps for building knowledge of adaptation and enhancing adaptive capacity must be an integral aspect of the adaptation planning process.

3.1 Moving from single to multiple drivers of change: the scholarly journey

Not surprisingly, the shift in emphasis in practitioner-focused documents from impacts to vulnerability is also reflected in academic literature, where much of the ideas originated. For example, a recent study of extreme sea-level rise and public perception (Toth and Hizsnyik 2008) uses a participatory assessment approach, which reflects a recognition of the importance of social aspects for determining risk. The study demonstrates that participatory climate impact assessments have scientific value because they allow climate models to be ground-truthed with people living in a given location and provide significant insights into how relevant the impacts will be to livelihoods. For instance, models might suggest that rainfall will be reduced in one location but this might not be such a significant concern to the inhabitants if other changes, such as the discovery of a large new underground reservoir, counteract that impact. Similarly, Füssel and Klein (2006) point to an increasing degree of stakeholder participation in vulnerability assessments and Van Aalst *et al.* (2008) describe the application of the community risk assessment approach, noting that in order to keep

it participatory, it needs to be simple enough for wide application. The learning process provided by adaptation planning has also been highlighted as an important outcome. For example, the experience of developing a municipal adaptation plan for Cape Town in South Africa led to the conclusion that making plans should not be seen as a one-off process, but instead initially applied as a tool to educate key actors (Mukheibir and Ziervogel 2007). This recognises the need for awareness raising and sensitisation about climate change before any planning activities can take place and reflects the important principle of ownership as a requirement for the planning process. This is key because there is often a low level of understanding of climate change at local government levels (Mukheibir and Ziervogel 2007). Related to this is the need to recognise different priorities among relevant stakeholders. De Chazal *et al.* (2008) describe a method for taking multiple stakeholders' perspectives into account for vulnerability assessment and the difficulty of dealing with conflicting values.

Luers *et al.* (2004) propose an approach for quantifying vulnerability. The authors acknowledge the limits of this approach, in particular that no single measure will be able to completely capture the multiple dimensions of vulnerability. Qualitative descriptions of vulnerability are not always useful to plug into tools that require data to be quantified. This challenge has led to a great deal of thinking about vulnerability assessments and how they can be improved. Polsky *et al.* (2007) provide an overview of different approaches and attempt to draw out commonalities between them in an effort to highlight the usefulness of a universal approach. They do this by suggesting a vulnerability scoping diagram. One of the most difficult things in vulnerability assessment is ensuring that the relative nature of vulnerability is not lost in aggregating data. Luers (2005) suggests an initial analytical framework for doing this. Eakin and Bojórquez-Tapia (2007) offer an approach for weighting disparate factors of vulnerability. This provides a more sophisticated assessment of vulnerability, because it draws out the most important drivers, recognising that these are different in different places. The authors base their approach on multi-criteria decision analysis and fuzzy logic. Hahn *et al.* (2008) provide another approach to measuring vulnerability at a household level, describing the Livelihood Vulnerability Index (LVI), which they applied in Mozambique. The LVI is based on the Sustainable Livelihoods Approach, and the authors suggest that it can be a useful tool to compare vulnerability of different locations.

As the interest in vulnerability and impact assessments has grown, so has the level of sophistication of the approaches. They have not necessarily become more difficult to apply but they have become more finely tuned and better able to reflect the complexity of vulnerability and the multiple drivers of change. Useful approaches include the study by O'Brien *et al.* (2004) on the multiple drivers of change, which recognises that climate change is just one of many changes that people have to deal with. They examine the overlapping impacts of globalisation and climate change in India based on the idea of 'double exposure' (O'Brien and Leichenko 2000), which has since been used extensively to express the compounding effect of climate change and the need to think beyond the climate change 'box'.

3.2 The practice of adaptation planning: applying methods and tools

Mukheibir and Ziervogel (2007) point to the difference between developing a plan for adaptation and actually implementing it. Clearly, adaptation tools and methods are not of much use if there is no sense of how, when and with whom they should be applied and no interest in or demand for them. Moving toward their use requires some understanding of what adaptation is and what its limits are. Because considerable knowledge gaps still exist about what adaptation is, training or other ways of building knowledge may need to be the first step before jumping into adaptation planning. Some of the methods and tools encountered in this review involve this sensitisation process, however for most of the guidelines, increasing understanding of adaptation is not explicitly one of the ‘steps’ described in the approaches. Instead, the handbooks/guidebooks include an explanatory section upfront.

Füssel (2007) summarises thinking about adaptation planning, which he defines as being about making recommendations about who should do what, more, less, or differently, and with what resources. He notes some of the key questions that motivate and complicate adaptation planning, including: How will future climatic and non-climatic conditions differ from those of the past? Do the expected changes matter to current decisions? What is a suitable balance between the risks of acting (too) early and those of acting (too) late? Importantly, he also suggests criteria for determining the suitability of adaptation options once the planning exercise is nearly complete. These include:

- *Awareness of the problem*: Assessing and communicating vulnerability to climate change.
- *Availability of effective adaptation measures*: Triggering research that may lead to the development of new adaptation options.
- *Information about these measures*: Identifying and assessing effective adaptation measures.
- *Availability of resources for implementing these measures*: Evaluating co-benefits of adaptation (thus increasing perceived benefits); identifying ways for the most efficient use of resources, e.g. by mainstreaming adaptation in existing activity (thus reducing costs); and motivating the provision of additional resources, either domestically or internationally.
- *Cultural acceptability of these measures*: Educating people about risks and response options to increase the acceptability of unfamiliar measures.
- *Incentives for implementing these measures*: Identifying obstacles for implementation of effective measures and suggesting ways to overcome them.

This list is an important reminder of the need for adaptation planning to take place in the open – it must be embedded in local institutional structures and have the acceptance and participation of the people who are the target of the planning process. Deressa *et al* (2009) also provide a useful study discussing why farmers make certain choices about adaptation

options. This provides further insight into what motivates people to initiate an adaptation process.

- Füssel (2007) also draws lessons about adaptation planning from the literature up to 2007. These include:
- Adaptation to climate change involves a very broad range of measures directed at reducing vulnerability to a range of climatic stimuli (changes in means, variability, and extremes).
- Adaptation planning shares many common features with risk management but involves unprecedented methodological challenges because of the uncertainty and complexity of the hazard.
- Adaptation to climate change is highly context-specific because it depends on the climatic, environmental, social, and political conditions in the target region and sector.
- Although there is no single approach for assessing, planning, and implementing adaptation to climate change, some robust adaptation principles have nevertheless emerged.
- Adaptation assessment has become more inclusive over time, linking future climate change with current climate risks and other policy concerns.
- Adaptation planning requires close collaboration of climate and impact scientists, sectoral practitioners, decision-makers and other stakeholders, and policy analysts.
- Consideration of global climate change is particularly important for decisions with a long planning or policy horizon.
- Adaptation cannot avoid all impacts of climate change because of important fundamental and practical constraints.

A UNFCCC synthesis report on approaches to and experiences in integrating and expanding adaptation planning and actions, lessons learned, good practices, gaps and needs, and barriers and constraints to adaptation (UNFCCC 2009) provides interesting insights into experiences with adaptation planning. The document does not reflect on any specific methods or tools but focuses on how to integrate adaptation planning across different scales and sectors.

Tyler and Fajber (2009) discuss how land and water management in Asia can inform adaptation to climate change. Although not framed as adaptation planning per se, this paper helps recall that there are many ways in which vulnerability to climate change can be reduced. Not all of these need to explicitly talk about the impacts of climate change because many of the reasons that people are, and will be, vulnerable to climate change are related to development challenges. Obstacles to fair and effective land and water management, which are significant in many parts of the world, serve as barriers to improved well-being.

Most of the approaches begin with assessing vulnerability and adaptive capacity (which are related but assessed differently), which can involve specific tools and methodologies. Identifying adaptation options and, more precisely, identifying which factors need to be addressed and in what way, and the subsequent designing of adaptation measures builds on

the understanding of vulnerability and capacity. Once the measures have been designed, their implementation follows. The process may end with an evaluation, which could be based on ongoing monitoring. Because adaptation is a process with no defined end point (since what we are adapting to is constantly changing), there will never be an absolute final conclusion. Nevertheless, tools for evaluating the effectiveness of adaptation strategies are in high demand from donors, who are eager to know the success of their investments.

In the specific context of Asia and the Pacific, Hay and Mimura (2006) suggest that a climate risk profile is a valuable tool for planners and decision-makers. They refer to the ADB climate risk proofing (ADB 2006).

Although there are many possible approaches, some of the typical steps in adaptation planning include:

1. Building knowledge on adaptation
2. Assessing impacts of climate change
3. Assessing vulnerability / adaptive capacity
4. Identifying adaptation options / designing adaptation measures
5. Implementing measures
6. Monitoring and evaluating effectiveness

The World Resources Institute, for example, in its draft National Adaptive Capacity Framework (WRI 2009, Table 5) suggests an approach that starts by assessing the functions of the ‘adaptation system’, which includes assessment of vulnerability, impacts, adaptation practices and climate sensitivity of development activities. A further four steps involve prioritising particular issues, areas, sectors or populations, coordinating activities by different actors, collecting, analysing and disseminating knowledge for adaptive activities and addressing climate risks. This approach, although different, includes many of the elements in the list above. These two approaches highlight the wide range of entry points to adaptation planning.

The final aspect of adaptation planning is evaluating effectiveness, which is difficult unless it can be carried out over an extended period of time (probably at least 10 years). WRI’s 2009 Bellagio Framework is a first step towards exploring how to systematically identify a core set of major adaptation functions needed in a broad spectrum of countries. It explores options for building progress metrics to assess effectiveness in performing these functions. This reflects growing interest in evaluating the success of adaptation projects and plans. Indicators are often used for this (see Box 1).

Table 5. *WRI's National Adaptive Capacity Framework.*

National Adaptive Capacity Framework 'Adaptations Functions Summary'	
Assessment	Assessment is the process of examining available information to guide decision-making. Adaptation is likely to require iterative assessments over time, including assessments of vulnerability, climate change impacts, adaptation practices, and the climate sensitivity of development activities.
Prioritisation	Prioritisation means assigning special importance to particular issues, areas, sectors, or populations. For adaptation, prioritisation at the national level usually takes into account projected geographic distribution of climate change impacts, as well as differential vulnerability to the impacts of climate change among a country's population. Effective processes for prioritisation will engage a wide range of stakeholders, be made transparent to the public and will enable review and adjustment of priorities as circumstances change.
Coordination	Adaptation requires action by disparate actors at multiple levels, both within and outside of government. Coordination of their activities helps avoid duplication or gaps and can create economies of scale in responding to challenges. Coordination may be horizontal (e.g. among ministries), vertical (e.g. among national, global, and sub-national actors), or inter-sectoral (e.g. between government and business).
Information Management	Information management consists of collecting, analysing, and disseminating knowledge in support of adaptive activities. Relevant information will vary but, at a minimum, typically covers climate variables, the status of natural and human systems and existing coping strategies. Good information management will ensure that information is useful and accessible to stakeholders. It may also involve general awareness-raising, or building the capacity of stakeholders to use information for adaptation.
Climate Risk Reduction	Different development priorities will face different risks from climate change. Addressing these risks depends on the above adaptation functions, but also requires a distinct process of identifying specific risks to a given priority, evaluating the full range of options for addressing the risks, and then selecting and implementing risk reduction measures. Many risk reduction measures will entail changing practices in the areas of infrastructure, natural resources management or social protection. For some countries, it may be useful to treat these three sets of activities as adaptation functions in their own right.

Source: WRI (2009)

A comment on indicators.

Indicators and indexes are a way of quantifying the level of vulnerability. An indicator is a single measure of a characteristic and an index is a composite measure of several indicators or indices. Indicators and indexes can be useful to guide decision-making and prioritise intervention, as they allow characteristics to be compared.

The use of indicators has been one of the most widely proposed approaches, which has been primarily applied to adaptive capacity (e.g. Adger and Vincent 2005; Adger *et al.* 2004; Eriksen and Kelly 2007; Brooks *et al.* 2005; Lioubimtseva and Henebry 2009; Swanson *et al.* 2007) as well as to vulnerability (e.g. Luers *et al.* 2004; Downing *et al.* 2001; Cutter *et al.* 2008). The development of indicators can be seen as a way to identify proxies for adaptation.

However, indexes of vulnerability should be treated with caution, precisely because of the complex nature of vulnerability that results in many factors being at play and the difficulty in capturing the diversity and sensitivity of vulnerability. To be reliable and effective, indicators need to reflect an explicit conceptual framework of vulnerability. Many scientists are very cautious about the use of indicators (Hinkel 2010; Barnett *et al.* 2008).

4 Review of projects, actions and initiatives

The stocktake sought to identify projects, actions and initiatives with relevance to adaptation planning, including impact and vulnerability assessment. A brief overview of the National Adaptation Programmes of Action (NAPA) or similar strategy considerations and the institutional context in each LMB country provide background for the analysis

4.1 Overview of adaptation in LMB countries

This section provides an overview of the major adaptation activities being carried out by the four LMB countries (MRC, 2009a). The information is not exhaustive and focuses on those activities whose main theme or objective is climate change adaptation. Numerous other activities in LMB countries also contribute although their main objective is something else, e.g. reforestation or poverty reduction.

4.1.1 Cambodia

With support from various donors, Cambodia has implemented a number of projects to address climate hazards through natural disaster management response projects. During the period 1995–2003, Cambodia implemented 98 such projects to address institutional strengthening, infrastructure development and human resource development. However, surveys carried out during preparation of the Cambodian National Adaptation Programme of Action to climate change (NAPA) indicate that, overall, the preparedness to respond to extreme climate events is low, as is adaptation capacity to climate change (MOE 2005a, 2005b). There are cases where local communities are resourceful when dealing with climate hazards but these are exceptions and usually coincide with settlements with higher socioeconomic standing and stronger local institutions. The Cambodian NAPA outlines 39 adaptation activities to be carried out within the following areas: coastal zone, health (malaria), water resources/agriculture, cross-sectoral and multiple hazards (MOE 2006). Of these proposed activities, 20 have been identified as high priority. Two years after the completion of the NAPA and its approval by the Royal Government of Cambodia, only one project – on water resources management – has been approved for funding by the Least Developed Countries Fund. The government has been unable to attract donor interest in financing the implementation of other high priority adaptation activities. The NAPA identified a number of barriers to the implementation of climate change adaptation projects in Cambodia, including:

- inadequate technical, financial and institutional capacity of local communities in dealing with climate hazards, and limited coordination;
- limited integration of climate-change issues into national policies and programmes; and
- limited awareness of climate-change issues.

4.1.2 Lao PDR

The NAPA for Lao PDR, which was launched in 2009, was prepared with support from UNDP (WREA 2009). It identifies 45 priority projects across the four sectors of agriculture, forestry, water and health. As well as identifying projects, the NAPA in Lao PDR also stressed the way forward for the Lao Government to continue to:

- strengthen the capacity of the National Disaster Management Committee to deal with likely future adverse impacts;
- strengthen the Climate Change Office;
- install an early warning system on floods;
- initiate in-depth studies of the impacts of climate change, especially concerning droughts and floods;
- formulate a strategy on climate change.
- mobilise increased reforestation.

The government is implementing a number of adaptation activities through the frameworks of water resources, forestry, infrastructure development and disaster preparedness policies. These projects include embankments for flood protection, water drainage systems and irrigation systems to respond to potential impacts of floods and drought.

4.1.3 Thailand

Thailand has a long history of implementing adaptation and mitigation measures. Past efforts have dealt with promoting better management and conservation of natural resources in various sectors and promoting energy security, both with and without linking these measures directly to climate pressure and greenhouse gas emission reduction in areas such as:

- water resource management and the agricultural sector;
- disaster management;
- restoration and conservation of biological diversity and forest resources;
- management of carbon sources;
- promotion of carbon sinks; and
- Clean Development Mechanism (CDM) projects.

Within different sectors, a range of approaches, particularly structural interventions like large-scale irrigation for agriculture and flood protection and warning systems, have been researched and developed. Traditionally, farmers have implemented a number of practices to adapt to climate variability, for example inter-cropping, mixed cropping, agroforestry and animal husbandry. Over the years, Thailand has also implemented both surface water and groundwater irrigation and diversification in agriculture to deal with drought as well as structural and non-structural measures to cope with flood and drought. Several community-based adaptations to climate change, variability and extreme events have been or are being

implemented in Thailand. Most of these are small-scale activities which concentrate on agriculture, water and disaster amelioration. Most of the community-based adaptation projects have an emphasis on livelihoods of the affected community, diversification of agriculture, conservation of water and awareness raising to change practices.

4.1.4 Viet Nam

To date, national adaptation strategies in Viet Nam have focused on reducing the risk posed by natural hazards. Strategies include a series of measures such as the establishment of hazard forecast centres across the country and awareness raising activities. However, these strategies focus on emergency responses to short-term climate extremes and subsequent reconstruction, rather than long-term adaptation to future climate change. They are also not integrated into wider policies for sustainable rural development and poverty reduction.

As part of Viet Nam's National Target Programme to Respond to Climate Change (Government of Viet Nam 2008), a detailed programme of adaptation activities for various sectors and regions is proposed. An 'Action Plan Framework for Adaptation to Climate Change in the Agriculture and Rural Development Sector Period 2008–2011' has been prepared, which demonstrates clear efforts to link disaster management with climate change adaptation activities (MARD 2008a). The objectives of the plan are to enhance the government's capabilities of adaptation and mitigation to climate change in order to minimise adverse impacts and to ensure sustainable development of the agriculture and rural development sector. The plan focuses on:

- ensuring the stability and safety of residents in cities and different zones and regions, especially the Mekong and Red River Deltas and central and mountainous areas;
- ensuring stable agricultural production and food security in an agricultural area of 3.8 million ha with two seasonal rice crops; and
- ensuring the maintenance of dike and infrastructure systems to meet disaster prevention and mitigation requirements.

National and local authorities in the Mekong Delta are beginning to integrate climate resilient policies into wider programmes of coastal zone management. In some areas of the delta, dikes are being strengthened or heightened, mangroves are being planted to improve protection from storm surges and houses are being built on bamboo stilts. Already, major investments have been committed to upgrading national and provincial dike systems. The Ministry of Agriculture and Rural Development is carrying out a national plan worth US\$109 million to restore mangroves along Vietnam's coastline. Other adaptation activities are being implemented as part of the National Strategy for Disaster Prevention, Response and Mitigation 2020 (MARD 2008b). This includes various mandatory requirements for flood safety and security in residential areas, including to raise house foundations and make them more flood secure.

4.2 Policy and institutional responses to climate change in LMB countries

All LMB countries have ratified the UNFCCC and the Kyoto Protocol. Each country has a primary policy document that outlines its strategy and responses to climate change. In Cambodia and Lao PDR, this is the NAPA. Thailand has prepared the ‘Action Plan on National Climate Change’ as the ‘Five Year Strategy on Climate Change 2008–2012’ and Viet Nam has prepared the ‘National Target Program to Respond to Climate Change’. In general, climate change issues are not well integrated into the broader policy frameworks of national governments (MRC 2009a).

Each of the LMB countries has nominated a national focal point for climate change issues. In Cambodia, it is the Ministry of Environment, in Lao PDR, the Water Resources and Environment Administration and, in Thailand and Viet Nam, the respective Ministries of Natural Resources and Environment. All countries have established a high-level government body with responsibility for the development of climate change policy and strategies. In Cambodia has established the National Climate Change Committee, Lao PDR a National Steering Committee on Climate Change, Thailand has a National Board on Climate Change Policy and Viet Nam a National Climate Change Committee.

In 2009, MRC launched its regional Climate Change and Adaptation Initiative (CCAI) designed to address the LMB’s shared climate change and adaptation challenges (MRC 2009b).

4.3 Overview of projects, actions and initiatives

The MRC Climate Change and Adaptation Initiative Framework Document for Implementation and Management (the MRC Adaptation Framework) identified the following four steps in the adaptation planning process: (a) scoping the adaptation strategy/project; (b) vulnerability assessment; (c) identification of adaptation options and development of adaptation strategy; and (d) implementation of adaptation options. As well, (e) stakeholder engagement and capacity building, and (f) monitoring and evaluation of adaptation implementation will be carried out throughout the planning process. We have adopted this framework to review and assess projects and actions. The initiatives are summarised according to the emphasised thematic working areas and geographical focus.

Projects: This section describes selected projects in the LMB and other Asian countries. A total of 46 projects are reviewed, of which 39 are adaptation planning projects and 7 are related to stakeholder engagement and capacity building. The status of each project varies; they are completed, ongoing or planned projects being implemented by governments, local and/or international NGOs, civil society organisations and research institutes, with a focus on adaptation planning. Not all of the projects relate explicitly to adaptation planning or trans-boundary waters, they have been selected to demonstrate the range of methods and tools

available for doing adaptation. Some of the approaches are part of standard social science methodologies, including group interviews and for this reason have not been expanded on extensively in Section 5. Nevertheless, it was felt that many of these projects have components that are relevant to adaptation planning, and could be useful to examine more closely. The full description of these projects can be found in Annex II.

The 39 adaptation planning projects were categorised as: (a) vulnerability assessment; (b) vulnerability assessment and adaptation planning; (c) adaptation planning; and (d) implementation of adaptation options (Fig. 2).

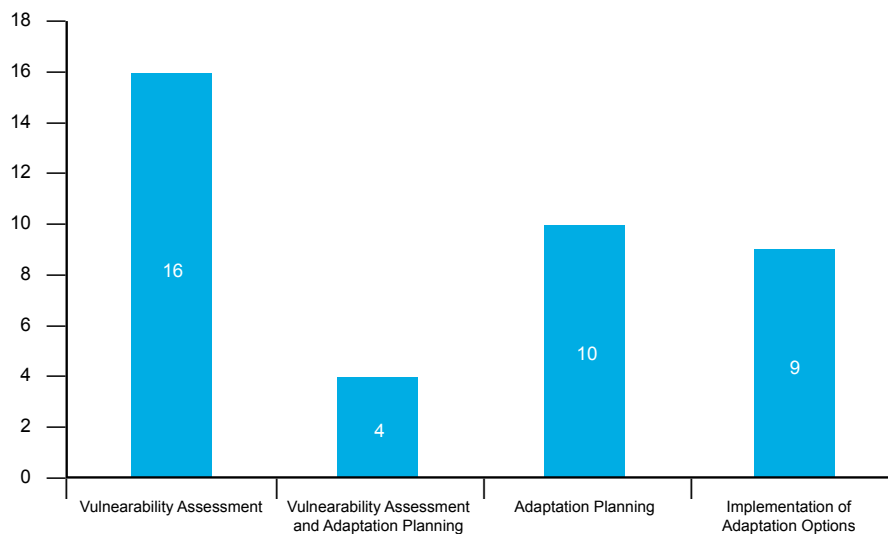


Figure 2. Summary of reviewed adaptation projects in Asia.

Just over half the projects (20 out of 39) focus on or cover vulnerability assessment. Four projects integrate both vulnerability assessment and adaptation planning. Fourteen projects focus on or cover adaptation planning issues. Only 9 out of 39 projects work on implementation of adaptation options. From the available documentation, none of the projects mention scoping the adaptation strategy/project.

Of the 24 adaptation planning projects in the Mekong region covered in this report (Fig. 3), Thailand implements 7 projects and Viet Nam operates 5 projects which cover vulnerability assessment, adaptation planning and implementation of adaptation options. Cambodia implements two projects on vulnerability assessment and adaptation planning, while Laos implements an integrated project on vulnerability assessment and adaptation planning and a project on implementation of adaptation options. As well, 6 projects on vulnerability assessment and two on adaptation planning are carried out for the Lower Mekong and Mekong region, in general. Although the list of projects documented in this study is not exhaustive, it reflects the active level of the LMB countries in addressing climate change adaptation planning issues.

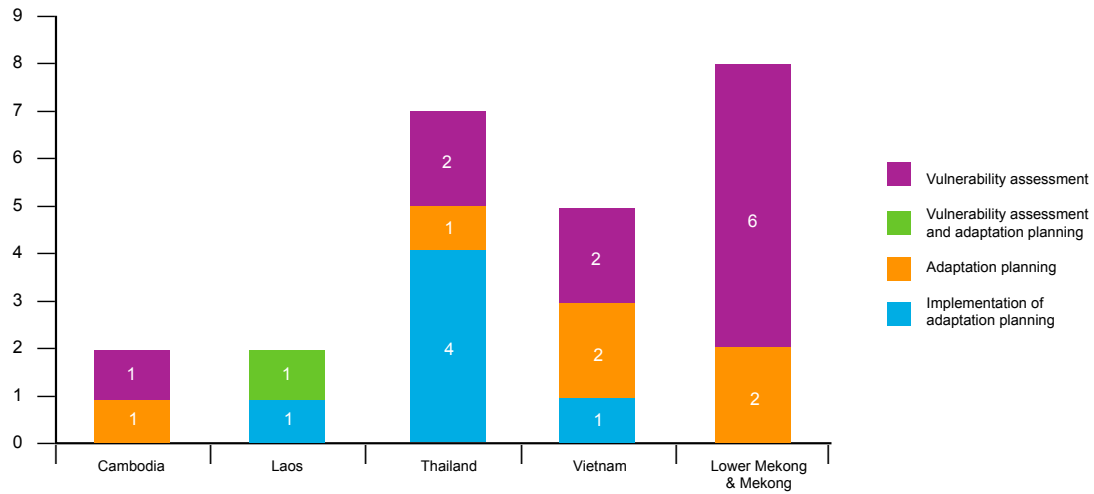


Figure 3. Summary of the reviewed adaptation planning projects in the Mekong region.

In terms of stakeholder engagement and capacity building, the review documents seven projects, which are categorised as (a) vulnerability assessment; (b) adaptation planning; (c) adaptation planning and implementation of adaptation options; and (d) implementation of adaptation options. Of the seven, four focus on or cover adaptation planning, two projects work on vulnerability assessment and two focus or cover implementation of adaptation options (Fig. 4). No projects are addressing scoping activities.

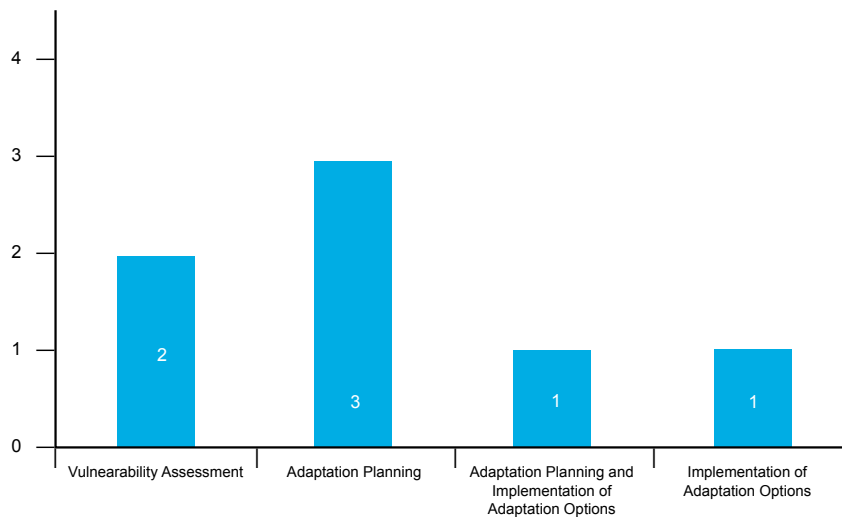


Figure 4. Summary of reviewed climate adaptation capacity building projects in Asia.

Furthermore, none of the projects monitor or evaluate implementation. This may be because most of the climate adaptation projects have only been initiated very recently and therefore monitoring and evaluation systems are not yet in place. Nonetheless, the results emphasize the need to include implement monitoring and evaluation of the adaptation projects.

Actions: This refers to relevant, internationally recognised actions on adaptation, especially meetings and workshops. The 19 actions documented in this study are divided into six categories: (a) scoping adaptation methods and tools; (b) vulnerability assessment; (c) vulnerability assessment and adaptation planning; (d) adaptation planning only; (e) adaptation planning and implementation of adaptation options; and (f) vulnerability assessment, adaptation planning and implementation of adaptation options (Fig. 5). Annex III contains a full list of actions on adaptation.

Most (14 out of 19) actions focus on or cover adaptation planning; eight focus on or cover vulnerability assessment; and six projects cover implementation of adaptation options. The internationally recognised actions or meetings and workshops discussed climate adaptation issues through more integrated and holistic approaches. Nine actions cover more than one step of the adaptation planning process. However, none of the actions has explicitly mentioned a monitoring and evaluation system for climate adaptation planning projects.

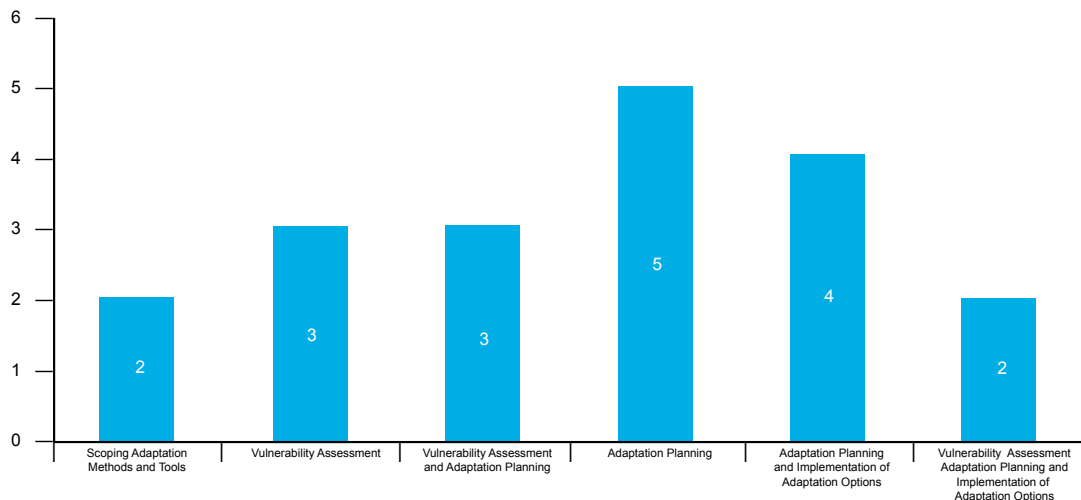


Figure 5. Summary of actions.

The following findings are based on the above analysis:

- While scoping may be considered during the formulation, this should be included as an important first step to ensure stakeholder involvement.
- The overrepresentation of impact and vulnerability assessment projects and actions reflect a need to increase understanding and awareness.
- Based on an integrated and holistic approach, the adaptation projects should shift from vulnerability assessment to adaptation planning and implementation of adaptation options to address the climate change that is already happening in the region.
- Capacity building projects in the region are limited.
- More efforts are needed in terms of monitoring and evaluating past and ongoing adaptation projects. Monitoring and evaluation systems are needed to assess projects and to draw out lessons and experiences for the implementation of future projects.

The nine networks are:

- 1) **AdaptNet** – a free weekly report on climate change adaptation issues produced by RMIT University Global Cities Institute’s Climate Change Programme
- 2) **Asia Flood Network (AFN)** – a flood mitigation initiative in Asia, supported by USAID/OFDA, to strengthen the capacity of regional and national institutions in climate, weather and hydrological forecasting
- 3) **Asia Pacific Network on Climate Change (AP-Net)** – a knowledge-based online clearing house for the Asia-Pacific region on climate change issues
- 4) **Asia-Pacific Network for Global Change Research (APN) Network for Climate Extremes** – a group of scientists in the Asia Pacific region who are collaborating to enhance the capability of nations in the region to monitor and analyse trends and variations in extreme climate events
- 5) **Asian Cities Climate Change Resilience Network (ACCCRN)** – aims to catalyse attention, funding, and action on building climate change resilience for poor and vulnerable people by creating robust models and methodologies for assessing and addressing risk through active engagement and analysis of various cities
- 6) **Capacity Strengthening of Least Developed Countries for Adaptation to Climate Change (CLACC)** – a group of fellows and international experts working on adaptation to climate change for least developed countries.
- 7) **Knowledge Hub on Water and Climate Change Adaptation, Asia-Pacific Water Forum (APWF)**. This is an independent network dedicated to improving sustainable water management by championing best practices, boosting investments, building capacity, and enhancing cooperation throughout the Asia-Pacific region. *Knowledge Hubs* is the APWF’s network of regional water knowledge hubs. Each hub is a centre of excellence committed to improving water security in the Asia-Pacific region by promoting knowledge sharing and championing feasible solutions for its priority water topic.
- 8) **CARE International’s Poverty, Environment and Climate Change Network (PECCN)** – is working to reduce the vulnerability of poor and vulnerable people in developing countries to the negative impacts of climate change.
- 9) **The Association of Pacific Rim Universities World Institute** – has developed a climate mitigation and adaptation strategies research programme that incorporates research teams at 13 universities across Asia, the United States and Australia.

The three partnerships are:

- 1) **Japan–Australia Practical Collaboration on Climate Change (JAPCCC)** – to engage all countries in a response to climate change
- 2) **Wetland Alliance** – helps local government, NGOs and community networks and associations make and maintain changes that will improve the livelihoods and food security of the region’s rural and peri-urban poor through sustainable management of wetlands and aquatic resources

- 3) **The Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)** – has been active in the pursuit of sustainable development, protecting life-support systems and enabling the sustainable use and management of coastal and marine resources through inter-governmental, inter-agency, and multi-sectoral partnerships.

The five adaptation-related regional activities are:

- 1) **Regional Climate Change Adaptation Knowledge Platform for Asia** – led by UNEP and SEI and funded by SENSAs/Sida, facilitates climate change adaptation in Asia at local, national, and regional levels and strengthens adaptive capacity
- 2) **MRC Climate Change Adaptation Initiative (CCAI)** – carries out climate change impact assessment and adaptation planning and implementation within the Mekong River Basin
- 3) **Coordinating Body on the Seas of East Asia (COBSEA)** – steers the East Asian Seas Action Plan
- 4) **Mangroves for the Future (MFF)** – a partner-led initiative to promote investment in coastal ecosystem conservation for sustainable development
- 5) **Association of Southeast Asian Nations (ASEAN) Climate Change Initiative (ACCI)** – a consultative platform to further strengthen regional coordination and cooperation in addressing climate change and to undertake concrete actions to respond to its adverse impacts.

4.5 Institutions

The review identified 25 institutions and their work on climate change (Table 7). Most of the institutions focus on water resources and agriculture, disaster risk management, and forestry, mountains and biodiversity. Very few institutions focus on public health or urban adaptation. The 25 institutions and their work on climate change are summarised below:

- 1) **Asian Disaster Preparedness Centre (ADPC)** – supports the advancement of safer communities and sustainable development, through implementing programmes and projects that reduce the impact of disasters upon countries and communities in Asia and the Pacific.
- 2) **Asia-Pacific Economic Cooperation Climate Centre (APEC CCC)** – work to enhance the socio-economic wellbeing of the APEC member economies by utilising up-to-date scientific knowledge and applying innovative climate prediction techniques.
- 3) **CARE International** – works in the region through its Poverty, Environment and Climate Change Network and other activities.
- 4) **Clinton Climate Initiative (CCI)** – assists partner cities to develop and implement large-scale projects, resulting in substantial reductions in energy use and greenhouse gas emissions.

- 5) **Food and Agriculture Organisation (FAO)** – climate-related work to mobilise the double role of forestry and agriculture in mitigation and adaptation.
- 6) **Global Change SysTem for Analysis, Research and Training (START)** – in Southeast Asia, South Asia and East Asia seeks to promote and enhance capacity for research that advances understanding needed for environmental risk management and communication of risks and response options to decision-makers and at-risk groups.
- 7) **Greater Mekong Sub-region - Environment Operations Centre (GMS-EOC)** – carries out development dialogues to promote a better understanding of the causes and consequences of climate change, and the challenges of crafting meaningful responses for the GMS countries.
- 8) **Institute for Global Environmental Strategies (IGES)** – carries out research on policies for facilitating community-based and national-level adaptation in the most vulnerable sectors, such as agriculture and water management, and identifies quantitative or semi-quantitative indicators of effectiveness of adaptation actions.
- 9) **International Centre for Integrated Mountain Development (ICIMOD)** - is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush-Himalayas - Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. Globalization and climate change are key issues addressed by the Centre.
- 10) **International Fund for Agricultural Development (IFAD)** – weather-based index insurance project, solar power system and biogas projects in China, Himalayas and Yemen.
- 11) **International Union for Conservation of Nature (IUCN)** – works to include biodiversity concerns in adaptation and mitigation polices and practice.
- 12) **International Water Management Institute (IWMI)** – works on water management, climate change, food security and adaptation along with many partner organisations in the region.
- 13) **M-POWER** – focuses on improving water governance in the Mekong region.
- 14) **Red Cross Climate Centre** – supports national Red Cross and Red Crescent societies to eventually reduce the loss of life and the damage done to the livelihoods of people affected by the impacts of climate change and extreme weather events.
- 15) **Rockefeller Foundation** – carries out a project on urban adaptation in Southeast Asia and South Asia (Asian Cities Climate Change Resilience Network – ACCERN).
- 16) **Southeast Asian Fisheries Development Center (SEAFDEC)** – an intergovernmental organisation established in December 1967 to promote sustainable fisheries development in the region. SEAFDEC also supports the establishment of appropriate management approaches, applicable for small-scale, tropical use, to ensure sustainable utilisation of fishery resources in the region.
- 17) **Stockholm Environment Institute (SEI)** – research on adaptation lies at the intersection of sustainable development and climate change. Support includes vulnerability assessments, financial needs assessments, capacity-building and response strategies, and widespread integration of climate risks and adaptation actions into local, national, and regional policies and planning.

- 18) **The Nature Conservancy (TNC)** – from building nature’s resilience to climate change to reducing impacts on people and nature.
- 19) **UN Development Programme (UNDP)** – integrating climate change risks into UN programming and national development policies, plans and strategies and identifying financing for adaptation initiatives.
- 20) **UN Economic and Social Commission for Asia and the Pacific (ESCAP)/ World Meteorological Organisation (WMO)** – typhoon committee is promoting and coordinating the planning and implementation of measures required for minimising the loss of life and material damage caused by typhoons in Asia and the Far East.
- 21) **UN Environment Programme (UNEP)** – helps developing countries to reduce vulnerabilities and build resilience to the impacts of climate change. It builds and strengthens national institutional capacities for vulnerability assessment and adaptation planning, and supports national efforts to integrate climate change adaptation measures into development planning and ecosystem management practices. Lately it has established the Global Adaptation Network.
- 22) **UN/International Strategy for Disaster Reduction (ISDR)** – awareness-raising activities in disaster risk reduction, the dissemination of guidelines to assist in the implementation of the Hyogo Framework for Action (HFA), promotion of the establishment of national platforms for disaster risk reduction.
- 23) **World Agroforestry Centre (ICRAF)** – implements the Global Research Climate Change Project to improve the resilience of farming systems and livelihood strategies of smallholder farmers to current climate variability as well as long-term climate change, through the increased use of trees for intensification, diversification and buffering of farming systems.
- 24) **World Fish Centre (WFC)** – carries out research-for-development to improve small-scale fisheries and aquaculture, with key competencies in policy economics, social sciences, natural resource management, aquaculture and genetic improvement.
- 25) **World Wide Fund for Nature (WWF)** – has numerous climate change adaptation/ resilience building projects in the Asia-Pacific region.

Table 7. Institutions: scope of climate adaptation work.

	Coastal Zone Management	Water Resources, Fisheries and Agriculture	Disaster Risk Management	Public Health	Forestry, Mountains and Biodiversity	Urban Adaptation	Others
ADPC							
APECCC							
CARE							
CCI							
EEP-SAC							
GMS-EOC							
FAO							
ICIMOD							
ICRAF							
IFAD							
ISDR							
IUCN							
IWMI							
M-POWER							
MRC							
Red Cross Climate Centre							
Rockefeller Foundation							
SEAFDEC							
SEI							
TNC							
Typhoon Committee							
UNDP							
UNEP							
WFC							
WWF							

5 Methods and tools

This section lists and describes a number of methods and tools, beginning with an overview of the methods and tools applied in the national communication reports submitted to the UNFCCC by the LMB countries.

5.1 Methods and tools in LMB countries

The review examined the methods and tools applied in the vulnerability and adaptation section of the National Communications provided by Cambodia, Lao PDR, Thailand and Vietnam to the UNFCCC Secretariat as part of their obligations as parties to that Convention. The national communications were completed in the early 2000s and could therefore not reflect many of the approaches that have since emerged. The information described in Table 9 also indicates when the experience of using these approaches was described in the documents, although this was only available for Cambodia and Thailand.

Table 8. *Experiences with methods and tools in the LMB countries' national communications.*

Country	Overview of UNFCCC National Communication	Climate Adaptation Methods and Tools Employed
Cambodia	<ul style="list-style-type: none"> • Cambodia submitted its first national communication in 2002 • The first national communication describes how Cambodia, as a Non-Annex 1 Party to the Convention, is meeting its commitments under the UNFCCC. This communication provides information on the national circumstances and national GHG inventory for 1994 • It also describes Cambodia's capability to respond to the impacts of climate change and measures that have been or need to be taken to mitigate climate change in the country • The national communication assessed climate impact on agriculture, forestry, health and coastal zone • Climate change-related research is limited by some activities conducted by the Climate Change Enabling Activity Project (CCEAP) from 1999. This includes the 1994 GHG inventory, GHG mitigation analysis and vulnerability and adaptation assessment in selected priority sectors 	<ul style="list-style-type: none"> • Cambodia does not have its own General Circulation Model (GCM). Climate change scenarios used in national studies are derived from GCMs of other countries (Japan and Australia) • The global warming scenarios used in this study are SRESA26 (reference) and SRESB1 (policy). The SRESA2 will lead to higher future GHG emissions while SRESB1 leads to lower future GHG emissions • The impact of climate change on Cambodia's climate was assessed using two GCMs, i.e. Center for Climate Research Studies (CCSR) and Commonwealth Scientific and Industrial Research Organization (CSIRO) • Impact on temperature, rainfall, agriculture, forestry, human health and coastal zone were discussed. Adaptation options were given on general basis based on the impact assessment
<p>Experience: The outputs simulated by these GCMs were consistently higher than the observed. This is probably because the two models were developed for use in Japan and Australia, which are very different geographical regions</p> <ul style="list-style-type: none"> • Therefore, correction factors were developed and used in the subsequent analysis 		

Country	Overview of UNFCCC National Communication	Climate Adaptation Methods and Tools Employed
Lao PDR	<ul style="list-style-type: none"> Lao PDR submitted its first national communication in 2000 The first national communication introduced national circumstances of Lao PDR; GHG inventory; policies, programmes and measures; financial and capacity constraints 	(not mentioned in documentation)
Thailand	<ul style="list-style-type: none"> Thailand submitted its first national communication in 2000 This initial national communication sets out Thailand's contribution to international efforts to address climate change issues, as a non-Annex I country It provides an overview of national circumstances that influence Thailand's capacity to respond and describes its GHG inventory and mitigation options This communication also discusses developments with regard to vulnerability and adaptation issues, policies and measures taken, and the areas where Thailand still lacks the capacity to address climate change problems <p>Experience:</p> <ul style="list-style-type: none"> Due to high uncertainty of the scenarios however, the results from a few GCMs were used for comparison and validation purposes and for analysing potential impacts The results of analyses should be viewed more as indicative rather than as giving the precise magnitude of the potential impacts Earlier climate change impact studies used several GCMs, such as GISS, UK89, UKMO. 	<ul style="list-style-type: none"> Climate scenarios were used to analyse the potential impacts of climate change on different sectors In the absence of more detailed climate models showing climate scenarios at the local level, the scenarios generated from the GCMs were translated into location-specific data by direct interpolation Scenarios derived from four GCMs were used in the analysis of impact on agriculture in Thailand The four models were (1) CSIRO global coupled ocean-atmosphere-sea-ice model (CGCM), (2) HadCM2 model, (3) ECHAM4/OPYC3 model and (4) CCCMA's First Generation Couple GCM (CGCM1) Scenarios from only one model (ECHAM4) were used in the analysis of impacts on water resources and health Five sectors are being emphasised, namely: forestry, crops, water resources, coastal areas, and health
Viet Nam	<ul style="list-style-type: none"> Viet Nam submitted its first national communication in 2003 The communication consists of 7 Chapters: 1) General features of geography, climate, and socio-economic conditions of Viet Nam in 1994; 2) National Greenhouse Gas Inventory in 1994, and estimated national GHG emissions to 2020; 3) Analysis of GHG mitigation options in energy, agriculture and forestry sectors; 4) Assessment of the potential impacts of climate change on some major economic activities and response measures; 5) The system of climate observations and some results of climate change research in Viet Nam; 6) Education, training and raising public awareness on climate change; 7) The main mitigation strategies to reduce GHGs through economic development plan of energy, agriculture and forestry sectors. 	<ul style="list-style-type: none"> Climate scenarios were used to analyse potential impacts of climate change on key sectors: agriculture, water resources, coastal zone, forestry, aquaculture and energy In this study, the models (RRMOD and SSARR) were used for calculating and assessing the variation of annual river run-off, low flow and flood flow according to the respective scenarios The potential evapotranspiration (PET) was calculated using the modified Penman formulae; the impacts of sea level rise on coastal zone were assessed on the basis of IPCC scenario for the year 2100 with sea level rise by 1 m Adaptation measurements were given on water resources; agriculture, forestry, aquaculture, coastal zones, energy and transportation sectors, and human health

5.2 Overview of methods and tools for adaptation planning

Table 9 provides an overview of all of the methods and tools that have been identified and the rest of this section describes in more detail some of the major categories of the approaches.

The approaches that have been identified have been categorised along these lines of the MRC CCAI Adaptation Framework. However, as described in the previous sections, some methods and tools cover more than one aspect of the framework categories, and some cover only certain aspects within the categories. For instance, vulnerability and capacity assessment, a recurring focus for approaches in disaster risk reduction, covers both vulnerability assessment as well as some of the aspects of identification and assessment of adaptation options. Table 9 also lists overview documents and overarching frameworks and guidelines as these would contribute to awareness-raising. The first step of the CCAI Adaptation Framework is scoping, which includes risk screening approaches that can be used to decide whether there is any need to carry out work on adaptation in a given location.

In organising the methods and tools, additional categories have been included, namely: disaster risk reduction approaches; sector-specific tools; and information platforms and training packages. The disaster risk reduction category has been separated from the adaptation category because the approaches have not always been developed with a long-term perspective of change in mind and so might not always be appropriate for dealing with climate change. On the other hand, disaster risk reduction is seen as a core part of adaptation, so these approaches will still be useful in some cases.

Table 9. *Overview of Methods and Tools.*
 (*Included in UNFCCC 2008a)

Overview documents
1. A Survey of Climate Change Adaptation Planning (Heinz Center)
2. Compendium on Methods and Tools to Evaluate Impacts of, and Vulnerability and Adaptation to, Climate Change (UNFCCC)
3. Screening Tools and Guidelines to Support the Mainstreaming of Climate Change Adaptation into Development Assistance – A Stocktaking Report (UNDP)
4. A Summary of Main Tools Related to Disaster Risk Reduction (IUCN)
Overarching Frameworks and Guidelines
1. A User’s Manual for Building Resistance and Resilience to Climate Change in Natural Systems (WWF)
2. Adaptation Policy Framework (UNDP)*
3. Adapting to climate change: a checklist for development (South East Climate Change Partnership, UK)
4. Adapting to Climate Variability and Change: A Guidance Manual for Development Planning (USAID)
5. Capacity Strengthening in Climate Change Vulnerability and Adaptation Strategy Assessments (CSCCVASA)
6. Climate Adaptation by Design: A Guide for Sustainable Communities (Town and Country Planning Association, UK)
7. Climate Adaptation: Risk, Uncertainty and Decision Making (UKCIP)*

Overarching Frameworks and Guidelines

8. Climate Change Information for Effective Adaptation (GTZ and PIK)
9. Climate Proofing Tool (HEKS, Bread for All)
10. Climate Proofing: A Risk-Based Approach to Adaptation (ADB)
11. Climate resilient cities : a primer on reducing vulnerabilities to climate change impacts and strengthening disaster risk management in East Asian cities (World Bank)
12. Community-Based Technology Solutions for Adapting to Climate Change (SouthSouthNorth)
13. Compendium of Community Based Adaptation Tools (UNFCCC)
14. Gender, Climate Change and Community-Based Adaptation (UNDP)
15. Guidelines for the Preparation of National Adaptation Programmes of Action (UNFCCC)*
16. Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies (UNEP and IVL)
17. IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations*
18. Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects (8 Guidance notes) (World Bank)
19. Mainstreaming Climate Change Adaptation: A Practitioner's Handbook (CARE International)
20. National Adaptive Capacity Framework (WRI)
21. Participatory Research for Sustainable Livelihoods: A Guidebook for Field Projects (IISD) [Hard copy only; HTML version available²]
22. Policy Guidance on Integrating Climate Change Adaptation into Development Co-Operation (OECD)
23. Preparing for Climate Change: A Guidebook for Local, Regional and State Governments (ICLEI)
24. Vulnerability and Adaptation Assessments: An International Guidebook (U.S. Country Studies Programme)*
25. Vulnerability mapping and impact assessment (ILRI, TERI, ACTS, CIAT)

Scoping (risk screening)

Tools

1. Community-based Risk Screening Tool – Adaptation & Livelihoods (CRiSTAL)*
2. Opportunities and Risks from Climate Change and Disasters (ORCHID)³
3. Gender Analysis Matrix (GAM)
4. ADB Risk Screening Tool (<http://www.adb.org/climate-change/cc-adaptation.asp>)

Methods

(none identified)

Guidelines

5. Risk Analysis, a Basis for Disaster Risk Management: Guidelines (GTZ)

Vulnerability Assessment

Tools

1. ADAPT (World Bank)⁴
2. Climate Quick Scans (DGIS/NCAP) (<http://www.nicap.net>)
3. Community Vulnerability Assessment Tool (NOAA)⁵
4. Hazard, Risk Vulnerability Analysis Tool Kit (British Columbia, Provincial Emergency Programme)⁶

2 <http://www.iisd.org/casl/CASLGuide/GuideBook-home.htm> (HTML version only, not downloadable)

3 <http://www.ids.ac.uk/go/idsproject/adaptation-screening-tools-for-development-cooperation-piloting-orchid-and-other-approaches>

4 <http://beta.worldbank.org/climatechange/content/additional-tools-adaptation>

5 <http://www.csc.noaa.gov/products/nchaz/startup.html>

6 <http://www.pep.bc.ca/hrva/toolkit.htm>

Vulnerability Assessment

Methods

5. Historical or Geographic Climate Analogues*
6. Vulnerability Indices*
7. Climate Vulnerability and Capacity Assessment (CVCA) (CARE)

Guidelines

1. Guidelines for Community Vulnerability Analysis, An Approach for Pacific Island Countries (UNDP/UNDHA/SPDRP)
2. How to do a Vulnerability and Capacity Assessment: A practical step by step guide for RC/RC staff and volunteers (International Federation of Red Cross and Red Crescent Societies)
3. Participatory Capacities and Vulnerabilities Assessment: Finding the Links Between Disasters and Development (Oxfam)
4. Participatory Vulnerability Analysis, A Step-by-Step Guide for Field Staff (ActionAid)
5. VCA toolbox with reference sheets (IFRC)
6. What is VCA? An Introduction to Vulnerability and Capacity Assessment (International Federation of Red Cross and Red Crescent Societies)

Impact Assessment

Tools

1. Business Area Climate Impacts Assessment Tool (BACLIAT)*
2. Climate Information and Prediction Services (CLIPS) Project and Regional Climate Outlook Forums (RCOFs)*
3. COSMIC2 (COuntry Specific Model for Intertemporal Climate Vers. 2)*
4. DSSAT model (agricultural impact assessment)*
5. MAGICC/SCENGEN*
6. NCEP Global Ocean Data Assimilation System (GODAS)*
7. PRECIS (Providing REgional Climates for Impacts Studies)*
8. RCLimDex*
9. SERVIR Climate Change Mapping Tool (USAID, NASA, CATHALAC, IAGT)⁷
10. SimCLIM*
11. Statistical DownScaling Model (SDSM)*
12. SWAT (hydrological impact assessment) (<http://swatmodel.tamu.edu/>)
13. UKCIP02 Climate Change Scenarios*
14. Variable Infiltration Capacity (VIC) (hydrological impact assessment)⁸
15. weAdapt Climate Change Explorer⁹

Methods

16. Statistical and dynamic downscaling

Guidelines

17. IPCC-TGCIAGuidelines on the Use of Scenario Data for Climate Impact and Adaptation Assessment*
18. Participatory Impact Assessment, A Guide for Practitioners (Feinstein International Center, Tufts University)
19. Workbook on Climate Change Impact Assessment in Agriculture: Basic Knowledge, Methodologies and Tools (Caribbean Community Climate Change Centre, Cuban Institute of Meteorology and Commonwealth Secretariat)

Adaptation Measure Identification

Tools

1. Adaptation Decision Matrix (ADM)*
2. Climate change and Environmental Degradation Risk and Adaptation (CEDRA) (Tearfund)
3. UKCIP Adaptation Wizard*

7 http://www.servir.net/en/The_Climate Mapper_and_SERVIR_Viz

8 <http://www.hydro.washington.edu/Lettenmaier/Models/VIC/>

9 http://wikiadapt.org/index.php?title=The_Climate_Change_Explorer_Tool

Adaptation Measure Identification

Methods

4. Decision climate envelopes (SEI)¹⁰
5. Cost-benefit Analysis*
6. Cost-Effectiveness Analysis*
7. Estimating Adaptation Costs: M-CACES*
8. Multicriteria Analysis (MCA)*

Guidelines

(none identified, but see Overarching Frameworks and Guidelines)

Disaster Risk Reduction Approaches

Tools

1. Comprehensive Hazard and Risk Management (CHARM)*
2. Household Livelihood Security Assessments: A Toolkit for Practitioners (CARE)
3. Mainstreaming Disaster Risk Reduction: A Tool for Development Organizations (Tearfund)

Methods

4. Child Oriented Participatory Risk Assessment and Planning (COPRAP) (Center for Positive Future, Center for Disaster Preparedness)¹¹
5. Preparing for disaster, a community-based approach (Philippine National Red Cross/Danish Red Cross)
6. Weathering the storm: participatory risk assessment for informal settlements (Disaster Mitigation for Sustainable Livelihoods Programme, University of Cape Town)

Guidelines

7. Mainstreaming Disaster Risk Reduction: A Tool for Development Organizations (Tearfund)
8. Mainstreaming Climate Change Adaptation: A Practitioner's Handbook (CARE International)
9. Community-Based Disaster Risk Management Field Practitioners' Handbook
10. Guidance notes on tools for mainstreaming disaster risk reduction (ProVention Consortium)
11. Handbook for Estimating the Socio-Economic and Environmental Effects of Disasters*
12. Reducing risk in our communities (Tearfund)
13. The Good Practice Guide: Community Awareness and Education in Emergency Management*
14. Working with Women at Risk: Practical Guidelines for Assessing Local Disaster Risk (International Hurricane Center)

Stakeholder Engagement Approaches

1. Agent Based Social Simulation*
2. Global Sustainability Scenarios*
3. Livelihood Sensitivity Exercise*
4. Multistakeholder Processes*

Sector-specific tools

Agriculture

1. Agricultural Catchments Research Unit (ACRU)*
2. Agroclimatic Water Stress Mapping*
3. AgroMetShell*
4. Agricultural Production Systems simulator (APSIM)*
5. CLIMWAT 2.0*
6. CM Box*
7. Decision Support Systems Linking Agro-Climatic Indices with GCM-Originated Climate Change Scenarios*
8. Economic Models: Econometric (Ricardian-based) Models*
9. Economic Models: Input-Output Modeling (with IMPLAN)*

¹⁰ http://weadapt.org/wiki/Decision_Climate_Envelopes

¹¹ <http://www.cdp.org.ph/publications/child-oriented-participatory-risk-assessment-and-planning-coprap-a-toolkit/>

Sector-specific tools

Agriculture

10. FAOclim 2.0*
11. Irrigation Model: AquaCrop*
12. Irrigation Model: CROPWAT*
13. Local Climate Estimator (New_LocClim)*
14. Model of Agricultural Adaptation to Climatic Variation (MAACV)*
15. ORYZA 2000*
16. Process Crop Models: AFRC-Wheat*
17. Process Crop Models: Alfalfa 1.4*
18. Process Crop Models: Decision Support System for Agrotechnology Transfer (DSSAT) developed under the International Consortium for Agricultural Systems Applications (ICASA)*
19. Process Crop Models: Erosion Productivity Impact Calculator (EPIC)*
20. Process Crop Models: General-Purpose Atmospheric Plant Soil Simulator (GAPS 3.1)*
21. Process Crop Models: GLYCIM*
22. Process Crop Models: GOSSYM/COMAX*
23. Process Crop Models: RICEMOD*
24. Process Soil and Crop Models: CENTURY*
25. Relative Risk Index (RRI)*
26. WOFOST*

Water Sector

27. Aquarius*
28. CALVIN (CALifornia Value Integrated Network)*
29. European Flood Alert System (EFAS)*
30. Interactive River and Aquifer Simulation (IRAS)*
31. MIKE BASIN*
32. OSWRM (Okanagan Sustainable Water Resources Model)*
33. RIBASIM*
34. RiverWare*
35. Spatial Tools for River Basins and Environment and Analysis of Management Options (STREAM)*
36. Water Evaluation and Planning System (WEAP)*
37. WaterWare*

Coastal Zones

38. Bruun Rule*
39. CoastClim of Simulator of Climate Change Risks and Adaptation Initiatives (SimClim)*
40. Community Vulnerability Assessment Tool (CVAT)*
41. Decision Support Models: COSMO (Coastal Zone Simulation Model)*
42. DIVA*
43. RamCo and ISLAND MODEL*
44. Reef Resilience Toolkit*
45. Shoreline Management Planning (SMP)*
46. Smartline*
47. SURVAS*
48. The South Pacific Island Methodology (SPIM)*

Information Platforms, Training Packages

1. Adaptation Learning Mechanism (UNDP) (including Photo Stories)
2. Capacity strengthening in climate change vulnerability and adaptation strategy assessments
3. ci:grasp

Information Platforms, Training Packages
4. NAPA Platform (UNITAR)
5. PreventionWeb of the Global Platform on Disaster Risk Reduction
6. ProVention Consortium Portal on Tools for Mainstreaming Disaster Risk Reduction
7. Regional Climate Change Adaptation Knowledge Platform for Asia (SEI/UNEP)
8. weADAPT (SEI)
9. World Bank Climate Change Portal
Monitoring and Evaluation
1. Bellagio Framework (WRI)

Most of the methods and tools covered in Table 9 are developed for impact assessment (Figure 6), often for sectoral approaches. Many of these are very specific to assessing climate change impacts, and most have been developed especially for this reason. Fewer approaches exist for vulnerability assessment and relatively few of these are targeted only at climate change. Very few approaches exist for scoping and identifying adaptation options. The scoping tools are risk screening tools, which are seen as useful for identifying areas of focus, however some of these risk tools are intended for disaster risk reduction. There are also some other general and sector specific tools applicable to adaptation planning, such as IWRM that are not specific to climate change. A range of step-by-step approaches described in handbooks and guidebooks provide all-in-one toolkits, which can often be tailored to very different contexts at both community and project levels.

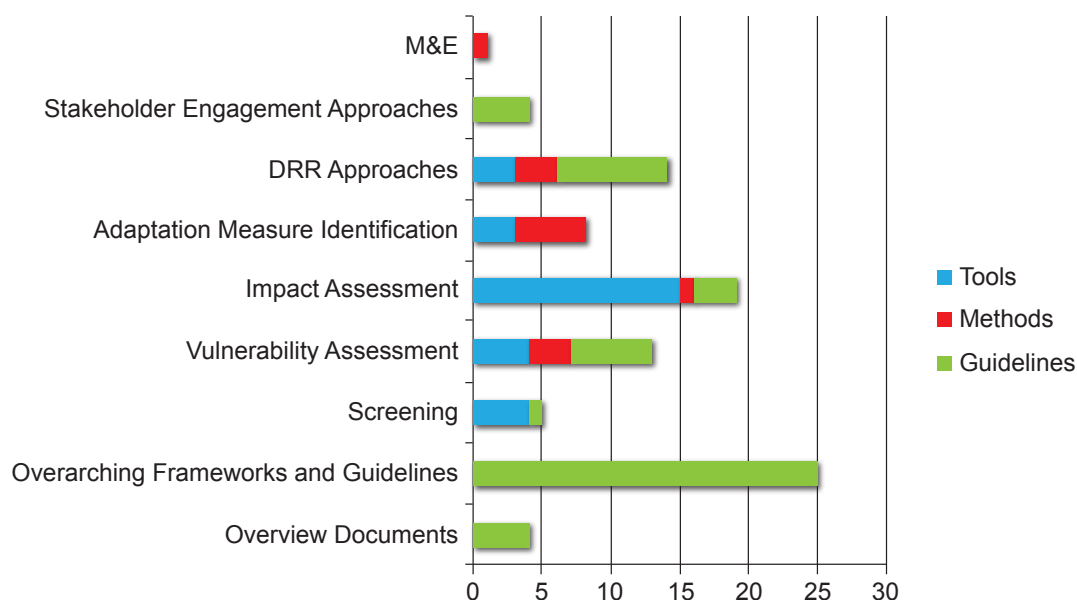


Figure 6. Overview of distribution of methods and tools

While many tools and methods have been developed, there is little available that critically describes the experiences of implementing them. Most of this literature is scientific, focused on impact assessment approaches and more specifically, on models and data needs. While

this information can be useful for an experienced user, often this sort of analysis is beyond the scope of most practitioners.

As noted in previous sections, the lack of accessible information could be because few of the approaches have actually been implemented. What is available, however, are reviews of experiences with adaptation planning *in general*. These typically feature several different types of methods and tools. Some of these experiences have been showcased at UNFCCC Nairobi Work Programme meetings, for example at the recent meeting on adaptation planning held in October 2009.

The list in Table 9 has been selected for its potential relevance for the LMB countries, but not all will be relevant for all situations. The approaches described below are likely to be among the most useful for the LMB countries. They have been selected for their ease of use and relevance to the typical circumstances in the region.

5.3 Scoping

Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL): CRiSTAL is a decision support Excel-based tool. Drawing on the environmental impact assessment model and the Sustainable Livelihoods Framework, CRiSTAL aims to provide a logical, user-friendly process to help users better understand the links between climate-related risks, people's livelihoods, and project activities. The application of CRiSTAL allows a detailed analysis of hazards and their impact on livelihoods at the local level, including hazards that are predicted to intensify as a result of climate change. The CRiSTAL approach also provides a gender-specific vulnerability analysis for different parts of the population, highlighting coping strategies that are specific to women, and resulting in clear directions for how gender-specific measures will need to be incorporated into projects.

The tool guides the user step by step in a simple narrative format to: collect project information; identify the climate change context; and identify current climate risk and important livelihood resources. Based on this information, the tool helps the user identify:

- a) how livelihood resources are affected by current climate hazards on a scale of 0–5 for level of influence;
- b) the importance of livelihood resources for implementing a coping strategy on a scale of 0–5;
- c) the impact of project activities on key livelihood resources (positive, negative or neutral); and
- d) revised project activities based on the assessment.

The user can make further refinements by including consideration of whether the revised project activities are sustainable under long-term climate change impacts and identify the synergies and barriers to the implementation of the revised project activities, e.g. local needs,

local capacities, financial, institutional and political support. The tool generates a series of reports (climate, livelihood context, project screening and project summary) so that the project planners can better understand vulnerabilities of local livelihoods to climate hazards, especially hydro-meteorological extremes. It also reveals the strategies people use to cope with increasing stresses. Between 2004 and 2006 an interdisciplinary team conducted a series of field tests on completed or ongoing natural resource management projects in Bangladesh, Mali, Nicaragua, Tanzania and Sri Lanka. Today, many projects are using CRiSTAL as a tool for understanding local vulnerability and to check ongoing coping strategies.

Opportunities and Risks of Climate Change and Disasters (ORCHID): This process-based tool is designed to be a light-touch screening process for donor programmes. The process uses quantitative inputs from climate science which are applied to the risk assessment of programmes, usually at wide scales, and using directional trends rather than discrete figures. The tool uses project documents and interviews with project staff as well as past trends in vulnerability and disaster risk. ORCHID aims to raise awareness of climate risk management and future climate change among staff, to stimulate dialogue with donor partners, and to integrate disaster risk reduction and climate change adaptation policies and activities. The process makes recommendations about how programmes might enhance risk management through adaptive practices and cost benefit analysis. Sector economic assessments are undertaken for areas where clear adaptation options can be discerned and where sufficient data is available. <http://www.ids.ac.uk/climatechange>.

ADB Risk Screening Tool: This is a user-friendly, desktop (web- and paper-based) risk screening tool pilot. A checklist alerts project officers and mission leaders to potential climate-induced impacts and risks and allows for possible incorporation of risk reduction measures at the project preparation concept stage. The tool relies on existing project data/knowledge. It pre-screens and assesses probable risk against a number of preconceived impact and risk tables and risk-related assumptions (location of project in climate-sensitive geo-climatic zones, sector risks, capacity development, and known disaster hotspots). It allows rapid desktop assessments of potential impacts and adaptation analysis. It helps mainstream risk reduction and adaptation during project preparation and does not rely on impact modeling data. The tool is designed for Asia and the Pacific although the methodology is applicable in other areas. It generates a risk value to help determine degree of risk (high, medium, low) with supporting recommendations. <http://www.adb.org/climate-change/cc-adaptation.asp>

5.4 Vulnerability assessment

*DIVA*¹²: The DIVA model is an integrated, global model of coastal systems that assesses biophysical and socio-economic consequences of sea-level rise and socio-economic development taking into account coastal erosion (both direct and indirect), coastal flooding

12 The DIVA tool is extensively described in Hinkel and Klein (2009).

(including rivers), wetland change and salinity intrusion into deltas and estuaries as well as adaptation in terms of raising dikes. The first version of the DIVA model was developed as part of the DIVA tool in the EC-funded project on dynamic and interactive assessment of national, regional and global vulnerability of coastal zones to climate change and sea-level rise (DINAS-COAST). This model has been tested in the Coral Triangle (McLeod *et al.* 2010). <http://www.diva-model.net/>

Providing Regional Climates for Impacts Studies (PRECIS): provides climate impact assessments in developing country contexts which are freely available to numerous users. The tool uses GCM to provide grid-scale averages of spatio-temporal hydro-climatic state variables as well as soil hydrology and thermodynamics, and some vegetation dynamic variables. The tool is applicable to multiple scales, sectors and levels of screening but is limited to fine/point scale information. <http://precis.metoffice.com/>

Vulnerability Capacity Assessment (VCA): is a diagnostic approach that permits work with vulnerable communities so that they can better understand the forces that affect them. They can then take measures to improve their lives based on their own skills, knowledge and initiatives. The purpose is to collect and analyse information in a structured and meaningful way, which can then be used to diagnose the risks and capacities a community faces and lead to activities that reduce people's vulnerability and increase their capacities. VCA facilitates work between agencies and communities where a sense of partnership is established and programmes are negotiated and jointly planned. Many organisations have developed toolkits for VCA (see Table 9 for a list of handbooks/guidance documents).

5.5 Identification, development and implementation of adaptation options

CEDRA: is an environmental field tool for agencies working in developing countries. It helps them to access and understand the science of climate change and environmental degradation and to compare this with local community experience of environmental change. Using CEDRA, civil society organisations can prioritise which environmental hazards may pose a risk to their existing project locations, enabling them to make decisions to adapt some projects, halt some projects or start new ones. Adaptation options are discussed and decision-making tools are provided to help organisations plan their responses to the hazards identified. NGOs working in disaster risk reduction as well as general development NGOs will find CEDRA useful. It is designed, ideally, to be used by people who are experienced in planning and managing development projects. <http://tilz.tearfund.org/Topics/Environmental+Sustainability/CEDRA.htm>

Cost-benefit analysis: can be used to determine whether an individual adaptation response is economically justified (i.e. are its benefits greater than its costs?). A cost-benefit analysis involves two steps: identifying and screening benefits and costs to be included in the analysis and converting them to monetary units. This is a general approach that is used in many

fields. A framework specific to adaptation was developed by Leary (1999) and in 2006 the Stern Review carried out cost analyses of climate change on the world economy, making the economics of adaptation a popular topic. Nevertheless, many studies of the economics of adaptation do not specifically use cost-benefit analysis but instead focus only on costs.

Adaptation Wizard: a web-based tool designed to help users gain a basic understanding of climate change as well as to integrate climate risks into their decision-making. It is a high-level generic tool that is valuable to newcomers to the issue of climate change as well as those who are preparing to adapt. The tool is specifically aimed at the UK context. It is more of a decision-support than a decision-making tool and plays a valuable awareness-raising and educational role. The tool takes users through an economic analysis of adaptation options and scenarios. <http://www.ukcip.org.uk/resources/tools/adapt.asp>

Integrated Water Resource Management (IWRM): a system based on account of all types of water (surface, ground, return) within hydrographic boundaries, which connects the interests of various sectors and hierarchical levels, promotes effective water use in the interest of sustainable development of society and ecologic security (aiming for maximum productivity). IWRM is considered as a methodological approach for water resources governance, management and development. IWRM can be a useful approach for planning adaptation to climate change when issues such as shared water resources, multiple stakeholders, limited natural resources, user conflicts and ecosystem services all need to be considered.

5.6 Gender

Most of the world's poor are women and children and climate change will affect these people, as they rely heavily on natural resources. Women are affected by climate change differently from men because of the gender differences in cultural, social, and economic dimensions in developing countries. For example, the 1991 cyclone and floods in Bangladesh killed five times more women than men (Aguilar 2004). One of the reasons was that women typically do not leave the house without a male relative, and therefore were left waiting for relatives to come and rescue them. Some guidelines and tools and useful approaches and experiences to mainstream gender in climate change adaptation are presented below.

UNDP Gender, Climate Change and Community-Based Adaptation Guidebook: This guidebook provides simple tools and practical advice on how to take a gender-sensitive approach to planning and implementing adaptation projects and programmes regardless of context. Gender mainstreaming in community-based adaptation projects supports the vigorous and sustained participation of both women and men in all project aspects because successful projects require the participation, knowledge, and skills of all community members. Gender mainstreaming also ensures that the project addresses women's and men's different needs and that the experiences of women and men alike become part of the knowledge generated and lessons learned from the project.

Gender Analysis Matrix (GAM): The gender analysis matrix was developed by A. Rani Parker as a quickly employed tool to identify how a particular development intervention will affect women and men. It uses a community-based technique to elicit and analyse gender differences and to challenge a community's assumptions about gender.

- It is explicitly intended for use by the community for self-identification of problems and solutions. The principles of the Gender Analysis Matrix are:
- All requisite knowledge for gender analysis exists among the people whose lives are the subject of the analysis
- Gender analysis does not require the technical expertise of those outside the community being analysed, except as facilitators
- Gender analysis cannot be transformative unless the analysis is done by the people being analysed.

Gender and climate change: some useful approaches

Many nations and agencies consider gender to be a significant dimension of vulnerability to climate change in developing countries. Various mechanisms are used to understand gender and climate change issues through study, planning and implementing pilot projects. Many of the existing methods and tools can be applied to studying gender specifically but the Gender Analysis Matrix (GAM) and UNDP's toolkit for gender and community-based adaptation are gender specific-approaches. There is still room for researchers and practitioners to experiment and develop methods and tools to suit conditions in the LMB region. Below are some examples of other (generic) approaches that can be applied to a study on gender and climate change.

The Heinrich Böll Foundation did a study on gender and climate change in Mozambique, which revealed that women and men are affected differently by climate changes due to the power structure and the differences between their roles. Women have access to, but not control over, natural resources and other property rights. As well, women do most of the reproductive and part of the productive work, while men are only responsible for productive work.¹³ Research in Andhra Pradesh, India recorded similar findings (FAO, forthcoming 2009).

The Mozambique study adopted the Gender Analysis Matrix (GAM) to help determine the different impacts of climate change on women and men, by providing a community-based technique for identifying and analysing gender differences. They also used *climate change impact assessment* to help identify the possible impacts of climate change on women and men in the community. They applied an analysis of *influencing factors* to decide what determines/influences the differences identified in the gender division of labour and with regards to access to and control over resources. They applied an *institutional analysis* to look at how institutions, i.e. structures and mechanisms of social order and cooperation governing the behaviour of two or more individuals, behave and function according to both empirical rules – informal rules-in-use and norms – and also theoretical

13 <http://www.boell.org.za/downloads/Mozambique.pdf>

14 <http://www.wedo.org/wp-content/uploads/nepalcasestudy.pdf>

rules – formal rules and law. They carried out *access and control and social profiles* to answer the question ‘Who has access to and control of knowledge, resources, services and decision-making and what kind of relationships exist that create and reproduce differences between women and men?’. Then they used *capacity and vulnerability analysis* to identify what will help (capacities) and what will hinder (vulnerabilities) the adaptation to climate change. Finally, a *needs assessment* provided a method of assessing the practical needs and the interests of women and men that must be addressed.

The International Centre for Integrated Mountain Development (ICIMOD) conducted a case study on Gender and Climate Change in the Hindu-Kush Himalayas of Nepal in preparation for the launch of an advocacy pilot project to mainstream gender into climate change policy-making and activity implementation in developing countries. The study concluded that adaptation strategies need to incorporate a gender perspective.¹⁴

This work discussed the possible impacts of climate change on mountain women. One of the approaches used was *adoption of existing socioeconomic scenarios* to assess impacts and adaptation and thus develop adaptation strategies.

The UN and Oxfam produced a policy discussion paper on ‘Responding To Climate Change In Viet Nam: Opportunities for improving gender equality’, which synthesises findings from three sources: a desk review, literature survey and fieldwork in two provinces, conducted in 2009. The paper aims to support implementation of the National Target Programme to Respond to Climate Change (NTP-RCC), which was approved in December 2008, in ways that promote gender equality and women’s empowerment.¹⁵

The analytical framework guiding this research draws on Sustainable Livelihoods Approaches (SLA), which include the *Sustainable Livelihoods Framework* (SLF), resilience thinking, gender theory and anthropology. The SLF, when used with participatory research methodologies, is useful to analyse complex rural and urban realities. SLA has been influential in international development in expanding understandings of poverty from income focused definitions to a more nuanced understanding of the diverse livelihood strategies undertaken by households, the full range of capital assets which households rely on and the vulnerability context, policies and institutions which shape actions by individuals and households. Gender analytical frameworks show how gendered power relations shape organisations and institutions (e.g. property rights, division of labour, livelihood opportunities) and mediate the outcomes of development processes.¹⁶

15 http://www.un.org.vn/index.php?option=com_docman&task=doc_details&Itemid=211&gid=110&lang=en

16 http://www.un.org.vn/index.php?option=com_docman&task=doc_details&Itemid=211&gid=110&lang=en

6 Analysis of methods and tools

This review has identified a vast number of approaches for adaptation planning, including methods, tools, guidelines, handbooks, and other advice that have all emerged from and for different actors. These include community groups, development and humanitarian NGOs, government agencies at different levels and researchers and technicians at universities and research institutes. In doing the review, it has become clear that not only are the quality and effectiveness of some of the approaches undocumented, but also they need to be selected carefully as they are designed for very different purposes. Although adaptation planning requires many steps, project risk-screening tools or methods that require complex data processing will not be useful for a community attempting to plan adaptation. For this reason, one of the most important findings emerging from this review does not relate to specific methods and tools, but rather to the process of selecting them. This section describes some of the challenges for applying the methods and tools reviewed, and discusses the selection criteria used (Table 2).

Additional issues that have emerged include questions about the time-frame for planning, the role of financing for implementing adaptation options, the extent to which gender issues and participation feature and questions about whose knowledge counts in identifying adaptation options. The latter issue, in particular, is important to raise to avoid making assumptions about the validity of findings emerging from the application of a method or tool versus traditional and local knowledge. Some of the approaches specifically mention that they are designed for ‘self-identification’, helping to set the local context (e.g. GAM). How can the application of approaches developed elsewhere be justified in situations where there is strong local confidence in indigenous solutions to climate change? This is especially relevant if the findings emerging from the application of approaches indicate that actions should be taken that go against the wishes of a community or a group of people. This recalls the points made by Füssel (2007) on the different criteria to consider in selecting adaptation measures. If expert judgment is still a key ingredient for the application of many of the methods and tools, who are the experts?

A related issue is the question of who is conducting the adaptation planning. Some of the approaches identified are clearly very top-down, requiring dedicated national involvement from government institutes. Others are bottom-up, starting with communities and prioritising a participatory approach.

There are seven main conclusions from the analysis of the reviewed methods and tools:

1. Access and availability of methods and tools for adaptation is not a limitation.
2. There is limited guidance available on how to select the most appropriate approaches for a given location.¹⁷
3. Because considerable knowledge gaps still exist about what adaptation is, training or other ways of sensitisation may need to be the first step before jumping into adaptation planning.
4. Most of the methods and tools are not ‘plug-and-play’; their use requires training, skilful facilitators, significant data collection and/or significant resources.
5. No one single approach is sufficient to successfully support adaptation planning, each contributes a small piece of the puzzle.
6. Monitoring progress would be an important component of adaptation planning and implementation because this is where the real lessons are drawn for application elsewhere.
7. Expert judgment is still one of the most important ingredients for success and cannot be replaced by any of the available methods and tools.

6.1 Evaluation of methods and tools

To deal with the vast range of tools and methods available, some techniques to help users select the most appropriate ones would be desirable. Many of the more technical tools require training, meaning both financial and time investments. An objective of this review was to identify which methods and tools would be the most appropriate for the LMB countries. Rather than looking at each individual approach to assess its suitability, this section offers some observations on how to evaluate the appropriateness of methods and tools.

One way to approach an evaluation of methods, both before and after their application, could be through a SWOT (Strengths Weaknesses Opportunities & Threats) analysis. During a GTZ workshop on mainstreaming held in May 2009, participants carried out a SWOT analysis of tools (Table 10). There are several interesting observations that can be useful for anyone considering the application of methods and tools or the development of new approaches, particularly when it comes to weaknesses, opportunities and threats. For example, the fact that tools need to be continuously reviewed may seem obvious but many have been developed as part of a project and therefore further resources for follow-up or ongoing monitoring may not be available. There are also reflections on the capacity needed to be able to use the methods and tools.

The level of application – whether they are targeted at national or local level – also emerges as an important issue, because it depends on the availability of data and the appropriateness of indicators. Many of the toolkits, guidebooks etc. are geared at the community level but

¹⁷ There are a number of overview documents listing the approaches, but few if any of these actually describe or contain information about experiences with applying the tools and methods.

many of the impact assessment models use national-level data. It is worth considering how the outputs from the impact assessments relate to local-level actions. As well, the actors behind the approach and the level of stakeholder engagement and use of local knowledge, are relevant. If methods and tools are developed that do not fit into local contexts and do not allow for local tailoring.

Downing and Ziervogel (2004) and Rennie and Singh (1996) offer some useful observations on the identification of appropriate methods and tools. They note the importance of context, in other words decision goals, analytical terms and priority vulnerabilities, which should drive the choice of methodology and methods. They also emphasise that an array of methods is essential and note that the most useful tools are those that fit the end-users' decision framework.

The UNFCCC provides observations on the use of methods and tools for adaptation in a background document prepared for an expert meeting (UNFCCC 2008b). It reflects not only on the aspects of methods and tools dealt with by the UNFCCC but also emphasises key areas that need to be improved for adaptation planning, including the importance of an understanding of model limitations and increasing local level data collection.

Given that so many actors are involved in developing these materials, quality control is not always assured. With such a large amount of materials available, it is also worth questioning why there are so many different versions of adaptation and vulnerability handbooks. Clearly, this suggests that few of the tools adequately address all of the stages of adaptation planning or provide sufficient outputs for adaptation to be planned effectively. Again, many of the guidebooks may not have been tested in the field and may be simply a summary of the methodology applied in a given project. Perhaps the methodology was successful and so the project team felt it was appropriate to publish as a handbook for others to apply. But one successful case study does not guarantee that a particular approach can be applied generically, so caution must be exercised. This is partly because the ultimate objective of a project may not always be clear from the guidance document.

Although many of the guidebooks, handbooks, methods and tools use similar language and seek to further the process of adaptation, they do not all target the same users or situations. Some are explicitly designed to see how existing or planned projects can be 'climate-proofed' (e.g. risk screening climate tools like CRiSTAL). Others are oriented around designing adaptation measures *per se* (e.g. WRI's NAC) while some only contribute to part of the many steps in adaptation planning (e.g. cost-benefit analysis). Some require considerable resources, and others, such as models like PRECIS and WEAP, require extensive training. This means that no one approach will be able to cover all of the aspects of adaptation planning and that a combination of approaches will be necessary. Recalling the components of adaptation planning described by the MRC CCAI Framework in Figure 1, these include:

1. Scoping the adaptation strategy/project (including risk screening)
2. Vulnerability assessment (including impact assessment)

Table 10. *SWOT analysis of methods and tools.*

Strengths	<p>“Some tools offer capacity building elements.”</p> <p>“Some provide good access to climate change information.”</p> <p>“There is an entrepreneurial spirit in the tool developer community.”</p> <p>“Most tools are very good at analysing the physical side, not so good on socio-economic factors.”</p> <p>“Many of the tools help to make sense of climate information if you are not an expert.”</p> <p>“Simple to use and open source – easy access for all.”</p> <p>“Tools can help to create a more open and transparent decision making process.”</p> <p>“Tools assist in guiding thought processes and bringing together stakeholders.”</p> <p>“There is richness in the diversity of tools, serving different needs; all are useful in some way.”</p>
Weaknesses	<p>“None of the tools are designed for the national level.”</p> <p>“I haven’t seen a tool that focuses on cross-sectoral interactions.”</p> <p>“Most of the tools neglect to mention the financial implications (cost-benefit analysis).”</p> <p>“Limits and constraints of tools are not well communicated (tools are only as effective as the information that they use).”</p> <p>“A lot of tools are donor-centric and not partner-centric and not developed in cooperation with partners.”</p> <p>“All tools are lacking monitoring and evaluation.”</p> <p>“The power of the tools depends on the power of the politics.”</p> <p>“Online tools depend on good internet connectivity, which is not available in all parts of the world.”</p> <p>“We haven’t engaged enough with soft solutions yet.”</p>
Opportunities	<p>“There is an opportunity for customisation.”</p> <p>“There is a readiness in many countries to apply tools.”</p> <p>“One could create a toolbox of all tools.”</p> <p>“We need to catalogue the various tools to see whether new tools are necessary to fill gaps.”</p> <p>“Synergies with greater coordination and collaboration.”</p> <p>“Quality can be improved through stronger link to scientific community and ongoing research.”</p> <p>“Tools can raise awareness at country-level (also about climate data needs).”</p> <p>“The tools need continuous peer review.”</p> <p>“We need to capture local knowledge. It is amazing what local people know.”</p> <p>“Trade-offs need to be dealt with when recommending adaptation options.”</p> <p>“There is a need for capacity building on how to use tools, which tool to use when and how tools will help in different situations.”</p> <p>“Tools need to integrate disaster risk management components – otherwise we miss out on a wealth of relevant experience.”</p> <p>“Quantity and quality of data fed into a tool needs to be transparent and assessed.”</p>
Threats	<p>“Waste resources through overlap and weak coordination.”</p> <p>“Some tools are too simplistic.”</p> <p>“Adaptation tools and policies may crowd out normal, economic development policy (climate bias).”</p> <p>“There are many tools, creating danger of competition.”</p>

Source: GTZ (2009)

3. Identification of adaptation options
4. Implementation of adaptation options

All of these steps are carried out through stakeholder engagement and capacity building and informed by the ongoing monitoring and evaluation of adaptation implementation. For some, the process may end at identifying adaptation options if that is the main objective. For others, it may involve the implementation of measures, but given the time-lag, it is likely that evaluating effectiveness is not always considered part of adaptation planning. However, including a system for monitoring progress would be an important component of implementation because this is where the real lessons are drawn for application elsewhere. The review only identified one approach for monitoring and evaluation (WRI, 2009b).

6.2 Selection criteria

An outcome of the review has been the identification of an approach for selecting the most appropriate methods and tools. This section discusses criteria that could be applied in this selection process. Besides selecting methods and tools that are appropriate for the purpose, i.e. impact assessment, vulnerability assessment, etc., it is important to think about the objective, scope and limitations of the planning exercise. Methods and tools should be carefully selected with respect to the data that are required and the data that are available. For instance, Thailand and Viet Nam could apply more data-demanding tools because they have more complete climate data than Cambodia or Lao PDR.

In reviewing the methods and tools, it became apparent that more in-depth assessments of the existing methods and tools, rather than just a review, would be highly desirable. As noted earlier, only limited information is available that critically evaluates experiences applying various methods and tools and there is even less available comparing different approaches. An assessment, based on a thorough examination of experience with different approaches, could provide this information. Another helpful aid could be an analytical framework that could be applied to each method and tool for a given situation and a given set of priority criteria. For example, in assessing the vulnerability of women fishers in Cambodia under different climate change scenarios through a participatory approach involving both women and men in a certain community would be desirable. This would require that methods and tools were gender-sensitive, participatory and simple, that the impact and vulnerability assessments could be linked and that probable scenarios for the location could be produced. Not all methods and tools would fit these criteria.

Table 2 in Section 2 indicates four categories of activities for which specific assessment criteria need to be considered: methods and tools for impact and vulnerability assessment; methods and tools for adaptation planning; identifying and evaluating adaptation options; and institutional issues. The criteria for the four categories based on the review of methods and tools are outlined below in Table 11.

Table 11. *Assessment criteria for adaptation planning methods and tools.*

1. Methods and tools for impact and vulnerability assessment – assessment criteria include:	
Is it simple to use or does it require training or other inputs?	Estimate the usability of each approach by looking through the accompanying documentation. In some cases, well-established methods have been evaluated sufficiently to give an indication of the time and amount of data collection needed. If training is required, this is also often indicated but it is not always clear whether the available training is sufficient or whether expert judgment is still required.
Is there evidence of application?	Either by consulting documentation of application or by contacting the developers of the approach.
Is it simple to use or does it require training or other inputs?	Estimate the usability of each approach by looking through the accompanying documentation. In some cases, well-established methods have been evaluated sufficiently to give an indication of the time and amount of data collection needed. If training is required, this is also often indicated but it is not always clear whether the available training is sufficient or whether expert judgment is still required.
Is it considered ‘state of the art’?	This is difficult to know without having a grasp of the entire field of methods and tools. This is where expert judgment can be appropriate.
2. Methods and tools for adaptation planning – assessment criteria include	
Is it relevant to the needs and concerns in the Mekong countries?	This will vary by country, but it should likely address issues such as water management, agriculture, floods and drought.
Is it holistic in considering all sectors, even if the main focus is on one sector?	This is likely to be evident in the documentation, but will also depend on the variables/data that are considered necessary inputs.
Does it acknowledge an IWRM approach?	This may or may not be evident in the documentation. Contacting the developers of the approach could be necessary.
Is it simple to use or does it require training or other inputs?	Estimate the usability of each approach by looking through the accompanying documentation. In some cases, well-established methods have been evaluated sufficiently to give an indication of the time and amount of data collection needed. If training is required, this is also often indicated but it is not always clear whether the available training is sufficient or whether expert judgment is still required.
Is it accessible?	This may be easy to figure out, but accessibility does not guarantee ease of use. It may still require training or significant data inputs.
3. Identifying and evaluating adaptation options – assessment criteria include	
Does it promote integration with development planning and management?	This is clearly a priority, and can be considered to be a mandatory criterion in almost all cases.

Does it consider relevant social, environmental and economic issues and impact analysis	This is also fundamental – because adaptation must be in line with and promote sustainable development.
Does it consider issues related to gender and minority groups?	This may not seem relevant in all cases, but because vulnerability is differential – in other words it is not the same for different groups of people – it is likely that women and minority groups will be the most vulnerable to climate change in many cases.
Does it consider cost-benefits and cost-efficiency?	This may not always be relevant, but in order to be sustainable and long-term, and to avoid turning into a maladaptation, adaptation needs to be cost beneficial and efficient.
4. Institutional issues – assessment criteria include	
Is it transparent?	As has been discussed, there are some concerns about who is ‘doing’ the adaptation, who is the target for adaptation, and whose knowledge counts. In order to ensure that conflict does not arise, and that all actors feel ownership of the process, the methods and tools should be applied in a way that is transparent and candid about the data used and the focus of the efforts.
Does it involve stakeholder participation?	As has been noted in the scholarly literature, stakeholder participation is vital to ensure ownership, and therefore survival and success, of an adaptation plan.
Is it politically feasible in the Mekong region?	Methods and tools must not require sharing data that is considered a national secret. Outcomes should also not suggest measures that go beyond sovereign limits, although in some cases solutions might be found in regional negotiations.
Is it gender responsive?	This may not seem relevant in all cases, but because vulnerability is differential – in other words it is not the same for different groups of people – it is likely that women and minority groups will be the most vulnerable to climate change in many cases.

6.3 Using methods and tools for adaptation planning in LMB countries

The criteria described in the previous section can be useful for examining individual methods and tools to determine whether they are useful for a given situation. Some will be more useful than others for LMB countries. It is likely that methods and tools related to water, agriculture, coastal zones and disaster risk reduction will be the most relevant. This is because people still depend on agriculture and many live on flood plains, near river banks and lakes and in coastal regions. An example of the use of a Water Evaluation And Planning (WEAP) system in the Mekong region is described in Box 3.

Adaptation is location specific so approaches for adaptation planning will need to be tailored to each location. It is important to look at the data input requirements for the models to see whether they can be met just as it is vital to look at the outputs to determine whether they are

appropriate. Most approaches have been designed to first be tailored to the location where they will be used. This means that it is expected that the team carrying out the work will elaborate on the sort of adjustments that need to be made to the approach in order to make it appropriate for their context. This would presumably involve experts, community members and, possibly, local decision makers. This process may take some time, and so it should not be expected that methods and tools can just be selected from a list and immediately implemented.

Some applications of methods and tools for impact and vulnerability assessment in Cambodia, Thailand and Viet Nam are described below. They suggest that each of the approaches has its limitations and that many different approaches are necessary to support all of the steps involved.

The use of WEAP in Mekong countries

Many development projects worldwide use WEAP as a simulation tool for assessing water balance accounting. It is applicable to many systems, including complex water systems. WEAP helps in calculation of water demand, supply, runoff, infiltration, crop requirements, flows, and storage, and pollution generation, treatment, discharge and in-stream water quality under varying hydrologic and policy scenarios. Many development projects, including hydropower plants and irrigation schemes, also use this tool to evaluate water development and management options. Water tools like WEAP will be more crucial for climate change adaptation planning when countries and regions are facing climate change impacts.

During 2005–2008, CSIRO, MRC and SEI collaborated to undertake the *Challenge Program on Water and Food (CPWF) in the Mekong Basin* using WEAP to assess water use conditions within the basin in both biophysical and socio-economic dimensions and to analyse the opportunities and risks of change in water management that will influence water poverty and thus identify potential water-related interventions that could alleviate poverty in key hotspot areas in the basin. The International Water Management Institute Southeast Asia collaborated with the Thai Department of Water Resources; Kasetsart University and Bang Pakong River Basin Committee to undertake *Establishing Methodologies for Water Allocation in Bang Pakong River Basin Project* using WEAP to plan for integrated water resources management in the river basin, strengthen the capacity of the river basin committee and reduce conflicts within the river basin.

WEAP can be used in a wide range of water resource planning and management contexts. It is closely related with planning of other sectors like agriculture, rural livelihoods, energy security (hydropower) and urbanisation (water supply management). Many countries and river basins have already used WEAP for assessment and planning. The use of WEAP in development studies in countries such as Thailand and India shows that it can scientifically and socially support decision making for water resource planning and management.

With more stresses on climate variability in the region, water tools like WEAP are vital for water resource planning processes in the Mekong countries, which are highly vulnerable to climate change impacts, for future water management planning and to reduce risks caused by climate variability, such as floods, droughts, longer dry seasons and lower rainfall.

Opportunities exist for the Mekong countries to apply this water tool in their adaptation planning and strategies. But, training is important – for government officials, practitioners, academics and the private sector. All those groups have to become familiar with the tool and work with different bodies to acquire important information as inputs to run the programme and provide options to decision makers.

Source: www.WEAP21.org

Using climate change adaptation methods and tools in Cambodia

Methods and tools for impact and vulnerability assessment: Adaptation practices in Cambodia have recently become more mainstream and are politically supported. Concerning institutionalisation, adaptation is integrated from the bottom-up in commune development planning. Local communities usually conduct their own informal assessment based on their traditional practices and knowledge (with some assistance from local development partners such as NGOs) and identify feasible options before submission for commune development planning.

The vulnerability and adaptation assessment from 2001 by the Ministry of Environment identified vulnerable areas and potential adaptation options using a range of methods and approaches as outlined below.

Agriculture: The first step analysed the trend for rice production in selected provinces (the four main rice growing areas of Prey Veng, Takeo, Kampong Cham and Battambang). They performed the analysis using regression techniques with the year as the independent variable, and wet season and dry season rice productivity as the dependent variables. The second step was a calculation of the anomaly of rice productivity (the difference between observation and estimated data derived from the equation developed in step 1). The third step was to develop a model for estimating anomalies of rice productivity from monthly rainfall in each province. Adaptation options: 1) improvement of genetic or development of new high yielding varieties; 2) improvement of crop management and cultural practices; 3) development of capacity to adapt to current extreme climate such as development of early warning system to extreme climate, development maps showing the provinces of rice growing areas prone to flood and drought; 4) development of irrigation facilities in many parts of lowland areas; 5) increasing planting index in suitable areas; and 6) diversification of foods.

Forestry: The steps taken were: 1) identify forest type using the current classification system in each grid of GCMs; 2) classify forest according to the Holdridge System based on interpolated observed climatic data in each grid; 3) match forest type between the current classification system and the Holdridge System; 4) assess forest type in each grid under future climate conditions extracted from MAGICC-SCENGEN; 5) estimate percentage change of forest area from the baseline. Percentage change of area from baseline conditions was estimated using the equation. Based on the above methods of assessment, the following adaptation options have been proposed to reduce the impacts of climate change on forestry in Cambodia: 1) afforestation, 2) protected area conservation, and 3) improvement of forest resource management.

Human health: The impact of climate change on malaria incidence was evaluated using two GCMs and two emission scenarios, SRESA2 and SRESB1 (see Section 2 for details). Based on the above preliminary findings, a model that explained variability of malaria cases between months, years and provinces was developed using regression techniques where wet season rainfall, dry season rainfall, annual mean temperature and socio-economic condition of the province were used as independent variables. In this study, the socio-economics of provinces were only represented by percent of literate population. Several options were proposed such as early diagnosis and treatment of malaria, promotion of pyrethroid treated mosquito nets to communities most at risk, and a public campaign to combat mosquito habitats through personal hygiene and health of the surrounding environment.

Coastal areas: The assessment of sea level rise was carried out using GIS. Some maps were developed for this analysis, namely coastal watershed, land-use and topographic maps. One-metre contour lines were developed based on a 20 m contour map using

linear interpolation techniques. Some adaptation strategies: 1) public awareness among vulnerable populations, and 2) enhancing the local knowledge of disaster prevention.

Methods and tools for adaptation planning: The negative impacts of climate change are only discussed briefly in the Socio-economic Development Plan II (2006–2010), under goals and strategies for the environment, agriculture and disaster relief. Rural livelihoods are vulnerable to the adverse impacts of climate extremes, in particular flooding and drought. As agricultural development is central to poverty reduction efforts, the government intends to strengthen disaster preparedness and meteorological and hydrological networks (MRC 2009c). Many policies and regulations in Cambodia do not include or even mention climate change, impacts and adaptation.

Adaptation to climate change is a cross-cutting issue which is usually integrated within the relevant sectors. However, since the establishment of the National Climate Change Committee and Climate Change Department, the NAPA has guided planning issues relevant to climate change. The NAPA is the first report on adaptation actions and many areas need further investigation. Although the NAPA has been generally and politically accepted, local and sector plans still need to mainstream climate change adaptation in their planning, e.g. the agricultural sector would encourage local farmers to diversify crops to deal with changes in climate patterns. It is clear that institutional coordination among the relevant ministries or departments is poor.

Identifying and evaluating adaptation options: There are no national estimates of the cost of adaptation. It is likely to be significant, but less than the cost of full climate change impacts without adaptation. This is an area where further research is needed (Smith and Sam 2009).

Thailand's experience with the second national communication

SEA START Regional Centre carried out Vulnerability and Adaptation Assessment using the PRECIS regional climate model for scenario development for Thailand's Second National Communication. The PRECIS model is limited in terms of how much customisation and tuning is possible. For impact assessment, they used four approaches:

- The Decisions Support System for Agro-technology Transfer (DSSAT) model for agricultural impact assessment
- Variable Infiltration Capacity (VIC) to assess hydrological impacts
- The Soil and Water Assessment Tool (SWAT) for hydrological impact assessment
- Dynamic Interactive Vulnerability Assessment (DIVA) for sea level rise assessment.

The VIC model is limited in its ability to simulate dry season river flow and the SWAT approach needs further fine-tuning to incorporate dams/dikes in the river basin.

For the risk, vulnerability and adaptation assessment, tools were less useful. The SEA START team used participatory methods in local scenario development to assess future risks based on information from the climate change scenarios and other impact assessment tools. Some statistical analysis and spatial analysis techniques were used in evaluating risk and vulnerability of sectors and areas that are exposed to risk. Various valuation techniques and cost-benefit analysis along with multi-criteria analysis techniques were used to assess adaptation options.

In many cases, participatory method (either by multiple stakeholders or key informants focus group) and expert judgment were used throughout the process.

Source: Personal communication with Suppakorn Chinvanno (2010)

Climate change impacts in Huong River Basin, Viet Nam and adaptation in its coastal district Phu Vang, Thua Thien Hue Province^{18, 19}

This project was implemented by the Institute of Meteorology and Hydrology (IMH) in collaboration with Netherlands Climate Assistance Programme (NCAP). Its aim was to strengthen the capacity and preparedness of the different sectors, organisations and Vietnamese people to adapt and respond to climate change, to reduce losses and efficiently recover from negative effects of climate change related disasters and phenomena, and to take advantage of possible positive impacts.

In the preparation stage, vulnerability assessment (VA) and participatory rural appraisal (PRA) tools were used to collect information.

Mathematical models were used with various physical scenarios including: *rainfall-runoff model* – for calculation of runoff flow caused by rainfall in the basin; *water use simulation models* for calculating water demand and supply for all water users in the basin, based on predicted demand of sectors for the next 50, 70, 100 years in the context that water resources change with climate change; *hydrodynamic model* – to calculate and simulate the flood regime, inundation areas and salinity intrusion for the downstream plain in the context of changing water resources and sea level rise; and *secondary analysis models* – to analyse the consequent impacts of the water resources changing to the regional socio-economical situation of the province and the basin, using GIS and some economy analytical models.

Furthermore, participatory tools like stakeholder action plan (SAP), semi-structured interviews and decision-making workshops were used to involve stakeholders in decision making and planning processes.

18 <http://www.nlcap.net/fileadmin/NCAP/Countries/Vietnam/NCAP.VN.CON-01.FinalReport.final.pdf>

19 http://www.nlcap.net/fileadmin/NCAP/Countries/Vietnam/NCAP_workplan_Vietnam_summary.01.300106.pdf

7 Conclusions

Adaptation is a popular topic for researchers, NGOs and development organisations concerned with environmental issues but it is still not a well understood concept. Being clear about the goal of adaptation planning is a necessary first step. Many approaches are available to guide the planning process but most assume a specific understanding of adaptation planning. Anyone intending to carry out adaptation planning needs to be clear about why they are doing it. This will also ensure that methods and tools are selected that will be appropriate and lead to the expected outcomes.

Adaptation planning, generally defined, refers to the proactive process of designing plans that will enable a group of people to adapt to climate change. It could refer to the building of infrastructure to protect coastal areas from storm surges or to enhancing the capacity of people to respond to slow-onset hazards and change. Some definitions of adaptation planning assume more steps than described by the MRC framework, and others assume less. In all cases, it is important to exercise caution when choosing approaches from the ‘toolbox’, as many of these may not use the same definitions as applied by the user.

This review has shown that there are many methods and tools available for adaptation planning and that there are various limitations to their application. For the Mekong countries, it is likely that methods and tools related to water, agriculture, coastal zones and disaster risk will be the most relevant. Guidance on how to select approaches is lacking, and an assessment of possible methods and tools would be useful to help fill this gap. A set of criteria for selecting methods and approaches have been developed in this review that could be used for the Mekong countries. Developing a criteria matrix based on this for selecting methods and tools would be a useful approach to fill this gap.

Countries in the region should consider carefully the following aspects when selecting approaches for adaptation planning:

- Data available and data needed;
- Skills needed to apply the approaches;
- Selecting the simplest tool available that provides the outputs needed – there is no need to apply the most complex approach if a simple one can provide sufficient outputs;
- The time available and the time needed to implement the approach.

Finally, because experience applying these methods and tools is scarcely documented, a mechanism allowing for these experiences to be shared across communities, countries and regions would be useful. Clearly networks/platforms like the Regional Climate Change Adaptation Knowledge Platform for Asia, the MRC Climate Change Adaptation Initiative and the APWF knowledge hub on climate change could contribute to fulfilling this role.

8 References

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Annex I. Additional definitions

Adaptive capacity

Adaptive capacity refers to the degree to which individuals or groups can adapt to risk at any given time. Usually, adaptation projects aim to enhance adaptive capacity, because adaptation is a long-term process beyond the temporal scope of any project.

Climate change and climate variability

Climate change involves a change in climate parameters, such as temperature and precipitation, in terms of timing, magnitude, distribution or all three. This change is measured in terms of how it differs from average values, as well as discrepancy with “normal” climate variability, which refers to the ‘variations in...climate...beyond that of individual weather events’, according to the IPCC. Climate change generally refers to human-induced changes. Importantly, UNFCCC addresses only climate change. The IPCC defines climate change as ‘a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use’.

Extreme events

An extreme weather event is an event that is rare within its statistical reference distribution at a particular place. Definitions of ‘rare’ vary, but an extreme weather event would normally be as rare or rarer than the 10th or 90th percentile. By definition, the characteristics of what is called extreme weather may vary from place to place, but generally refers to natural hazards of abnormal proportions in terms of magnitude.

Impacts

Impacts refer to the way in which human or natural systems are affected by climate change. Often, reference to impacts refers also to secondary and tertiary consequences. For example, an impact of climate change will be less rainfall, and the consequence of this will be lower crop productivity. Usually, it is the reduced productivity that is of interest, from an anthropocentric perspective. Consequences of this will include food insecurity, hunger or famine.

Risk

Risk is used in many different contexts. In terms of environmental change, it either refers to the threat posed by a change, i.e. the probability of an adverse impact. Climate change risk is a function of the magnitude of an individual hazard and degree of vulnerability of a system in question to that hazard, according to the conceptual equation $\text{Risk} = \text{Hazard} \times \text{Vulnerability}$. Generally, unless someone is vulnerable to the hazard, there is no risk implied.

Disaster risk reduction

Disaster risk reduction includes the suite of interventions, approaches and policy frameworks needed to avoid or minimise the impacts of natural hazards on societies and the environment, focusing on reducing vulnerability to hazards. Disaster risk reduction includes the concept of disaster accumulation, i.e. it reflects that each disaster event reduces the ability to cope with the next event.

Mitigation

An anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks.

Hazards

Hazard is a physical event (natural hazard) that can pose a threat to a system if the system is vulnerable to the hazard. Hazards discussed in the climate change context include floods, cyclones, hurricanes, typhoons, droughts, hail or snow storms, etc. Hazard is often used in a way that implies risk, but in reality if a flood occurs in an area that is not vulnerable to floods, there is no risk involved. Of course, risk without hazard is not possible, and therefore hazard is conceptually linked with damage and loss.

Annex II. Details of projects

Title	Brief description
Vulnerability Assessment	
Men and Women's Participation in Disaster Risk Management: A Case Study of Flood-prone Area of Peam Ro and Preah Sdach Districts, Prey Veng Province, Cambodia	This research study aims to assess the impact of floods on villagers residing in the flood-prone area of Peam Ro and Preah Sdach Districts, Prey Veng Province, Cambodia. The study will look at health conditions, epidemics, and the differences in the roles of men and women at coping with disasters.
Bangkok Assessment Report on Climate Change 2009	The Bangkok Assessment Report on Climate Change 2009 was produced under the partnership of UNEP, BMA and GLF to assess climate change impacts, to support decision makers in understanding the need for urgent action and to mobilize public awareness and participation.
Vulnerability assessment of Climate Risks in the Lower Songkram River Basin, Thailand	As a part of the GEF funded, Mekong Wetlands Biodiversity Conservation and Sustainable Use Programme (MWBSP), a joint programme of the four governments of Cambodia, Lao PDR, Thailand and Viet Nam, managed by the United Nations Development Programme (UNDP), the World Conservation Union (IUCN) and the Mekong River Commission (MRC), IUCN has participate in a dialogue focusing on water and climate change in the Lower Mekong Basin. The ongoing dialogue aims to infuse climate change concerns into the decisions made by water managers and policy makers, and to help local communities cope with and adapt to increasing climatic variability. Assessing vulnerability is a key component of this initiative. The Thai assessment is one of three case studies that aims to assess the potential consequences of climate change on wetlands communities and livelihoods. As in the other studies conducted in Cambodia and Laos, initial attention is given to understanding vulnerability and adaptations to current climate variability.
Climate Change Impacts in Huong River Basin and Adaptation in Its Coastal District Phu Vang, Viet Nam	Major activities of first phase were to: Collect and analyze data on meteo-hydrological factors and natural conditions in the study area; and Assess the impacts of climate change on water resources by conducting water and climate change modelling for the Huong River Basin as well as Develop the stakeholder action plan (SAP) for one commune in Phu Vang district.
VIE Study on Climate Impact Adaptation and Mitigation in Asian Coastal Mega Cities, Ho Chi Minh City (HCMC), Phase II	Evaluation of climate change impacts (from social, economic, and environmental viewpoints) was conducted on the basis of stylized scenarios city-level strategies for implementation in the short-, medium- and long-term to make adaptation and coastal zone development plans more robust to climate change and to increase the resiliency.

Title	Brief description
Vulnerability Assessment	
Climate Change Adaptation in the Lower Mekong Basin: Summary of Findings and Outlook (MRC-GTZ Watershed Management Project, 2008)	Two pilot sites were studied in Laos and Cambodia to study local impacts of climate change and adaptation.
Climate Risk Management Assessment for Agriculture in Thailand & Viet Nam	The project was aimed to assess scientific, technical and socioeconomic information relevant for the understanding of climate change, and its potential impacts and options for adaptation and mitigation.
Climate Risks and Rice Farming in the Lower Mekong River Countries (2006)	The assessment was conducted through household interviews and focus group meetings to generalise commonalities and differences in measures used for managing climate risks by farmers across the study sites.
Impacts of climate change and development on Mekong flow regimes First assessment – 2009	Two scenarios were compared to assess the impacts of climate change on the flow regime in the Lower Mekong Basin.
Water and Climate Change in the Lower Mekong Basin: Diagnosis & Recommendations for Adaptation	The analysis of the hydrological impacts of climate change indicate that climate change is likely to bring remarkable changes to the Mekong River Basin, with most remarkable impacts being felt in the longer term.
Climate change adaptation to drought and its implication to disaster management: Focus on the Mekong region	The goal of this project is to study the interrelationship of environmental impacts in form of drought, and to suggest possible mitigation measures as local government policy options, and prepare a community adaptation model.
Climate Change Vulnerability Mapping for Southeast Asia	This assessment was carried out by overlaying climate hazard maps, sensitivity maps, and adaptive capacity maps following the vulnerability assessment framework of the United Nations' Inter-governmental Panel on Climate Change (IPCC).
Children's participation in community-based disaster risk reduction and adaptation to climate change in El Salvador and the Philippines	Activities for vulnerability and capacity assessment such as hazard identification and ranking grids, mapping vulnerabilities and capacities in the community, stakeholder analysis and mapping, group timelines, guided walks, and poems were provided for children in community-based disaster risk reduction and adaptation to climate change.
Comparative Analysis of Disaster Risk Management Practices in Seven Megacities	Risks were identified and assessed for any disaster risk reduction process. The objective is to identify parameters of sound practice and assess impediments to the implementation of DRM in complex urban areas (i.e. megacities). Because they are most relevant to the city-level conditions, three thematic areas out of five suggested in the ISDR1 approach were used in this study. These are: Political Commitment, Risk identification and Institutions, and Knowledge Management. The cities are Metropolitan Manila, Mumbai and Kathmandu in Asia; Bogotá and Quito in the Americas; and Tehran and Istanbul in the Euro-Mediterranean region

Title	Brief description
Vulnerability Assessment	
Impact of Sea Level Rise (SLR) on Land Use Suitability and Adaptation Options	The study has developed the framework for assessment of climate change induced SLR and its impacts on land suitability in the context of the southwest region of Bangladesh.
Empowering women as community leaders in disaster risk reduction in India	Participatory Vulnerability Analysis (PVA) of local risks and underlying vulnerabilities were conducted continuously.
Vulnerability Assessment and Adaptation Planning	
Climate Change Impacts and Adaptation Strategies for the Rural Infrastructure Sector in Lao PDR	Assessment of the flood risk and possible economic impacts of flooding by considering various expectations about both climate change and socio-economic development in 2010-2100 timeframe.
Climate Impact and Adaptation Sectoral Strategy for Rural Infrastructure in Lao PDR	An impact and adaptation risk-based approach designed to support priority rural infrastructure and agricultural outputs in southern Lao PDR.
Livelihood adaptation to climate variability and change in drought-prone areas of Bangladesh	This project aims to assess the current vulnerability, assess future climate risks and design adaptation strategy in drought-prone areas of Bangladesh
Livelihood Adaptation to Climate Change in Bangladesh	The project has established a strong, collaborative institutional mechanism for the identification, validation, testing, evaluation and sharing of adaptation options which brings together farmers, staff from various government line agencies, national research institutes and civil society organizations.
Adaptation Planning	
The Pilot Program for Climate Resilience (PPCR)	The PPCR will be transformational by piloting and demonstrating approaches for the integration of climate risk and climate resilience into core development policies, planning and budgeting, and to strengthen related capacities at the national and regional levels. Country programmes in Bangladesh, Bolivia, Cambodia, Mozambique, Nepal, Niger, Tajikistan, Yemen and Zambia
Disaster Risk Reduction and Tsunami Early Warning Systems in Thailand: a case study on Krabi Province	National efforts to develop an EWS in Thailand are undertaken in the context of the establishment of the Indian Ocean Tsunami Warning System (IOTWS) initiated at the World Conference for Disaster Reduction in 2005 under the leadership of the United Nations Education Scientific and Cultural Organisation Intergovernmental Oceanographic Commission (UNESCO/IOC).
Ho Chi Minh City Adaptation to Climate Change Study	The overall objective of the HCMC Adaptation to Climate Change Study is: To assist HCMC to develop effective approaches to strengthen adaptation and amelioration capacities against the impacts of climate change and variability.

Title	Brief description
Adaptation Planning	
Viet Nam's Community Based Adaptation Country Programme Strategy (CBA CPS)	CBA in Viet Nam will give priority to projects which demonstrate community-based cost effective CC adaptation measures aiming to mitigate negative impact of CC, focusing on droughts and salinisation, for sustainable agriculture development through an integrated management of biodiversity, land and water resources.
MRC Flood Management and Mitigation Programme	The programme is a Regional Flood Management and Mitigation Centre, which provides technical and coordination services to the four countries in the Lower Mekong Basin.
Support to the Ehance Capacity Programme on Linking Information and Decision Making to Improve Food Security for Selected Greater Mekong Subregional Countries	This project aimed to enhance national and regional capacities to provide timely information and analysis for impending food and agricultural crises.
Designing adaptation strategies for vulnerable women: Analyzing and understanding the causes of vulnerability to climate change	This project aimed to provide vulnerable women with a chance to develop and voice their unique concerns in Tajikistan and Africa
Mainstreaming Climate Change Adaptation in Irrigated Agriculture Project	The project will Increase the awareness about 1) upscaling and improving 2) quality and safety and 3) efficiency and reliability of pico-hydropower technology.
Participatory rice variety selection in Sri Lanka	Hambantota District is a major paddy (rice) producing area in the southern coastal region of Sri Lanka. Communities here have been experiencing salt water intrusion into their rice fields, leading to reduced yields. This has been caused largely by seawater contamination of irrigation systems. Farmers had been using saline-resistant varieties developed at the rice research station, Ambalantota, but in badly affected areas these varieties were still failing. This article focuses on work done to identify traditional rice varieties suitable for cultivation in the degraded paddies through a process of participatory research.
Reducing Vulnerability to Climate Change (RVCC) Project in Southwest Bangladesh	The project focuses on three main areas: raising awareness of the expected impacts of climate change and possible solutions; building capacity at the household and community levels; and advocating with local, regional and national government to take appropriate action to reduce climate-related vulnerability
Implementation of Adaptation Options	
Lao PDR: Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts	The proposed project will implement the top priority identified in the Lao People's Democratic Republic (Lao PDR) National Adaptation Programme of Action (NAPA), which was finalised and submitted to the UNFCCC on 22nd May, 2009.

Title	Brief description
Implementation of Adaptation Options	
<p>Oxfam Disaster Risk Reduction and Climate Change Adaptation Resources: Case Study Jasmine Rice in the Weeping Plain: Adapting Rice Farming to Climate Change in Northeast Thailand</p>	<p>In consultation with farming communities and ENF, Oxfam decided to implement an initial one year pilot climate-change adaptation project for organic rice (May 2008 – March 2009). The project also received support from START (Global Change Systems for Analysis, Research and Training), which provided technical input on climate-change issues and supervised/commented on the adaptation process, as well as training project extension officers to interpret weather forecasts.</p>
<p>Project “STAAR” Southern Thailand Tsunami Affected Area Rehabilitation</p>	<p>The disaster risk management component is progressing well. Raks Thai Foundation is currently working in 16 coastal communities to increase community resilience to natural disasters.</p>
<p>Sustainable Livelihoods and Water Management in Shared River Basins</p>	<p>In Thailand, the Lower Songkram River Basin (LSRB) faces significant risks from ongoing land conversion activities and upstream dam construction by both China and Thailand. This adaptation pilot study was based in three villages, which experience different levels of flooding (locations: on the river bank, in the middle of flooded lands, and on somewhat higher ground).</p>
<p>Women’s Empowerment In Community Based Disaster Risk Management Through Tsunami Experience in Thailand</p>	<p>The Sustainable Development Foundation worked with the Save Andaman Network, a coalition of non-governmental organizations to help people on the Andaman coast to recover from the tsunami and strengthen their community. Over the past four years, the women from Ban Koh Muk and other island communities along the Andaman coast have expanded their traditional role as managers of households and keepers of the family to become community decision makers, advisers and business managers.</p>
<p>Preparing for Climate Change in Vietnam</p>	<p>In 2003 the Vietnam Red Cross was one of the first national societies of the Red Cross/Red Crescent to start a pilot project to integrate climate change into its existing disaster preparedness programs. By understanding the projected impact of global warming on the occurrence of extreme weather events, and adjusting disaster management programs accordingly, the Vietnam Red Cross aims to contribute to safer communities for people living in disaster prone areas.</p>
<p>Implementing Climate Change Adaptation in Nepal</p>	<p>This pilot project in Langtang National Park and Buffer Zone (LNPBZ) aims to combine local indigenous knowledge of natural resources with scientific evidence and new technologies to help local communities adapt to the detrimental effects of climate change.</p>
<p>Application of Community Based Adaptation Measures to Weather Related Disasters (WRDs): Preparation for the Potential Climate Change Signal</p>	<p>This project has the twin goals of initiating a collective disaster insurance scheme in Western Nepal and establishing communication between the National Meteorological Service of Nepal and the Community Based Disaster Preparedness (CBDP) Units.</p>

Title	Brief description
Implementation of Adaptation Options	
Homestead gardens in Bangladesh	The objective of homestead gardening is to provide vegetables throughout the year, primarily for household consumption and thereby contribute to family nutrition. The use of drought tolerant tree and vegetable species must be promoted. Surplus vegetables may be sold in the market for additional family income, which increases household resilience and flexibility to better cope with potential hazard impacts. Women are engaged in homestead gardening as an income diversification activity.
Capacity Building	
Short course on adaptation including 2 streams: 'Adaptation Principles and Planning' and 'Climate Information for Adaptation and Risk Communication	The training course is part of the inception phase of the Regional Climate Change Adaptation Knowledge Platform for Asia which is a three year programme being implemented by the Stockholm Environment Institute, the Swedish Environment Secretariat for Asia, the United Nations Environment Programme Regional Office for Asia and the Pacific and the UNEP/AIT Regional Resource Centre for Asia and the Pacific.
Management of Flash Floods- Capacity Building and awareness raising in the Hindu Kush Himalayas	ICIMOD has embarked on a number of initiatives aimed at reducing the vulnerability to flash floods in the Hindu Kush-Himalayan region, including developing a systematic inventory of glaciers and glacial lakes in the region, and identifying glacial lakes in danger of bursting.
Cyclone preparedness programme in Bangladesh	The BDRCS Cyclone Preparedness Programme (CPP) covers 11 districts in the coastal areas. Volunteers have been trained to play a crucial role in the dissemination of cyclone warnings, evacuation, rescue, first aid emergency relief and in the usage of radio communication equipment.
Strengthening National Capacities for Disaster Preparedness and Management in Cambodia	The project on Capacity-Building for Integrated Disaster Management has assisted NCDM in building the capacity of relevant staff of its four departments.
Capacity Building for Planning and Implementation of Flood Preparedness Programs at Provincial and District Levels in the Lower Mekong Basin (Phase II)	This training was that Emergency management systems in 3 riparian countries are more effectively dealing with floods in the Lower Mekong Basin.
Pico-hydropower innovation and capacity building program (pilot) in Laos	This project aimed to enhance national and regional capacities to provide timely information and analysis for impending food and agricultural crises.
Vulnerability, adaptation and resilience to climate risks: an assessment of education and training capacities and needs in southeast Asia	In this workshop we hope to build on these foundations and the expertise of other partners to design longer-term programs and support for capacity building with respect to vulnerability, adaptation and resilience to climate change risks.

Annex III. List of climate adaptation actions

Date	Workshop Title / Link	Report/ file saved
Scoping Adaptation Methods/Tools and Project/Strategy		
28-30 May, 09 Berlin, Germany	Workshop Mainstreaming Adaptation to Climate Change http://www.gtz.de/en/themen/umwelt- infrastruktur/27616.htm	http://www.gtz.de/de/dokumente/en- climate-mainstreaming-adaptation- workshop-report.pdf
11-12 Apr, 07 Geneva, Switzerland	Sharing Climate Adaptation Tools: Improving decision-making for development http://www.iisd.org/publications/pub. aspx?id=872	http://www.iisd.org/pdf/2007/ sharing_climate_adaptation_tools.pdf
Vulnerability Assessment		
10-12 Mar, 09 Havana, Cuba	Workshop on integrating practices, tools and systems for climate risk assessment and management and disaster risk reduction strategies into national policies and programmes http://unfccc.int/adaptation/nairobi_ work_programme/workshops_and_ meetings/items/4742.php	http://unfccc.int/resource/docs/2009/ sbsta/eng/05.pdf
21-23 Sep, 06 Accra, Ghana	UNFCCC African Regional Workshop on Adaptation http://unfccc.int/adaptation/adverse_ effects_and_response_measures_ art_48/items/3743.php	http://unfccc.int/resource/docs/2007/ sbi/eng/02.pdf
26-29 Sep, 00 Malaysia	Regional Exchange Workshop on Climate Change for the Asian Region http://www.undp.org/cpr/disred/ documents/wedo/icrm/rep_malaysia. pdf	http://www.undp.org/cpr/disred/ documents/wedo/icrm/rep_malaysia. pdf
Vulnerability Assessment and Adaptation Planning		
4-7 Mar, 08 Mexico City, Mexico	UNFCCC expert meeting on methods and tools and on data and observations, under the Nairobi work programme on impacts, vulnerability and adaptation to climate change http://unfccc.int/adaptation/nairobi_ work_programme/workshops_and_ meetings/items/4259.php	http://unfccc.int/resource/docs/2008/ sbsta/eng/03.pdf

Date	Workshop Title / Link	Report/ file saved
Vulnerability Assessment and Adaptation Planning		
14-15 Sep, 09 Utrecht, the Netherlands	Workshop ‘Science-Policy interactions in national adaptation policy’ http://knowledgeforclimate.climateresearchnetherlands.nl/25222857-Workshop_Science_Policy_interactions.html	-
24-25 Jun, 08 Tirana, Albania	International Roundtable “Water and Climate Change in Southeastern Europe: Understanding Impacts & Planning for Adaptation” http://www.watersee.net/water-and-climate-change.html	http://www.watersee.net/files/albania/15_Tirana_Closing.pdf
Vulnerability Assessment, Adaptation Planning and Implementation of Adaptation Options		
11-13 Apr, 07 Beijing, China	UNFCCC Asian Regional Workshop on Adaptation http://unfccc.int/adaptation/adverse_effects_and_response_measures_art_48/items/3932.php	http://unfccc.int/resource/docs/2007/sbi/eng/13.pdf
18-20 Apr, 06 Lima, Peru	UNFCCC Latin American regional workshop on adaptation http://unfccc.int/adaptation/adverse_effects_and_response_measures_art_48/items/3719.php	http://unfccc.int/resource/docs/2006/sbi/eng/19.pdf
Adaptation Planning		
12-14 Oct, 09 Bangkok, Thailand	Technical workshop on advancing the integration of approaches to adaptation planning http://unfccc.int/adaptation/nairobi_work_programme/workshops_and_meetings/items/4915.php	No report available on UNFCCC website but IISD’s http://www.iisd.ca/download/pdf/enb12440e.pdf
10-12 Sep, 07 Rome, Italy	UNFCCC workshop on adaptation planning and practices under the Nairobi work programme on impacts, vulnerability and adaptation to climate change http://unfccc.int/adaptation/nairobi_work_programme/workshops_and_meetings/items/4036.php http://www.iisd.ca/climate/cawro/	http://unfccc.int/resource/docs/2007/sbsta/eng/15.pdf
14-17 Apr, 09 Tokyo, Japan	Regional Workshop on Mainstreaming Climate Change Adaptation into Developmental Planning http://www.adbi.org/event/2886.regional.workshop.climate.change.adaptation/	http://www.adbi.org/files/workshop.climate.change.summary.proceedings.pdf

Date	Workshop Title / Link	Report/ file saved
Adaptation Planning		
3-5 Mar, 09 Pretoria, South Africa	Mainstreaming Climate Change Adaptation Learning Exchange <i>A joint GEF IW:LEARN/InWent Learning Exchange addressing climate change adaptation considerations and the need to mainstream it into international waters management</i>	http://74.125.153.132/search?q=cache:CkkRw6Y9XjMJ:www.iwlearn.net/abt_iwlearn/pns/learning/climate-change-adaptation-exchange/mainstreaming-climate-change-in-international-water-projects-implementation-workshop-proceedings+Mainstreaming+Climate+Change+Adaptation+Learning+Exchange+workshop+report&cd=2&hl=en&ct=clnk&gl=th
6-7 Mar, 08 Seattle, Washington	MPO Peer Workshop On Planning For Climate Change http://www.fhwa.dot.gov/planning/metro/mpoclimstlwa.htm#a10	http://www.fhwa.dot.gov/planning/metro/mpoclimstlwa.htm#a10
Adaptation Planning and Implementation of Adaptation Options		
24-28 Feb , 07 Dhaka, Bangladesh	The 2nd International Workshop on Community Based Adaptation to Climate Change http://www.iisd.ca/yimb/sdban/	http://www.iisd.ca/download/pdf/sd/ymbvol135num1e.pdf
18-24 Feb, 09 Dhaka, Bangladesh	Third International Conference on Community-Based Adaptation to Climate Change http://www.iisd.ca/yimb/sdcab/	http://www.iisd.ca/download/pdf/sd/ymbvol135num2e.pdf
21-27 Feb, 10 Dar es Salaam, Tanzania	The 4th International Conference on Community Based Adaptation (CBA) to Climate Change http://www.iied.org/climate-change/key-issues/community-based-adaptation/cba-conference-2010	http://www.iisd.ca/download/pdf/sd/ymbvol135num3e.pdf
27-30 Apr, 09 Ouagadou- gou, Burkina Faso	International Workshop on Adaptation to Climate Change in West African Agriculture http://www.wmo.int/pages/prog/wcp/agm/meetings/iwacc08/index_en.html	No report available, only workshop declaration http://www.wmo.int/pages/prog/wcp/agm/meetings/iwacc08/documents/Ouagadougou_declaration_en.pdf



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