

# Mainstreaming climate change adaptation into development planning

Louis Lebel, Lailai Li, Chayanis Krittasudthacheewa, Muanpong Juntopas,  
Tatirose Vijitpan, Tomoharu Uchiyama, and Dusita Krawanchid



**ADAPTATION  
KNOWLEDGE  
PLATFORM**



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

# Acknowledgements

---

Thanks to the partners of the Adaptation Knowledge Platform for sharing documents related to the 2010 forum and follow-up events. Thanks also to editors and reviewers Marion Davis, Skye Turner-Walker, Paul Bulcock and Albert Salamanca whose corrections and queries greatly improved the clarity of the text.

## Mainstreaming climate change adaptation into development planning

Louis Lebel<sup>1</sup>, Lailai Li<sup>2</sup>, Chayanis Krittasudthacheewa<sup>2</sup>, Muanpong Juntopas<sup>2</sup>, Tatirose Vijitpan<sup>3</sup>, Tomoharu Uchiyama<sup>4</sup>, and Dusita Krawanchid<sup>2</sup>

<sup>1</sup> Unit for Social and Environmental Research (USER), Faculty of Social Sciences, Chiang Mai University, Chiang Mai, Thailand

<sup>2</sup> Stockholm Environment Institute (SEI), Chulalongkorn University, Bangkok, Thailand

<sup>3</sup> Mekong River Commission, Vientiane, Lao PDR

<sup>4</sup> School of Global Environmental Studies, Kyoto University, Japan

### Abstract

Mainstreaming adaptation into development planning has been promoted as an effective way to respond to climate change. The expected benefits include avoided policy conflicts, reduced risks and vulnerability, greater efficiency compared with managing adaptation separately, and leveraging the much larger financial flows in sectors affected by climate risks than the amounts available for financing adaptation separately. This report reviews the main approaches proposed and lessons learned from relevant experiences in the Asia-Pacific region. A regional forum convened by the Adaptation Knowledge Platform and its partners, held at the United Nations Conference Centre in Bangkok in 2010, provided the starting point for this analysis.

Mainstreaming adaptation is a multi-level process. Planning at the national level provides the overall framework within which sectoral and other sub-national levels operate. The national level is where the policy goals from long-term visions and national development strategies are translated into actions plans and budgets. Key planning interventions including applying a climate lens to sectoral plans and initiating new programmes to enable adaptation which may, for example, reallocate funds to more vulnerable sectors or regions. Within a sector there are also several entry points. First, during sectoral policy formulation and planning, a climate lens could be applied to avoid maladaptation and to identify potential opportunities resulting from climate change. Second, during the planning stage, interventions could include specific adaptation activities. Third, during resource allocation, programme screening can be used to assess whether project proposals should include climate change risks. Finally, monitoring and evaluation activities should be introduced to track the performance of adaptation measures and interventions. Of course the details of planning processes and capacities vary substantially among countries. Nevertheless, there are many common constraints and opportunities and thus strategies that can help mainstream adaptation to climate change.

**Suggested citation:** Lebel, L., L. Li, C. Krittasudthacheewa, *et al.*, 2012. Mainstreaming climate change adaptation into development planning. Bangkok: Adaptation Knowledge Platform and Stockholm Environment Institute. 32 pp.

### Copyright © SEI 2012

This publication can be electronically downloaded from the [www.sei-international.org](http://www.sei-international.org) and [www.asiapacificadapt.net](http://www.asiapacificadapt.net)

This digital publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, provided acknowledgement of the source is made. The Regional Climate Change Adaptation Knowledge Platform for Asia would appreciate receiving a copy of any publication that uses this report as a source.

# Contents

---

<i>1 Introduction</i>	3
<i>2 Mainstreaming and adaptation</i>	4
<i>3 Development planning</i>	6
3.1 Guides	6
3.2 Levels	9
<i>4 National level</i>	10
4.1 Poverty reduction	11
4.2 National development plans	11
<i>5 Sector-level</i>	13
5.1 Disaster risk reduction	13
5.2 Water resources management	14
<i>6 Sub-national level</i>	16
6.1 Urban planning	16
6.2 Local area-based planning	17
<i>7 Lessons learned and strategies</i>	18
7.1 Inform and engage	18
7.2 Screen and assess	19
7.3 Allocate and coordinate	19
7.4 Review and learn	20
<i>8 Limitations and conclusions</i>	21
Acknowledgements	22
References	23

# 1 Introduction

---

In recent years, there has been a growing push to “mainstream” climate change adaptation into development planning, to avoid working at cross-purposes and more efficiently use resources. This report reviews the main approaches proposed and lessons learned from relevant experiences in the Asia-Pacific region.

Home to over one billion people, and to 60 per cent of the world's poor (UNESCAP, 2009), the Asia-Pacific region is widely viewed as vulnerable to climate change (ADB 2009a, 2009b; USAID 2010:1; World Bank, ADB, and JICA, 2010). The rural poor in developing countries are vulnerable, as they depend on the productivity of climate-sensitive ecosystems for their livelihoods, including agriculture and fisheries. The urban poor are vulnerable to infrastructure and land development decisions that drive settlements into areas that are already exposed to flooding, landslides, and other climate-related disasters, or likely to become so. In both realms, poverty hinders access to education, health care and other important services and resources. Additionally, poor countries often lack the knowledge and resources to adequately adapt to growing climate-related risks, building up an “adaptation deficit”. In this context, climate change exacerbates what are already significant challenges, and adds another layer of risk and uncertainty to efforts to achieve sustainable development.

There is a growing need for policy-makers, particularly in the ministries related to development such as in finance or planning, to better understand how climate change adaptation can be addressed in national and sub-national planning processes, and through fiscal and investment decisions. For example, when making decisions on long-lived infrastructure, it may be more cost-effective to take adaptation needs into account earlier rather than later (Agrawala and van Aalst, 2008).

The analysis that follows grew out of a regional forum convened by the Adaptation Knowledge Platform (AKP) and its partners (AKP, 2010b) and held at the United Nations Conference Centre in Bangkok in 2010. Participants embraced the notion of mainstreaming adaptation, and explored the options in detail.



# 2 Mainstreaming and adaptation

Broadly speaking, “mainstreaming” entails the integration of adaptation to climate change into development planning. Part of the idea is that it is often easier to start with existing policies and practices, rather than creating new ones. Mainstreaming can therefore save money by making more efficient use of scarce resources, rather than building separate institutions and processes to support adaptation. This should also help to avoid conflicting policies. The notion of mainstreaming is not new. Similar approaches have been taken to gender equality, responses to HIV/AIDS, and on environmental and poverty reduction issues. From those experiences, it may be possible to extract useful lessons for climate change adaptation efforts. For instance, mainstreaming was established as a global strategy for the promotion of gender equality via the Platform for Action at the fourth World Conference on Women, held in Beijing in 1995 (UN, 1996). Ten years later, it had become an important element of many policies. However, implementation was inconsistent, and the outcomes for gender equality remained largely unknown (Moser and Moser, 2005). Many barriers to mainstreaming gender have been identified including a lack of meaningful participation and political commitment as well as persistent practices within organisations that continue to discriminate against women (Kusakabe, 2005).

Another example is the Poverty-Environment Initiative, a joint effort between the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). This initiative has promoted the mainstreaming of poverty and environment linkages in national development planning (UNDP-UNEP, 2008). Economic arguments have played an important role in these efforts, but they have not fully succeeded in promoting recognition of the value of ecosystem services and environmental protection for human development.

Climate change could significantly undermine development by threatening critical resources, especially water, and increasing the incidence and severity of natural disasters. Given the urgency of the problem, it is essential to reduce greenhouse gas emissions and slow global warming. This is what is known as mitigation, and it has been the priority of international climate policy for many years. More recently, in recognition that some climate impacts are now unavoidable, there has been a growing push for adaptation, in effectively responding to climate change to minimise impacts on both people and ecosystems (see Box 1). Both are vitally important, as UNEP Executive Director Achim Steiner highlighted at the 2010 Forum, “Adaptation is not the poor cousin of climate change mitigation” (AKP, 2010b:1)

## Box 1 Climate change adaptation and mitigation

There are two main ways of responding to climate change: mitigation and adaptation. The Intergovernmental Panel on Climate Change (IPCC) defines mitigation as “an anthropogenic intervention to reduce the anthropogenic forcing of the climate system, which includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks” (IPCC, 2007).

Adaptation, the IPCC has said, is the “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007).

Mitigation actions, such as a reduction of CO<sub>2</sub> emissions, tackle the causes of climate change. They may be undertaken at any level, from the local to the global, but their benefits are always global. In contrast, adaptation actions such as the replanting of mangroves, tackle the consequences of climate change, usually at the local or regional level. The resulting benefits accrue locally or regionally.

Given the limited economic resources available to combat climate change, one major policy challenge has been to determine what constitutes a socially, economically and environmentally justifiable mix of mitigation, adaptation and development policy, and how it can be achieved (Klein, Schipper and Dessai 2005).



Adaptation to climate change entails adjusting ecological or social systems in response to minimise damages from climate change. Although adaptation does not completely prevent the adverse impacts of climate change (Füssel, 2007), it can reduce those impacts and take advantage of opportunities to achieve positive outcomes. Yet, not all are equally well prepared to adapt: as adaptive capacity varies considerably depending on multiple variables, including socioeconomic conditions, state and availability of resources, and the integrity and quality of governance.

Adaptation efforts can therefore focus on building adaptive capacity, or on transforming that capacity into specific actions. An important part of adaptation is the strengthening of social-ecological systems, and fostering them to be more resilient. Another is investing in innovations with the potential to transform systems along more sustainable pathways. While some of the threats from climate change may be new, such as unprecedented climate conditions, many aspects of adaptation build on longstanding efforts, such as to reduce the risk of disaster or protect vulnerable coasts (Füssel, 2007). Accordingly, it is clear that adaptation has the potential to align closely with major development objectives (Klein, Schipper, and Dessai 2005; Schipper 2007; Schipper, Cigaran, and Hedger 2008).

Mainstreaming adaptation means acknowledging this insight and capitalising on it. From the perspective of government, the Poverty-Environment Initiative defines mainstreaming as “integrating considerations of climate change adaptation into policy-making, budgeting, implementation and monitoring processes at national, sector and subnational levels” (UNDP-UNEP, 2011). The process is seen as on-going, involving multiple stakeholders and contributing to human well-being.

Mainstreaming can also be a form of cross-sectoral policy integration (Dovers and Hezri, 2010). For example, there is a recognised need to take into account the potential long-term effects of climate change when making decisions concerning investments in long-lived infrastructure, or when providing development assistance that will shape future patterns of human settlement and livelihoods (Agrawala and van Aalst, 2008; World Bank, 2006). Similarly, mitigation strategies can and should be aligned with adaptation strategies, and vice-versa (Ayers and Huq, 2009; Hamin and Gurrán, 2009; Revi, 2008; Swart and Raes, 2007).

The expected benefits of mainstreaming climate change adaptation into development activities include avoided policy conflicts; reduced risks and vulnerability; greater efficiency compared to managing adaptation separately, and; leveraging the much larger financial flows in sectors affected by climate risks than the amounts available for financing adaptation separately (Agrawala, 2004; Srinivasan and Uchida, 2008). Climate change adaptation policies need not develop specific and detailed response options, but rather facilitate their development and implementation as part of existing sectoral policies (Dovers, 2009; Klein, Schipper, and Dessai 2005).

Mainstreaming adaptation is emerging as a significant policy discourse in the Asia-Pacific region. At the 2010 Adaptation Forum in Bangkok, Virachai Virameteekul, then Minister of Science and Technology, Thailand, argued that “adaptation can be used to meet the development needs of our countries” (AKP, 2010b).

# 3 Development planning

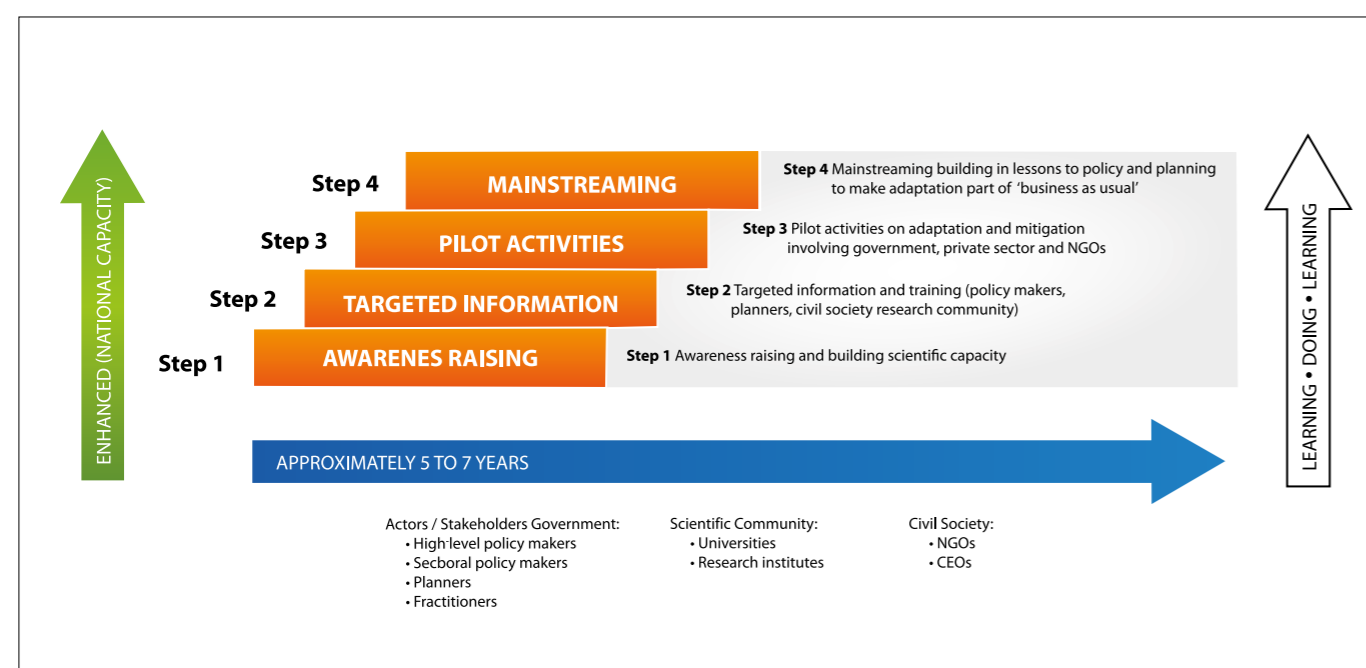
Development planning is a multi-level and multi-time scale activity that should be responsive to policy, and accountable to the public. Plans drive resource allocation, and national plans normally frame sectoral and sub-national plans. Therefore, the overall planning system can be rather complex.

Several guides or frameworks have been proposed on how to integrate climate change concerns into ongoing national development planning processes. This section focuses on how, and to what extent, such integration might assist governments. It begins with a brief review of a few illustrative guides of differing complexity, followed by a consideration of the implications for planning at different levels.

## 3.1 Guides

Huq and Ayers (2008) proposed a four-step framework for mainstreaming at the national level (Figure 1). An attractive feature of their framework is that it is simple and proposes a linear sequence of awareness and scientific capacity building, targeted information, and training of key stakeholders, which is followed-up with pilot studies to inform policy-makers and persuade them to incorporate the lessons learned into policy and planning. However, a lot of the framework remains unspecified. For example, there is no mention of governance, and little about planning or implementation; the focus is mostly on getting started. Lack of knowledge is assumed to be the main constraint, and participation is driven by instrumental concerns. In addition, there is no planned evaluation or policy review. Under the guide, pilot activities are intended to provide governments with experience, but it is not clear how mainstreaming will emerge from these activities, or how training and greater knowledge will lead to appropriate pilot projects.

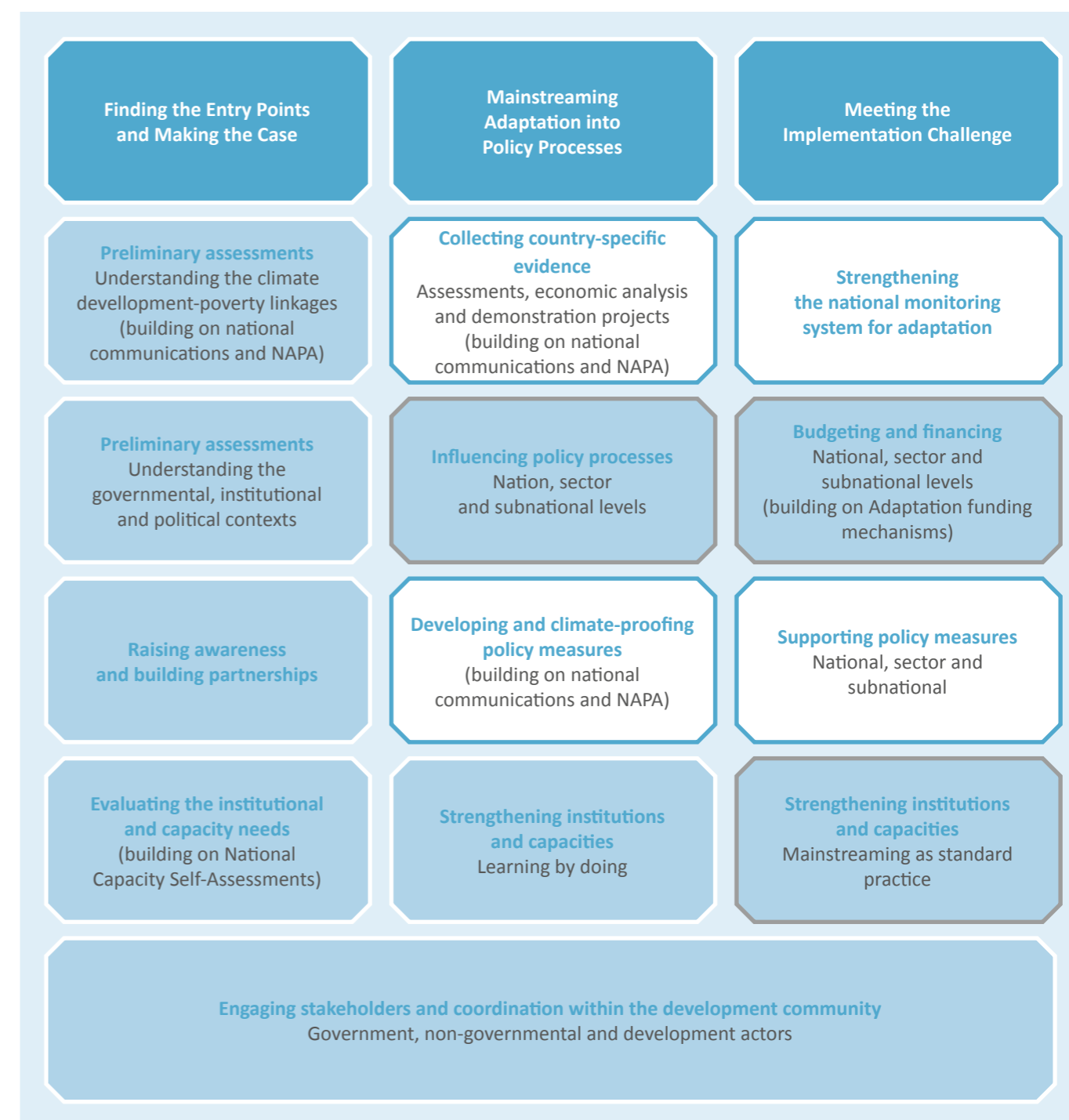
Figure 1. A simple step framework for mainstreaming (Huq and Ayers, 2008)



The second framework considered was broader and covered policy, planning and implementation. The Poverty-Environment Initiative guide for practitioners proposes a framework with three main components: 1) finding the entry points and making the case; 2) mainstreaming adaptation into policy processes, and; 3) meeting the implementation challenge (Figure 2) (UNDP-UNEP 2011). Stakeholder engagement is emphasised throughout the policy cycle, and the process is assumed to be iterative and integrative. The framework builds on experiences with poverty-environment mainstreaming, and this emphasis is apparent in the framework's sub-components, checklists and assessment questions.

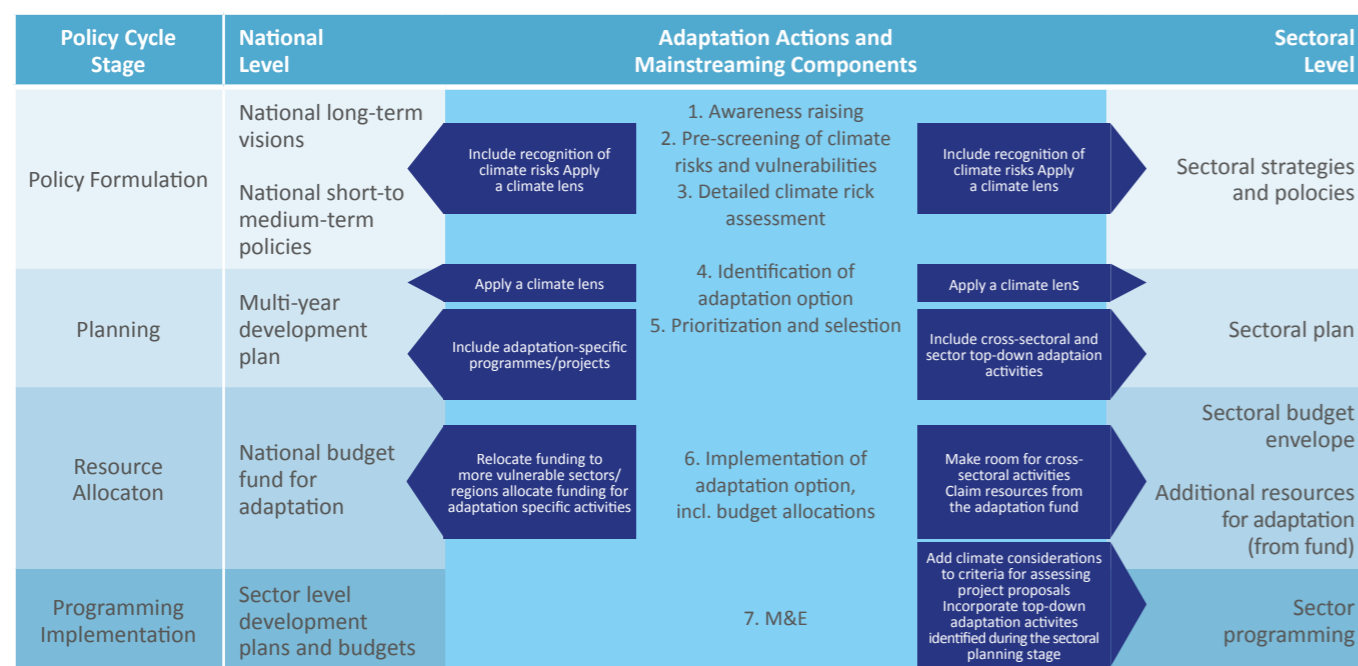
The first component of the framework identifies where to start mainstreaming and how to prepare for it. It has similarities to the step framework (Figure 1). At the national level, the framework places an emphasis on key strategy documents and budget allocation processes. Evidence from impact, vulnerability and adaptation assessments, analyses of the costs and benefits of adaptation options, and lessons learned from demonstration projects, should all be used to inform decisions on modifying policies or initiating new interventions.

Figure 2. Poverty-Environment Initiative framework for mainstreaming (UNDP-UNEP, 2011)



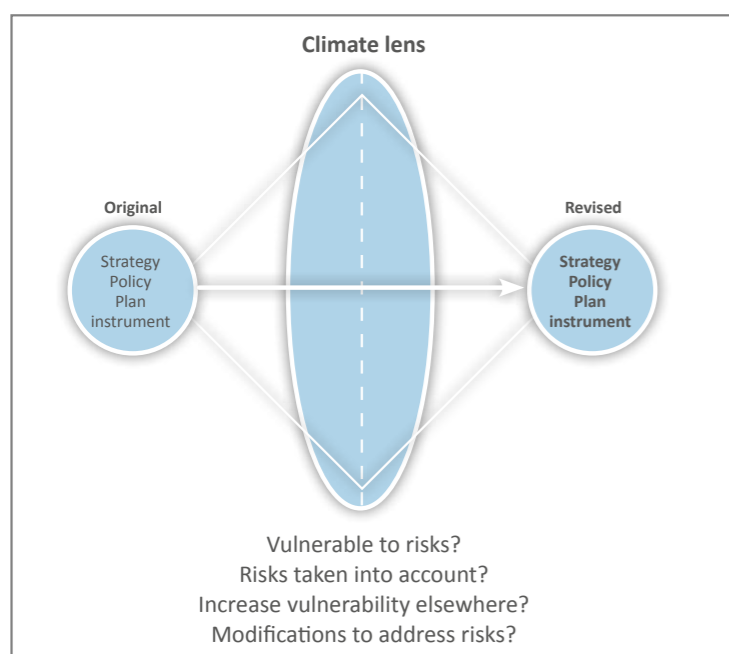
The third and final framework we considered was developed by the Organisation for Economic Co-operation and Development (OECD, 2009). This framework was comprehensive and oriented towards national policy and planning systems (Figure 3). It is also relatively complex. Under the framework, resource allocation is distinguished from planning. At the national level, the “whole of government” approach is recommended. This requires the involvement of key stakeholders, the improvement of coordination, and the implementation of related multilateral and regional environmental agreements. Relevant regulations and standards are reviewed and adjusted to reflect or take into consideration the impacts of climate change.

**Figure 3.** OECD framework for mainstreaming (OECD 2009; Olhoff and Schaer, 2010)



Strategies, plans, regulations and programmes are analysed through a “climate lens” in order to identify suitable entry points in the policy cycle (Figure 4). This entails gauging vulnerability to the impacts of climate change, the extent to which climate risks have been taken into consideration, whether a proposed measure could inadvertently exacerbate vulnerability, and whether the measure could be modified to better respond to climate risks and/or opportunities. The climate lens is a key element of this framework and can be applied through tools such as a strategic environmental assessment (UNDP-UNEP, 2011).

**Figure 4.** Climate lens (modified after OECD, 2009)



A clear advantage of the OECD framework compared with the four-step framework, is the explicit link to steps in planning and policy cycles; providing governments with recognisable “hooks” for mainstreaming actions. Planning is iterative and multi-level with both top-down frameworks and bottom-up projects. Adaptation and development strategies are integrated whenever possible. The emphasis is clearly on the technical and administrative dimensions of planning. Science inputs are valued but “contained” in specific steps and activities such as assessments. The identification and prioritisation of adaptation options could also provide opportunities for significant multi-stakeholder engagement, but it is not prescribed.

### 3.2 Levels

Development planning is multi-level (see Table 1). Mainstreaming adaptation into development planning will need to consider at least national, sectoral and sub-national levels. In some cases it may also be important to consider planning at the regional and international levels, for example, in respect to dealing with trans-boundary rivers (Lebel, Xu *et al.*, 2010). Planning at the level of individual local projects is also important, but due to space limitations, it is not considered further in this review. However, in Section 4, planning theory and practice at the three main national, sectoral and sub-national levels is examined.

The following sections examine key issues in mainstreaming climate change adaptation into poverty reduction and economic development plans, drawing on all of the three aforementioned frameworks, as well as on more project-oriented guidance notes prepared by the World Bank (World Bank, 2010).

**Table 1.** Entry points for mainstreaming at different planning levels (modified after UNDP-UNEP, 2011)

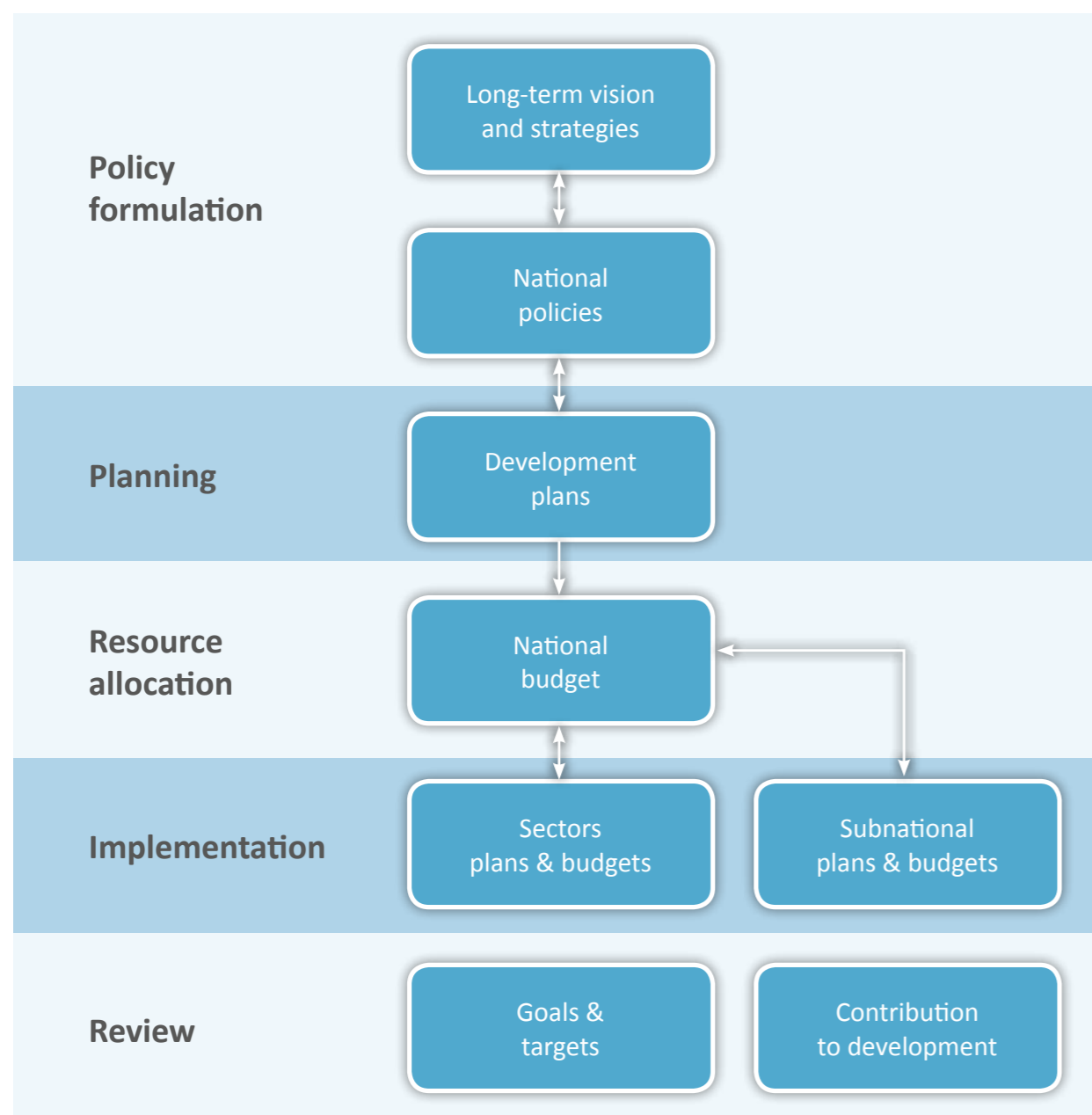
Planning level	Entry points
<b>National</b>	Poverty reduction strategy paper
	National development plan
	MDG-based national development strategy Budget allocation processes or reviews
<b>Sector</b>	Sector strategies, plans and policies
	Sector budgets
	Public expenditure reviews
<b>Subnational</b>	Decentralisation policies
	District plans
	Sub national budgets



# 4 National level

Planning at the national level is critical, as national government provides the framework within which other levels operate and the coordination of sector-specific policies (Table 1). The national level is where the policy goals from long-term visions and national development strategies are translated into actions plans and budgets. The national level is also important for international diplomacy and dealing with partners and donors. Key interventions at the national level include applying a climate lens to sectoral plans and initiating new programmes to enable adaptation. Plans are the basis for budget decisions that reallocate funds to more vulnerable sectors or regions (AKP, 2010b:4,6). To deal with climate change, new and/or more flexible funding mechanisms should be established to foster longer-term thinking and help cover the cost of integrating adaptation into development planning (OECD, 2009).

**Figure 5.** Generalised scheme of national development planning system (modified after OECD, 2009)



## 4.1 Poverty reduction

In developing countries, adaptation, poverty reduction and rural development are all strongly linked, as agriculture is highly climate-sensitive, and the poor are the most vulnerable (Kok and de Coninck, 2007). As a result, Poverty Reduction Strategy Papers are seen by many as useful entry points for mainstreaming (ADB, 2009a; Björklund *et al.*, 2009; UNDP-UNEP, 2011). However, it has also been noted that environment, natural resource and disaster management issues are rarely covered in these papers (Kok and Coninck, 2007; Nkem *et al.*, 2007).

In less-developed countries, grants and loans make up a significant fraction of financial flows. Analysis of official development assistance (ODA) and other official flows to Nepal suggest that as much as 50-65 per cent of ODA funding goes to activities that could be affected by climate change (Agrawala and van Aalst, 2008). Poverty reduction strategy papers for Nepal, however, have paid little attention to climate-related risks or the potential impacts of climate change (Agrawala, 2004). This is in contrast to Bangladesh, where the links between natural hazards and poverty are acknowledged, as are the potential impacts of climate change on the frequency of hazards.

The importance of addressing the impacts of climate variability in the context of poverty reduction is illustrated by the situation in the state of Maharashtra, India, where recently a prolonged drought severely affected around 15 million small-scale farmers. Historically, such droughts have occurred every 25 years, but climate projections suggest that their frequency will increase to once every 8 years. A combination of low-cost technical soil and water-conserving irrigation measures could offset most drought-related losses, but the first step is to acknowledge the need to adapt (UNDP-UNEP, 2011:37). Meanwhile, in Andhra Pradesh, paddy rice is currently grown in drylands as a result of government price-support policies. These policies hinder the switch to more drought-tolerant crops, such as millet, which is much more suitable for drylands. In this case, adaptation would be supported by removing a policy that encourages risky practices (World Bank, 2010).

## 4.2 National development plans

Many countries implement five, or ten-year plans, and these medium and longer-term national development plans could be key strategy documents in which to incorporate adaptation concerns. Yet, to date, such integration has been rare.

A review of major development plans and policies of the Philippines, published in 2009, found no evidence of mainstreaming (Lasco *et al.*, 2009). References to climate change adaptation were absent from key documents, and key stakeholders emphasised other priorities. At the same time, it was recognised that many infrastructure projects were being designed to withstand weather-related hazards. These projects could potentially integrate climate change and be entry points for adaptation into development planning.

The 2008 Bangladesh Climate Change Strategic Action Plan (MoEF, 2008) was a follow-up to the country's 2005 National Plan on Adaptation (NAPA), which despite initial acclaim, had failed to lead to many projects, and remained separate from normal government programmes. The 2008 Action Plan was meant to overcome this implementation gap, but was widely criticised for its lack of consultation with stakeholders, the vagueness of its lists of programmes, and failure to conduct a proper needs assessment or make use of the best available scientific knowledge (Alam *et al.*, 2011). In September 2009, a revised version of the plan was released by the new government with promises of further periodic reviews (Alam *et al.*, 2011; MoEF, 2009). This complex history underlines the importance of engaging with key stakeholders and encouraging local participation in adaptation planning.

In Vietnam, the National Target Programme to Respond to Climate Change was led by the Ministry of Natural Resources and the Environment. This programme was approved by the Prime Minister in December 2007, and it mentions disaster management in the context of climate change. However, Vietnam's official disaster plan, the National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020, approved just a month before the National Target Programme, does not explicitly address adaptation, although it does acknowledge climate impacts (Lebel, Sinh and Nikitina, 2010). The disaster plan also falls under the purview of a different government agency, the Ministry of Agriculture and Rural Development.

Achieving cross-sector policy integration has proved challenging in other countries as well. For instance, in Thailand, coordination of disaster management responsibilities lies with the Ministry of Interior, whereas climate change

policies are mainly overseen by the Ministry of Natural Resources and Environment. Thailand's Initial Communication under the United Nations Framework Convention on Climate Change (UNFCCC), highlighted the significant impact and costs of flood disasters (OEPP, 2000). The Department of Disaster Prevention and Mitigation (DDPM)'s 2006 Annual Report ranked the risk from floods as the highest priority for Thailand. However, it did not even mention climate change (DDPM, 2006). Subsequent versions do mention it, but the links to flood disaster risk management remain weak.

The adaptation elements of China's National Climate Change Programme focused on observing and assessing the impacts of climate change on water resources and agricultural production (China's Ministry of Science and Technology, 2007; Yu, 2004). Within China, some experts see the problem primarily as how to more closely align existing environmental protection, economic, and sustainable development strategies (Dongmei *et al.*, 2007). Recently, a World Bank-supported project has been attempting to mainstream climate change adaptation into China's Comprehensive Agricultural Development policy, aiming to intensify irrigated agricultural production (OECD, 2009; UNDP-UNEP, 2011: 42).

The Bangladeshi scientist Saleemul Huq has characterised adaptation as "sustainable development done well in a climate change context" (AKP, 2010b:8). National planning as a framework for sectoral and local plans needs to identify priorities, complementarities and trade-offs. It is also important to consider the long-term consequences of decisions. Both current and future climate-related risks need to be addressed in plans (Füssel, 2007).

# 5 Sector-level

Within many sectors, there are multiple stages in the policy cycle where the integration of adaptation may be plausible. First, during sectoral policy formulation and planning, a climate lens could be applied to avoid maladaptation, and to identify potential opportunities resulting from climate change. Second, during the planning stage, interventions could include specific adaptation activities. Thirdly, during resource allocation, project proposals could be screened to assess whether they need to address climate change risks. Finally, monitoring and evaluation activities should be introduced that track the performance of adaptation measures and interventions (OECD, 2009).

Sector planning is important because vulnerability and potential responses are often highly sector-specific. This is also a challenge for governance, as decision support tools need to be tailored to each sector. One typical strategy is to introduce climate change adaptation criteria into systems used to screen project proposals. In the following sections, some of the issues of integrating climate into sector planning are illustrated. Disaster and water management are used as examples as these are central to adaptation in the Asia-Pacific region (AKP, 2010a, 2010b, 2010e).

## 5.1 Disaster risk reduction

Many commentators have noted that existing policies to reduce the risk of climate-related disasters provide an obvious entry point for adaptation policies (ADPC, 2008, 2010; AKP, 2010e; O'Brien *et al.* 2006; Schipper, 2009; Schipper and Pelling, 2006; Thomalla *et al.*, 2006). Disaster agencies are increasingly looking for ways to reduce disaster risk, not just respond to disasters, and adaptation efforts share that risk-reduction goal. In addition, disaster risk reduction programmes are also fostering communication and engagement with local communities, which can in turn, support adaptation goals (Allen 2006; Handmer and Dovers, 2007). Yet, there are several challenges. First, disaster management has conventionally been concerned with emergency relief and recovery from discrete, individual, events. While, prolonged stress or gradual change such as droughts or a declining water quality have typically been the concern of other programmes (Lebel, Sinh and Nikitina, 2010). Second, responses tend to emphasise the importance of communication and logistics for early warning and emergency relief, rather than critical reflection or strategic planning that would reduce risks and vulnerability. Third, responsibilities for disaster risk reduction and climate policy typically lie within different ministries, making coordination much more difficult (DDPM, 2006; Lebel, Sinh and Nikitina, 2010; OEPP, 2000).

In Thailand, for example, the coordination of disaster management responsibilities lies with the Ministry of Interior, whereas climate policies are mainly overseen by the Ministry of Natural Resources and Environment. Similarly, in Vietnam, disaster management is overseen by the Ministry of Agricultural and Rural Development, whereby climate policy is the responsibility of the Ministry of Natural Resources and Environment (Lebel, Sinh, and Nikitina, 2010).

Yet, there are several positive trends. Thailand's Department of Disaster Prevention and Mitigation has successfully introduced two programmes in local communities: "One Tambon One Search and Rescue Team" (or OTOS), and "Mr and Mrs Early Warning". Efforts are also underway to facilitate more comprehensive community-based management initiatives in high-risk areas (Lebel, Krawanchid, *et al.*, 2010). In practice, however, integration has proven difficult as disaster management remains largely event-oriented and reactive, rather than proactive (Lebel, Manuta, and Garden, 2011; Lebel, Sinh, and Nikitina, 2010). Bureaucratic and cultural norms persist that treat disaster management as primarily a technical exercise in which stakeholders have a limited role, except as recipients of advice and aid.

Ecosystem-based adaptation is another dimension of disaster risk reduction, which is emerging within pilot projects and national policies. For instance, Cambodia, with support from UNEP and the Global Environmental Facility, is implementing coastal protection projects under its NAPA framework.





## Box 2 Climate change and climate variability

It is important to distinguish between climate change and climate variability when discussing adaptation. Climate is naturally variable, with hotter and colder years, droughts and periods of heavy rains, and in the longer term, even very significant shifts, such as the onset of ice ages. In recognition of this, the UNFCCC defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.” While in practice, a farmer may suffer just as much from a drought due to natural variability as from one due to climate change, adaptation funding through the UNFCCC is meant to address impacts from climate change in particular. In this context, mainstreaming can help bridge the gap between adaptation and more general resilience-building, and also ensure that funding limitations do not lead to overly narrow framing of programmes.

## 5.2 Water resources management

Water resources management is another promising entry point for mainstreaming climate change adaptation into development. Water resource planners often have substantial experience in dealing with climate-related variability in water flow (Lebel, Sinh and Nikitina, 2010; Pahl-Wostl *et al.*, 2011; van Beek, 2009). For instance, Cambodia received support for its NAPA and is now pursuing a project on integrated water resources planning for agricultural development (Biagani, 2007; Royal Government of Cambodia, 2006).

The challenge is that water management has traditionally been viewed by the governments as a technical planning exercise in optimising allocation and augmenting supply via the building of reservoirs, and the promotion of inter-basin transfers and irrigation schemes (Lebel, Dore, *et al.*, 2007; Molle, Foran and Kakonen, 2009). The emphasis on direct economic benefits of particular uses tends to ignore the burden and risks created by infrastructure to other users and ecosystems. A ‘command and control’ paradigm has predominated, with little stakeholder participation and centralised and hierarchical organisations that focus on goals and optimisation (Lebel, Sinh and Nikitina, 2010; Pahl-Wostl *et al.*, 2011).

Integrated water resources management (IWRM) has been touted as the solution for dealing with the complex problem of multiple water uses and users (Molle, 2008). The institutional response in many countries has been to enact overarching water laws, creating water departments and ministries, declaring basins as the units of management, and providing committees and organisations with varying levels of oversight, responsibility and decision-making authority (Abonyi, 2005; Biswas, Varis and Tortajada, 2005).

Experiences with IWRM could be valuable in developing adaptation strategies in the water sector for several reasons. First, by acknowledging multi-sector issues, it provides a foundation for considering the potential impacts of climate change induced shortages (Lebel, Manuta and Garden, 2011). Second, by considering links between land and water use, it opens up the possibility of considering landscape approaches and building resilience rather than in-stream infrastructure and modifications (Lebel, Foran *et al.*, 2009). Third, by introducing basin-level hierarchies, organisations are gaining experience in coordination between different levels and across administrative hierarchies, an important governance issue in building adaptive capacity (Adger, Arnell and Tompkins, 2005; Thomas, 2006).

In practice, the outcomes of IWRM reforms have often been disappointing (Biswas, Varis and Tortajada, 2005; Gyawali and Dixit, 2001; Molle, 2008; Thomas, 2006). One reason has been that insufficient attention was given to pre-existing institutions (Ganjanapan and Lebel, 2009). Existing institutions and networks may be helpful in building cooperation around new integrated goals, but past conflicts tend to present significant barriers to achieving this. Another problem is the persistence of powerful interests in large-scale infrastructure projects, which can discourage innovation.

More useful approaches for dealing with uncertainties include looking for “no-regrets strategies” that will yield benefits even if climate does not change; increasing safety margins in new investments when these are low-cost; favouring reversible and flexible options; promoting soft strategies such as those involving insurance or other institutional measures; and reducing decision time horizons so that decisions can be updated easily when



new information becomes available (Hallegatte, 2009). These strategies, all forms of adaptive governance, seem particularly useful for dealing with adaptation issues in the water sector (Pahl-Wostl, 2007; Pahl-Wostl *et al.*, 2011).

Adaptation planning is just beginning at the international level. As a result, international relations experts and ministries of foreign affairs are beginning to ask questions about the impacts of climate change on treaties and cooperation. Trans-boundary rivers are one obvious area where international adaptation planning may need to take place. For instance, the Mekong River Commission has recently launched a climate change adaptation initiative (MRC, 2009). In addition, international cooperation to build the capacities of Small Island Developing States in water resources management is one of the activities of the regional Secretariat of the Pacific Regional Environment Programme (AKP, 2010b:2).

# 6 Sub-national level

Sub-national level planning recognises that vulnerabilities and the capacity to respond are site-specific. Planning at this level can engage local government, businesses, NGOs and the community. Rural and urban development planning will often have a different emphasis. For instance, in rural areas the focus is likely to be on livelihoods, reducing poverty and improving access to public services. Meanwhile, in urban areas, the focus could be on improving infrastructure and building residents' resilience to hazards (UNDP-UNEP, 2011).

## 6.1 Urban planning

Municipal governments in developing countries typically have limited capacity and resources to effectively plan for climate variability and to provide basic public services (Sharma and Tomar, 2010). Impacts are often not well understood, and therefore, basic awareness-raising exercises and capacity-building may be required before mainstreaming can be considered. Moreover, adaptation planning must place an emphasis on meeting other immediate and pressing development goals.

In lower-middle income and developed countries there are more resources available for assessments that could provide inputs into planning. An assessment by the Bangkok Metropolitan Administration, considered the explicit changes to flood disaster management. These included a change in floodplain mapping to take into account that one in 100-year floods may now occur every 50 years; taking into account land-use restrictions for floodplains; infrastructure adjustments such as flood channels, dams and dykes; new programmes for disaster recovery and support at district level, and; the modification of disaster response protocols to take into account a potential increased frequency of flooding (BMA, GLF, and UNEP, 2009). However, effecting real change on the ground will not be easy. The agency's Director of Environment said the main barrier to adaptation was inflexible urban planning traditions that ignore the issue of climate: *"There are only three factors in these planners' minds: land utilisation, expansion of road networks, and recreation areas as required by law. Environment and global warming have yet to enter their minds"* (Tangwisutijit, 2007).

Australia's National Climate Change Adaptation Framework places a substantial emphasis on understanding vulnerability, disaster risks, and adaptation options at the local level (COAG, 2007). Planning responses of municipalities have included changes to infrastructure and disaster plans. For example, in the State of South Australia, local plans must include provisions for sea level rise and more intense storms, typically larger river floodplains and wetland preservation. In Queensland, building codes have been changed to reduce housing's contribution to the heat island effect.

Replacing relatively impermeable surfaces such as concrete with vegetation can help reduce an area's vulnerability to flash floods, a significant climate change concern for many cities (Lebel, Perez *et al.*, 2009). Vegetation can also help improve the quality of run-off. Rooftop gardens and trees planted along streets can help moderate local climate and reduce the need for air conditioning, simultaneously contributing to climate change mitigation efforts. Reducing urban heat-island effects can also be viewed as an adaptation to potential climate change induced heat waves. Urban spatial planning should take into account both adaptation needs and the contribution of mitigation measures (McGregor and Lebel, 2010; Swart and Raes, 2007). A review of policies in the U.S. and Australia found frequent trade-offs or policy conflicts (Hamin and Gurrán, 2009). For example, creating space for water to reduce flood impacts reduces urban densities and therefore increases the need for transport. Similarly, tree planting and green spaces require space. Many adaptation actions appear to require more space and necessitate a less densely built environment. Therefore, a more modular organisation of space where key urban functions are clustered may be part of the solution (Lebel, Garden *et al.*, 2007).

As Abel (2010) argues, development planning should view catastrophes "as opportunities for change, rather than signals to rebuild." The planned retreat behind restored or re-colonised coastal ecosystems is one potential adaptation option for human settlements in coastal zones vulnerable to sea level rise. Such a strategy requires substantial innovation in governance (Abel *et al.*, 2011), such as changing the rules and incentives for relocation as thresholds are reached.

The opportunities to re-structure the spatial layout of existing cities may be quite limited, given that a lot of land is privately owned. On the other hand, in newly urbanising regions, when transport infrastructure is laid out first, it can help guide subsequent patterns of urbanisation. Property and service markets invariably play an important role in fine-tuning urban land-use dynamics, automatically creating some degree of modularity with respect to key urban services and functions (McGregor and Lebel, 2010). In these types of adaptation measures, leadership is clearly important, whether it comes from mayors, scholars or others in the policy realm (Sanchez-Rodriguez, 2009). Finally, mainstreaming adaptation should lead to development that reduces the vulnerability of cities' poorest inhabitants and builds their capacity to adapt to a range of stresses and challenges, not just climate change (Pielke Jr *et al.*, 2007). At the 2010 Adaptation Forum, Governor Joey Salceda, from the Philippines, pushed participants to ask: "How can we be sure that we are not increasing vulnerability through our interventions?" (AKP, 2010b:10). This is also one of the key questions of the climate lens (Figure 4). The long lifespan of much urban infrastructure makes it particularly important to be forward looking and consider the potential side effects of interventions (Sanchez-Rodriguez, 2009).

## 6.2 Local area-based planning

The factors influencing adaptive capacities in urban and rural areas can be quite distinct (OECD, 2009), and beyond major cities and urban agglomerations, planning often needs to take into account more complex and dynamic landscapes in which agriculture and forestry activities may dominate. Therefore, a common objective of sub-national area-based planning is to reconcile conservation and development objectives, such as supporting nature-based tourism or maintaining other ecosystem goods and services, while still supporting activities such as agriculture, aquaculture or forestry. The presence of resilient natural or less-intensively managed ecosystems in the landscape can also be important to people's livelihoods and capacity to adapt (AKP 2010c; Gilman *et al.*, 2008; Heller and Zavaleta, 2009; Millar, Stephenson and Stephens, 2007; WWF, 2009).

National programmes and plans on climate change in developing and lower-middle income countries often emphasise natural resource management and ecosystem-based adaptation (Stucki and Smith, 2010). For instance, Bangladesh's National Adaptation Programme for Action (NAPA), launched with the UNFCCC in November 2005, gave a high priority to coastal afforestation, which was approved for funding via the Global Environment Facility (AKP, 2010f; MoEF, 2005). These national level frameworks can be very supportive of local initiatives, and indeed, some rural communities have a lot of experience in responding to climate variability and change (AKP, 2010d) (see also Scott & Weston, 2011).

Decentralisation has created opportunities for local government agencies to become more accountable to their constituencies. However, the most appropriate entry points for mainstreaming climate change adaptation in local government depend upon the details of the individual administrative system, and these vary widely from country to country (OECD, 2009). For example, Byron, a coastal shire in New South Wales, Australia, has adopted a strategic plan for specific temperature increases, sea-level rise, change in rainfall intensities and storm surges. As a result, climate change planning scenarios have been taken into account in all relevant plans, for example, with infrastructure, land use and development. Moreover, this strategy includes the possibility to update key climate parameters based on IPCC and national reports and recommendations. As a result, the construction plans of a new town library had to be adjusted to take into account that it fell within an expanded flood zone (Hamin and Gurrán, 2009). The need for balancing bottom-up and top-down processes to improve adaptation is particularly critical at the local level. Inputs from sub-national actors are likely to be critical to successful adaptation actions (OECD, 2009). Planning processes should provide channels through which lessons and experiences at the local level can influence decision-making at higher levels, and ensure that higher-level decisions and programmes incorporate local strategies and actions.

# 7 Lessons learned and strategies

Planning processes and capacities vary substantially among countries. Nevertheless, the experiences of national, sub national and sectoral planning initiatives suggest that there are common constraints and opportunities to mainstreaming adaptation to climate change. In the following sections, a few of the major lessons learned for development planning from theory and practices in the Asia-Pacific region are outlined.

## 7.1 Inform and engage

### Strengthen capacities to use climate information

Most national climate change adaptation plans and strategies in developing countries place an emphasis on strengthening the use of climate information. Specific recommendations include expanding climate observation networks, developing tools and models for climate risk assessment, and introducing techniques for communicating the uncertainties associated with climate projections and impact assessments (Agrawala and van Aalst, 2008; OECD, 2009). Improving the relevance, accessibility and usefulness of information requires attention to the needs and practical experience of practitioners, rather than a reliance on just science (Cash, Borck, and Patt, 2006; Moser and Leurs, 2008).

A key issue concerning knowledge is improving the understanding of and capacity to deal with uncertainty. Most climate variables cannot be projected with confidence for the time scale required by development planning, especially at sub-national levels. Moreover, development activities are often susceptible to changes in climate extremes, rather than average conditions. These are even less well understood. Future vulnerability and risk may not be closely related to historical patterns, and thus provide only a rough guide to adaptation actions. These challenges are not likely to disappear, but need to be considered.

### Enable locally appropriate responses

Factors that influence vulnerability and adaptive capacity are highly context-specific. Therefore, national plans and policies should enable local responses. Support for local planning processes will need to include resources and procedures to improve the understanding of short and long term climate risks and adaptation options (OECD, 2009). Stakeholder engagement at the local level is also widely recognised as crucial to mainstreaming throughout the policy cycle. The private sector and local communities have key roles in economic development and thus are critical to the effectiveness of mainstreaming efforts on the ground. The exclusion of local insight and knowledge concerning adaptation remains a major limitation to adaptation planning and provides a strong argument for the introduction of more efforts aimed at improving the amount of participation and local deliberation in such exercises (Ayers, 2011).

The need for greater stakeholder engagement in planning adaptation is frequently acknowledged. In fact, most commentators emphasise the need for the involvement of scientists, practitioners, and decision-makers. However, many also believe that wider public involvement is needed. As Innes and Booher put it, “Citizens need to make a difference and planners need to believe their work is professionally responsible” (Innes and Booher, 2004). Existing planning systems often limit wider engagement and deliberation. Improving transparency and accountability in adaptation planning is an issue that has not been sufficiently addressed in discussions concerning mainstreaming. One can, for example, ask in practice: who gains and who loses (Flyvbjerg, 2001).

## 7.2 Screen and assess

### Screen risks

Planning and policy frameworks for mainstreaming provide guidance for governments on how to incorporate adaptation concerns into normal administrative procedures. They often include or refer to tools that can systematically screen and review plans, policies, programmes and projects.

This screening or identification of climate risks associated with policies, plans, programmes and projects is a component of most mainstreaming frameworks, and aims to identify the extent to which climate change, risks and vulnerability have been considered or addressed and whether more should be done (Klein *et al.*, 2007). Opportunities for mainstreaming climate change adaptation into official development assistance, for example, have been identified through portfolio screening (Klein *et al.*, 2007). When high risks are identified, further assessment and follow-up may be warranted.

### Assess risks and adaptation options

Thorough and well organised assessments should inform development planning and help to identify and evaluate risks and adaptation options that are specific to the decision or policy problem. Assessments have evolved beyond their early linear hazards model to include a consideration of current climate, policies and other development factors (Füssel, 2007).

Many guides to conducting assessments have been developed, and some studies have evaluated their relative strengths and weaknesses (Perkins, Ojima, and Correll, 2007; Smith *et al.*, 2009). Füssel (2008), for example, used 14 criteria to evaluate the suitability of five international guidelines on impact and adaptation assessment for use in national and regional assessments of public health. He concluded that although several guides that were based on risk management frameworks were useful, no individual guide covered all the major issues.

Weaknesses in existing plans in developed countries suggest that guides are not being used often enough. For instance, studies by Preston and colleagues (2011) evaluated a set of 57 adaptation plans from Australia, United Kingdom and the United States against 19 planning process criteria (Preston, Westaway and Yuen, 2011). Following this, they found many gaps; in particular, insufficient attention was paid to non-climatic factors, and factors influencing adaptive capacity were ignored. Most options focused on capacity-building, while few focused on actions that would reduce vulnerability. Situations in which climatic factors have a considerable influence on a decision, and where risks due to climate change are likely to increase significantly, should be prioritised for detailed assessment (Füssel, 2007).

## 7.3 Allocate and coordinate

### Start with existing policies and plans

Mainstreaming should start with existing policies, plans and institutions, as these often embody important experiences and may already address key development issues (Dovers, 2009). Thus, in many instances, a key opportunity is to simply implement environment and development measures that have already been identified (Dovers and Hezri, 2010). Adaptation or “mainstreaming” in these situations becomes just another rationale for making investments and taking action. Of course the factors hindering implementation of existing policies and plans may also be obstacles to mainstreaming. “No-regrets” strategies (see Section 5.2) can be particularly valuable (Hallegatte, 2009). Prioritising such options represents a low cost and low risk way to mainstream adaptation into development. Detailed and reliable projections of future climate are not essential for such policies (Füssel, 2007). Broaden constituencies beyond environment agencies

For mainstreaming to be effective, it is important that climate change adaptation is seen as a development rather than an environmental issue. Typically, the initial response of governments has been to allocate responsibilities for adaptation to environmental agencies. In the developing world this is a constraint.<sup>9</sup> When responsibilities are

shifted to a ministries and agencies more directly concerned with development it is more likely that the significance of climate change adaptation will be acknowledged by decision-makers, allocated an adequate budget and responses integrated into development planning. Adequate financial support for integration activities is crucial; otherwise well-meaning plans are unlikely to be implemented.<sup>9</sup> The issue of visibility creates a paradox. The benefits of mainstreaming are likely to be harder to attribute to a particular intervention and as a consequence it is less likely to be supported.

#### *Broaden constituencies beyond environment agencies*

For mainstreaming to be effective, it is important that climate change adaptation be seen as a development issue, rather than an environmental one. Typically, the initial response of governments has been to allocate responsibilities for adaptation to environmental agencies. In the developing world, this is a constraint (Agrawala and van Aalst, 2008). When responsibilities are shifted to ministries and agencies more directly concerned with development, it is more likely that the significance of climate change adaptation will be acknowledged by decision-makers and given an adequate budget, and that responses will be integrated into development planning. In this context, however, there is one disadvantage to mainstreaming: by reducing the visibility of adaptation measures, it could make it harder to attribute the resulting benefits, and as a result to build broader support for adaptation efforts.

#### *Manage policy conflicts*

Conflicts with other priorities are another obstacle to mainstreaming adaptation. Governments prioritise poverty reduction and other development objectives, making it hard to divert resources and funding to actions that do not show clear and immediate benefits. This is especially true when mainstreaming is perceived to generate extra costs and complexity. Differences in stakeholders' interests may also prevent consideration of long-term benefits. For example, the conversion of mangroves to shrimp farms and infrastructure development in low-lying coastal areas may both yield short term gains, but ultimately lead to greater vulnerability to sea-level rise and storm surges.

### **7.4 Review and learn**

#### *Learn from projects but recognise their limitations too*

While mainstreaming frameworks often praise the value of pilot projects, it must be recognised that a project oriented approach has limitations that also arise with development in general. Most development projects receive funding for three to five years and thus might not contribute to reducing climate risks in the long term. As climate change adaptation actions are proactive measures that involve building capacity and reducing risks, they are likely to be less attractive than other more visible activities such as investments in infrastructure.

Learning should not be restricted to just climate change policy and adaptation plans. In fact, as there is little long term experience with these, it often makes more sense to analyse related policy and planning experiences, for example, in disaster or investment risk management and to cautiously borrow insights (Dovers and Hezri, 2010; Lebel, Grothmann and Siebenhüner, 2010).

#### *Monitor and learn*

Planning processes that attempt to bring climate change considerations into poverty reduction, water resources or disaster management should treat policies and projects as experiments. Monitoring and evaluation of adaptation strategies is important because of the large uncertainties associated with both climate change and the impacts of newly formulated policies and projects (Lebel, Krawanchid *et al.*, 2010; Lebel, Sinh and Nikitina, 2010). Monitoring is needed to evaluate whether projects meet their climate adaptation objectives, and what other benefits or adverse impacts they may have on the environment and development. Ways of obtaining continuous feedback that enables implementation to be adjusted as it proceeds should be included from the start. The system should also be open to ad hoc contributions that identify previously unknown risks and impacts (Swanson and Bhadwal, 2009).

Although the need to monitor and review is stressed in most guides and frameworks, how to achieve this is often left unspecified (Preston, Westaway and Yuen, 2011). The way plans and policies are evaluated is an important issue. Huitema and colleagues (2011), carried out a meta-analysis of 259 evaluations of climate policies from six countries in Europe and found that few took into account complexity or were either participatory or reflexive (i.e. questioned official policy goals) (Huitema *et al.*, 2011). Evaluators were often based in universities, research institutes or consultancy firms, and around a third of the evaluations were commissioned.

# 8 *Limitations and conclusions*

Mainstreaming adaptation in development is not a panacea. Individual issues, details and institutional contexts significantly affect its implementation. The proliferation of issues concerning mainstreaming, can lead to frustration or scepticism in targeted national governments. Several commentators have noted that mainstreaming initiatives create more work for administrative staff and may lead to mainstreaming fatigue or overload (Agrawala and van Aalst, 2008).

Experiences with mainstreaming adaptation into planning in Asia have not always matched the expectations generated by generic frameworks and strategies. Mainstreaming discourses such as those calling for greater integration or poverty reduction are hard to oppose directly, but in practice may be harder to pursue than proponents realise.

With respect to flood management, nobody is against protection (Lebel, Sinh *et al.*, 2009), just as in water resources management, nobody is against food security (Molle and Floch, 2008), and in development, nobody is against poverty reduction (Molle, 2008). Yet, such justifications for mainstreaming climate change adaptation into development do not remove the need for public scrutiny of the distribution of benefits, burdens and risks (Lebel 2007; Lebel, Foran *et al.*, 2009).

It must also be stressed that mainstreaming is not the only possible response when the issue of adaptation to climate change is raised. Others are to ignore the issue or deal with it separately. Mainstreaming may also be less important when there is a high certainty that the risks being considered are relatively independent of other factors in development and can be addressed with discrete targeted actions with few side effects.

There are several useful guides to help think of ways to integrate adaptation concerns into development planning. Some of the features of climate change adaptation as a planning problem are familiar, whereas others are not. This implies that a mixture of building on existing plans and processes and innovation will be needed. The details of planning how responsibilities are divided within public administration and the over-arching laws and institutions that frame planning activities are all important to mainstreaming and are relatively under-studied. Theory and empirical research suggest some ways forward, but much more critical reflection on current planning practices is required to effectively identify entry and leverage points for integrating climate change adaptation into development planning.



# References

- Abel, N. A. N., R. Gorrard, B. Harman, et al. 2011. Sea level rise, coastal development and planned retreat: analytical framework, governance principles and an Australian case study. *Environmental Science & Policy* 14(3):279-88.
- Abonyi, G. 2005. *Policy reform in Thailand and the Asian Development Bank's Agricultural Sector Program Loan*. ERD Working Paper Series No. 71. Asian Development Bank.
- ADB. 2009a. *Building climate resilience in the agriculture sector of Asia and the Pacific*. Asian Development Bank.
- ADB. 2009b. *The economics of climate change in Southeast Asia: A regional review*. Asian Development Bank.
- Adger, N. W., N. W. Arnell and E. L. Tompkins. 2005. Successful adaptation to climate change across scales. *Global Environmental Change* 15:77-86.
- ADPC. 2008. *Mainstreaming disaster risk reduction into development policy, planning and implementation in Asia*. A program of the Regional Consultative Committee on Disaster Management. Asian Disaster Preparedness Center.
- ADPC. 2010. *Regional Consultative Committee Program on mainstreaming disaster risk reduction into development policy, planning and implementation*. Presentation given at the Asia-Pacific Climate Change Forum 2010. 22 October 2010. Asian Disaster Preparedness Center.
- Agrawala, S. 2004. Adaptation, development assistance and planning: Challenges and opportunities. *IDS Bulletin* 35(3):50-4.
- Agrawala, S. and M. van Aalst. 2008. Adapting development cooperation to adapt to climate change. *Climate Policy* 8:183-93.
- AKP. 2010a. *Adaptation strategies for water and agricultural sector in Southeast Asia*. Adaptation Knowledge Platform, AIT-UNEP Regional Resource Centre for Asia and the Pacific.
- AKP. 2010b. *Asia-Pacific Climate Change Adaptation Forum 2010: Mainstreaming adaptation into development planning*. Proceedings Report. 21-22 October 2010, Bangkok, Thailand. Adaptation Knowledge Platform, AIT-UNEP Regional Resource Centre for Asia and the Pacific.
- AKP. 2010c. *Coastal ecosystems' role in climate change adaptation*. Second Sharing and Learning Seminar. 3 June 2010. Adaptation Knowledge Platform, AIT-UNEP Regional Resource Centre for Asia and the Pacific.
- AKP. 2010d. *Effectiveness of community-based adaptation to climate change*. Third sharing and learning seminar. 6 August 2010. Adaptation Knowledge Platform, AIT-UNEP Regional Resource Centre for Asia and the Pacific.
- AKP. 2010e. *Linkages between disaster risk reduction (DRR) and climate change adaptation (CCA)*. First Knowledge sharing and learning seminar. 31 March 2010. Adaptation Knowledge Platform, AIT-UNEP Regional Resource Centre for Asia and the Pacific.
- AKP. 2010f. *Scoping assessment on climate change adaptation in Bangladesh*. October 2010. Adaptation Knowledge Platform, AIT-UNEP Regional Resource Centre for Asia and the Pacific.
- Alam, K., M. Shamsuddoha, T. Tanner, et al. 2011. The political economy of climate resilient development planning in Bangladesh. *IDS Bulletin* 42(3):52-61.
- Allen, K. M. 2006. Community-based disaster preparedness and climate adaptation: local capacity-building in the Philippines. *Disasters* 30(1):81-101.
- Ayers, J. 2011. Resolving the Adaptation Paradox: Exploring the Potential for Deliberative Adaptation Policy-Making in Bangladesh. *Global Environmental Politics* 11(1):62-+.
- Ayers, J. M. and S. Huq. 2009. *The Value of Linking Mitigation and Adaptation: A Case Study of Bangladesh*. *Environmental Management* 43(5):753.
- Biagani, B. 2007. *NAPA implementation in practice – current status of the LDCF portfolio*. Presentation for LEG stocktaking meeting on the National Adaptation Programmes of Action, 3-5 September 2007. Available on line: [unfccc.int/files/meetings/workshops/other\\_meetings/application/vnd.ms-powerpoint/bonizella\\_biagani.ppt](http://unfccc.int/files/meetings/workshops/other_meetings/application/vnd.ms-powerpoint/bonizella_biagani.ppt) (Accessed 4 Dec 07). Global Environmental Facility.
- Biswas, A. K., O. Varis and C. Tortajada. Editors. 2005. *Integrated water resources management in South and Southeast Asia*. Oxford: Oxford University Press.
- Björklund, G., H. Tropp, J. Harlin, et al. 2009. *Water adaptation in National Adaptation Programmes for Action*. The United Nations World Water Assessment Programme. Dialogue Paper. United Nations Educational, Scientific and Cultural Organization.
- BMA, GLF and UNEP. 2009. *Bangkok Assessment Report on Climate Change 2009*. Bangkok Metropolitan Administration, Green Leaf Foundation, United Nations Environment Programme.
- Cash, D. W., J. C. Borck and A. G. Patt. 2006. Countering the loading-dock approach to linking science and decision making. *Science, Technology and Human Values* 31(4):465-94.
- China's Ministry of Science and Technology. 2007. *China's Scientific & Technological Actions on Climate Change*. Ministry of Science and Technology.
- COAG. 2007. *National climate change adaptation framework*. Council of Australian Governments Secretariat.
- DDPM. 2006. *Thailand Country Report*. Department of Disaster Prevention and Mitigation, Ministry of Interior, Thailand.
- Dongmei, J., W. Can, H. Shanfeng and Z. Mengheng. 2007. Roles of state strategy of adaptation to climate change in China. *Chinese Journal of Population, Resources and Environment* 5(4):74-80.
- Dovers, S. R. 2009. Normalizing adaptation. *Global Environmental Change* 19:4-6.
- Dovers, S. R. and A. A. Hezri. 2010. Institutions and policy processes: the means to the ends of adaptation. *WIREs Climate Change* 1:212-31.
- Flyvbjerg, B. 2001. *Making social science matter: why social inquiry fails and how it can succeed again*. Cambridge: Cambridge University Press. 204 pp.
- Füssel, H. 2007. Adaptation planning for climate change: concepts, assessment approaches, and key lessons. *Sustainability Science* 2:265-75.
- Ganjanapan, S. and L. Lebel. 2009. *Improving water allocation through multi-stakeholder platforms in the Mae Kuang watershed, northern Thailand*. USER Working Paper WP-2009-04. Unit for Social and Environmental Research, Faculty of Social Sciences, Chiang Mai University.
- Gilman, E. L., J. Ellison, N. C. Duke and C. Field. 2008. Threats to mangroves from climate change and adaptation options: A review. *Aquatic Botany* 89(2):237-50.
- Gyawali, D. and A. Dixit. 2001. Water and science: hydrological uncertainties, development aspirations, and uningrained scientific culture. *Futures* 33:689-708.
- Hallegatte, S. 2009. Strategies to adapt to an uncertain climate change. *Global Environmental Change* 19:240-7.
- Hamin, E. and N. Gurrán. 2009. Urban form and climate change: Balancing adaptation and mitigation in the U.S. and Australia. *Habitat International* 33:238-45.
- Handmer, J. and S. R. Dovers. 2007. *The handbook of disaster and emergency policy and institutions*. London: Earthscan.
- Heller, N. E. and E. S. Zavaleta. 2009. Biodiversity management in the face of climate change: A review of 22 years of recommendations. *Biological Conservation* 142(1):14-32.
- Huitema, D., A. Jordan, E. Massey, et al. 2011. The evaluation of climate policy: theory and emerging practice in Europe. *Policy Sciences* doi:.
- Huq, S. and J. Ayers. 2008. *Taking Steps: Mainstreaming National Adaptation*. IIED Policy Brief. URL: [www.iied.org/pubs/display.php?o=17040IIED](http://www.iied.org/pubs/display.php?o=17040IIED) [accessed 8 July 2011]. International Institute for Environment and Development.
- Innes, J. E. and D. E. Booher. 2004. Reframing public participation: strategies for the 21st century. *Planning Theory & Practice* 5(4):419-36.
- IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the IPCC. Cambridge, UK: Cambridge University Press.
- Klein, R., S. Eriksen, L. Naess, et al. 2007. Portfolio screening to support the mainstreaming of adaptation to climate change into development assistance. *Climatic Change* 84:23-44.
- Klein, R., E. L. F. Schipper and S. Dessai. 2005. Integrating mitigation and adaptation into climate and development policy: three research questions. *Environmental Science & Policy* 8:579-88.
- Kok, M. T. J. and H. C. Coninck. 2007. Widening the scope of policies to address climate change: directions for mainstreaming. *Environmental Science & Policy* 10(7-8):587-99.
- Kok, M. T. J. and H. C. de Coninck. 2007. Widening the scope of policies to address climate change: directions for mainstreaming. *Environmental Science and Policy* 10(7-8):587-99.
- Kusakabe, K. 2005. Gender mainstreaming in government offices in Thailand, Cambodia and Laos: perspectives from below. *Gender and Development* 13(2):46-56.
- Lasco, R. D., F. B. Pulhin, P. A. Jaranilla-Sanchez, et al. 2009. Mainstreaming adaptation in developing countries: The case of the Philippines. *Climate and Development* 1(2):130-46.
- Lebel, L. 2007. Adapting to climate change. *Global Asia* 2(3):15-21.
- Lebel, L., J. Dore, R. Daniel and Y. S. Koma. Editors. 2007. *Democratizing water governance in the Mekong region*. Chiang Mai: Mekong Press.
- Lebel, L., T. Foran, P. Garden and B. J. Manuta. 2009. "Adaptation to climate change and social justice: challenges for flood and disaster management in Thailand" in *Climate change adaptation in the water sector*. Edited by F. Ludwig, et al., pp. 125-41. London: Earthscan.
- Lebel, L., P. Garden, M. R. N. Banaticla, et al. 2007. Integrating carbon management into the development strategies of urbanizing regions in Asia: implications of urban form, function and role. *Journal of Industrial Ecology* 11(2):61-81.
- Lebel, L., T. Grothmann and B. Siebenhüner. 2010. The role of social learning in adaptiveness: insights from water management. *International Environmental Agreements* DOI 10.1007/s10784-010-9142-6.
- Lebel, L., D. Krawanchid, C. Krittasudthacheewa, et al. 2010. *Adaptation Knowledge Platform. Scoping assessment for national implementation in Thailand - Summary* AIT-UNEP RRC.AP.
- Lebel, L., B. J. Manuta and P. Garden 2011. Institutional traps and vulnerability to changes in climate and flood regimes in Thailand. *Regional Environmental Change* 11:45-58.
- Lebel, L., R. T. Perez, T. Sukhaphunnaphan, et al. 2009. "Reducing vulnerability of urban communities to flooding," in *Critical states: Environmental challenges to development in Monsoon Asia*. Edited by L. Lebel, et al., pp. 381-99. Selangor, Malaysia: Strategic Information and Research Development Centre.
- Lebel, L., B. T. Sinh, P. Garden, et al. 2009. "The promise of flood protection: Dykes and dams, drains and diversions," in *Contested Waterscapes in the Mekong Region*. Edited by F. Molle, et al., pp. 283-306. London: Earthscan.
- Lebel, L., B. T. Sinh and E. Nikitina. 2010. "Adaptive governance of risks: climate, water, and disasters," in *Climate change adaptation and disaster risk reduction: Issues and challenges, Community, Environment and Disaster Risk Management*. Edited by R. Shaw, et al., pp. 115-42. Bingley, UK: Emerald Publishers.
- Lebel, L., J. Xu, R. C. Bastakoti and A. Lamba. 2010. Pursuits of adaptiveness in the shared rivers of Monsoon Asia. *International Environmental Agreements* 10(4):355-75.
- McGregor, I. and L. Lebel. 2010. *A U-TURN for sustainable cities*. USER Working Paper WP-2009-18. (SENSE Symposium on Climate Proofing Cities). Unit for Social and Environmental Research, Chiang Mai University.
- Millar, C. I., N. L. Stephenson and S. L. Stephens. 2007. Climate change and forests of the future: Managing in the face of uncertainty. *Ecological Applications* 17(8):2145-51.
- MoEF. 2005. *National Adaptation Programme of Action (NAPA)*. November 2005. Ministry of Environment and Forests, Government of the People's Republic of Bangladesh.
- MoEF. 2008. *Bangladesh Climate Change Strategy and Action Plan 2008*. On-line: <http://www.moef.gov.bd/moef.pdf> (Accessed 25 July 2011). Ministry of Environment and Forests, Government of the People's Republic of Bangladesh.
- MoEF. 2009. *Bangladesh Climate Change Strategy and Action Plan*. September 2009. Ministry of Environment and Forests, Government of the People's Republic of Bangladesh.
- Molle, F. 2008. Nirvana concepts, narratives and policy models: insights from the water sector. *Water Alternatives* 1(1):23-40.
- Molle, F. 2009. River-basin planning and management: The social life of a concept. *Geoforum* 40:484-94.
- Molle, F. and P. Floch. 2008. Megaprojects and social and environmental changes: the case of the Thai "water grid". *Ambio* 37(3):199-204.
- Molle, F., T. Foran and M. Kakonen. Editors. 2009. *Contested waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance*. London: Earthscan.
- Moser, C. and A. Moser. 2005. Gender mainstreaming since Beijing: a review of success and limitations in international institutions. *Gender & Development* 13(2):11-22.

Moser, S. C. and A. L. Leurs. 2008. Managing climate risks in California: the need to engage resource managers for successful adaptation to change. *Climatic Change* 87:S309-S22.

MRC. 2009. *Climate Change and Adaptation Initiative: Framework document for implementation and management. Version: 12 June 2009.* Mekong River Commission.

Nkem, J., H. Santoso, D. Murdiyarto, et al. 2007. Using tropical forest ecosystem goods and services for planning climate change adaptation with implications for food security and poverty reduction. *SAT eJournal* 4(1).

O'Brien, G., P. O'Keefe, J. Rose and B. Wisner. 2006. Climate change and disaster management. *Disasters* 30(1):64-80.

OECD. 2009. *Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance.* Organisation for Economic Co-Operation and Development

OEPP. 2000. *Thailand's initial National Communication under the United Nations Framework Convention on Climate Change.* Office of Environmental Policy and Planning, Ministry of Science, Technology and Environment.

Olhoff, A. and C. Schaer. 2010. *Screening Tools and Guidelines to Support the Mainstreaming of Climate Change Adaptation into Development Assistance – A Stocktaking Report.* United Nations Development Programme.

Pahl-Wostl, C. 2007. Transitions towards adaptive management of water facing climate and global change. *Water Resources Management* 21:49-62.

Pahl-Wostl, C., P. Jeffrey, N. Isendahl and M. Brugnach. 2011. Maturing the new water management paradigm: Progressing from aspiration to practice. *Water Resources Management* 25:837-56.

Perkins, B., D. Ojima and R. Correll. 2007. *A survey of climate change adaptation planning.* H. John Heinz III Center for Science, Economics and the Environment.

Pielke Jr, R., G. Prins, S. Rayner and D. Sarewitz. 2007. Lifting the taboo on adaptation. *Nature* 445:597-8.

Preston, B. L., R. M. Westaway and E. J. Yuen. 2011. Climate adaptation planning in practice: an evaluation of adaptation plans from three developed nations. *Mitigation and Adaptation Strategies for Global Change* 16(4):407-38.

Revi, A. 2008. Climate change risk: an adaptation and mitigation agenda for Indian cities. *Environment & Urbanization* 20(1):207-29.

Royal Government of Cambodia. 2006. *National Adaptation Programme of Action to climate change (NAPA).* Ministry of Environment.

Sanchez-Rodriguez, R. 2009. Learning to adapt to climate change in urban areas. A review of recent contributions. *Current Opinion in Environmental Sustainability* 1:201-6.

Schipper, E. L. F. 2007. *Climate change adaptation and development: exploring the linkages.* Working Paper 107. Tyndall Centre for Climate Change Research.

Schipper. 2009. Meeting at the crossroads?: Exploring the linkages between climate change adaptation and disaster risk reduction. *Climate and Development* 1:16-30.

Schipper, E. L. F., M. P. Cigaran and M. M. Hedger. 2008. *Adaptation to climate change: the new challenge for development in the developing world.* United Nations Development Programme.

Schipper, L. and M. Pelling. 2006. Disaster risk, climate change and international development: scope for, and challenges to, integration. *Disasters* 30(1):19-38.

Sharma, D. and S. Tomar. 2010. Mainstreaming climate change adaptation in Indian cities. *Environment and Urbanization* 22(2):451-65.

Smith, J., S. Schneider, M. Oppenheimer, et al. 2009. Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) "reasons for concern". *Proc Natl Acad Sci* 106:4133-7.

Srinivasan, A. and T. Uchida. 2008. "Mainstreaming and financing adaptation to climate change," in *The climate regime beyond 2012. Reconciling Asian development priorities and global climate interests.* Edited by A. Srinivasan, pp. 57-83. Hayama: Institute for Global Environmental Strategies.

Stucki, V. and M. Smith. 2010. Integrated approaches to natural resource management in practice: The catalyzing role of National Adaptation Programmes for Action. *Ambio* DOI 10.1007/s13280-010-0097-1.

Swanson, D. and S. Bhadwal. Editors. 2009. *Creating adaptive policies: A guide for policy-making in an uncertain world.* London: Sage.

Swart, R. and F. Raes. 2007. Making integration of adaptation and mitigation work: Mainstreaming into sustainable development policies? *Climate Policy* 7(4):288-303.

Tangwisutijit, N. 2007. "Bangkok will be underwater, experts predict", *The Nation*, 26 June 2007, Bangkok. Online, Available from World Wide.

Thomalla, F., T. Downing, E. Spanger-Siegried, et al. 2006. Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation. *Disasters* 30(1):39-48.

Thomas, D. E. 2006. *Participatory Watershed Management in Ping Watershed: Final Report.* Bangkok: Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment, Thailand.

UN. 1996. *Report of the fourth world conference on women. Beijing, 4-15 September 1995. A/CONF.177/20/Rev.1.* United Nations.

UNDP-UNEP. 2008. *Making the economic case: A primer on the economic arguments for mainstreaming poverty-environment linkages into national development planning.* United Nations Development Programme and United Nations Environment Programme Poverty Environment Initiative.

UNDP-UNEP. 2011. *Mainstreaming adaptation to climate change in development planning: A guidance for practitioners.* United Nations Development Programme and United Nations Environment Programme Poverty Environment Initiative.

UNESCAP. 2009. *Statistical yearbook for Asia and the Pacific. 2009.* United Nations Economic and Social Commission for Asia and the Pacific.

USAID. 2010. *Asia-Pacific Regional Climate Change Adaptation Assessment. Final Report: Findings and recommendations. April 2010.* United States Agency for International Development.

van Beek, E. 2009. "Managing water under current climate variability," in *Climate change adaptation in the water sector.* Edited by F. Ludwig, et al., pp. 51-77. London: Earthscan.

World Bank. 2006. *Managing climate risk. Integrating adaptation into World Bank Group operations.* World Bank.

World Bank. 2010. *Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects. Available online: <http://climatechange.worldbank.org/climatechange/content/mainstreaming> (Accessed 19 August 2011) Guidance Notes.* World Bank.

World Bank, ADB and JICA. 2010. *Climate risks and adaptation in Asian coastal megacities.* World Bank, Asian Development Bank and Japan International Cooperation Agency.

WWF. 2009. *The Greater Mekong and Climate Change: biodiversity, ecosystem services and development at risk.* World Wildlife Fund Greater Mekong Program.

Yu, H. 2004. Knowledge and climate change policy coordination in China. *East Asia* 21(3):58-77.



Stockholm Environment Institute, Asia Centre  
15th Floor, Witthayakit Building,  
254 Chulalongkorn University,  
Chulalongkorn Soi 64,  
Phyathai Road, Pathumwan,  
Bangkok, 10330, Thailand  
Tel: +66 225 144 15  
Website: <http://www.sei-international.org>